Increasing Workers' Health and Safety Engagement
A Ford Bridgend Engine Plant Case Study

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II List of Publications and Other Outputs Arising From This Research

II.I Publications (Peer-Reviewed and Professional Articles)

Bell, N. and Homann, F., 2019. For want of a Nail. *IOSH magazine (online)*. October 2019. Available at: https://www.ioshmagazine.com/2019/10/15/want-nail

Homann, F., Limbert, C., Matthews, S., Castaldi, D. and Sykes, P., 2021 (2021). Identifying Management Practices that Drive Production-Line Workers' Engagement through Qualitative Analysis. *Journal of Safety Research.*
This paper contains the findings from Chapter 5.

Homann, F., Limbert, C., Bell, N. and Sykes, P., 2021. Safety through engaged workers: The link between Safety-II and work engagement. *Safety Science.*
This paper contains the findings from Chapter 2.

Homann, F., Limbert, C., & Sykes, P., 2021 (under review). Engagement in the Context of Production-Line Workers: A Review of the Literature. *Human Factors.*
This paper contains the findings from Chapter 3.

Homann, F., Limbert, C., and Sykes, P., 2021 (under preparation) Increasing Workers' Health and Safety Engagement: An Intervention Framework Proposal. *Organisational Psychology.*
This paper contains the findings from the whole research project.

Homann, F., Bell, N., Limbert, C., and Sykes, P., 2021 (under preparation). Safety Engagement in a Safety-II Context: Development of a Safety Engagement Maturity Matrix Through a Delphi Study. *Safety Science.*
This paper contains the findings from Chapter 2.

II.II Presentations and Posters

Homann, F. (2019). Engaging workers in health and safety (H&S) practice: Increased health and, safety performance and wellbeing through worker engagement in the automotive industry - A Ford Bridgend Engine Plant (BEP) Case Study. *Poster Presentation at the Cardiff Metropolitan University School of Sport and Health Sciences Annual Post-Graduate Research Conference, 14 May 2019, SWALEC, Cardiff, Wales.*

Homann, F., Limbert, C. and Sykes, P. (2019). Engaging workers to adopt positive health and safety behaviours. *Oral Presentation at the Cardiff Metropolitan University School of Sport and Health Sciences Annual Post-Graduate Research Conference, 14 May 2019, SWALEC, Cardiff, Wales.*

Homann, F., Limbert, C. and Sykes, P. (2019). “I don’t have time for this!”: Addressing the challenges of conducting interviews in a manufacturing environment. *Poster Presentation at the BPS Conference of Qualitative Methods in Psychology & History & Philosophy of Psychology, 3-5 July 2019, Cardiff, Wales.*

III Abstract

From 2019 to 2020, 11,245 UK-manufacturing workers were injured at work. It has been reported that health and safety (H&S) behaviour and compliance are positive outcomes of increased work engagement (WE), suggesting that research on WE and H&S engagement is warranted in relation to production-line workers. WE, which is often defined as a worker's psychological state of vigour, dedication and absorption, is beneficial for workers and employers as it motivates them to 'go the extra mile' to ensure H&S for all. This is recognised within the concept of Safety-II which views humans as clever, proactive, flexible resources in safety management, showing resilience and, through their performance variability, prevent adverse events. The research presented in this thesis integrates the concepts of WE and Safety-II and generates a novel intervention framework that aims to increase both, WE and Safety-II principles.

Based in a Welsh production plant, this research was designed to: 1) explore the crucial factors that promote 'engagement with H&S', and 2) develop a practical intervention to be applied within production environments to enhance WE towards H&S.

After critically evaluating the literature on WE and Safety-II, the workers' drivers of H&S engagement were analysed. Then, critical literature reviews identified best practice in engagement interventions for production environments. An intervention framework was then designed utilising a structural change in the organisation by implementing co-design structures, that were qualitatively evaluated with regard to feasibility and transferability on hypothetical grounds.

This is the first study that integrates the concepts of WE and Safety-II in production-line workers. Additionally, it offers a practical intervention framework for companies to incorporate Safety-II principles and increase WE to improve H&S climate and behaviour. Furthermore, the research adds to the limited body of qualitative insights into production-line workers' perceptions of WE in the context of H&S practice, and engagement intervention research, developing assessable guidelines for practitioners.

IV Acknowledgements

What a rollercoaster of a ride this was, with twists and turns, scary parts, but mostly the excitement and thrill of the journey.

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VIII Table of Abbreviation and Definitions

AHP	Analytic Hierarchy Process
ANSI	American National Standards Institute
BEP	Bridgend Engine Plant
BC	Blue-Collar Worker(s)
C	Control Group
COM-B	Capability, Opportunity, Motivation-Behaviour
COR	Conservation of Resource Theory
ERI	Effort Reward Imbalance model
ESF	European Social Fund
FRAM	Functional Resonance Analysis Method
FTOV	First-Time Occupational Visits
GDPR	General Data Protection Regulation
H&S	Health and Safety
HRM	Human Resource Management
HSC	Health and Safety Commission
HSE	Health and Safety Executive
HSL	Health and Safety Laboratory
I	Intervention Group
INSAG	International Nuclear Safety Group
ISO	International Organization for Standardization
JD-R	Job Demands-Resources

Table of Abbreviation and Definitions

KESS	Knowledge Economy Skill Scholarship
LMX	Leader-Member Exchange
LTCR	Lost-Time Case Rate
MET	Measure Evaluation Tool
MF	Manufacturing
MRS	Model of Resilience in Situation
NEBOSH	National Examination Board in Occupational Safety and Health
NHS	National Health Service UK
OCB	Organisational Citizenship Behaviour
OSH	Occupational Safety and Health
PAR	Participatory Action Research
PL	Production-Line
PPE	Personal Protective Equipment
PSC	Psychological Safety Climate
RAG	Resilience Analysis Grid
SCB	Safety Citizenship Behaviour
SDT	Self-Determination Theory
SET	Social-Exchange Theory
SMS	Safety Management System
TDF	Theoretical Domain Framework
TFA	Theoretical Framework of Acceptability
UWES	Utrecht Work Engagement Scale
VPP	Voluntary Protection Program

Table of Abbreviation and Definitions

WE	Work Engagement
WG	Working Group

Chapter 1 - Introduction and Background of the Research

1.1 Introduction

Workers' health and safety (H&S) is of paramount importance to companies. Yet often, especially in environments with a well-implemented safety management system (SMS), adverse incidents and events still occur with varying frequency, and effort to achieve continual performance of the field with H&S performance often reaching a plateau, while low-impact incidents still occur regularly and the occasional surprising high-impact accident seems to be unrelated to the risks monitored (Townsend, 2016). This phenomenon has been described by Dekker and Pitzer (2016) who postulated that some safety practices and structures focused on control and compliance may be counterproductive as they restrict workers' autonomy and prevent taking responsibility and developing flexible problem-solving skills. Occupational health and safety (OSH) refers to the employers' duty to ensure an employee's safety, health and welfare at work (Health and Safety at Work etc. Act 1974 Chapter 37, 2019). Despite the UK having one of the lowest rates of work-related accidents in Europe, there were still 111 fatalities in 2019/2020 in the UK, 15 of which were in the manufacturing (MF) industry, while 11,245 MF workers were injured at work (Health and Safety Executive, 2020). The Health and Safety Executive (2017) found that human behaviour contributed to 70-90% of work-related incidents in the UK. Therefore, UK legislation called for workers to be part of the risk assessment process, as well as workers being represented and included in active consultation in safety committees in statutes like the HSG65 (Health and Safety Executive, 2013). From an empirical perspective, this notion has been supported by evidence which shows an association between worker involvement and improved safety outcomes; Worker involvement was presented as one of the major factors to the low incident rate in the 2012 London Olympic games (Geldart *et al.*, 2010; Lucy *et al.*, 2011; Zanko and Dawson, 2012). Therefore, the current evidence suggests that for a company to promote continuous improvement in safety and resilience, more than just rules, procedures and compliance are needed, rather an environment is required where workers are not only involved superficially, but engaged with their work and, therefore their safety.

Engagement is defined as a positive psychological state in its own right, further defined by a worker's "positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption" (Schaufeli *et al.*, 2002, p. 74), hence showing traits of, (among others) psychological presence and extra-role-behaviour, such as 'being fully there' and 'going the extra mile' (Schaufeli *et al.*, 2002). The tangible outputs of engagement are hard to measure and have not been readily reported in the literature, though it has been shown that improved safety behaviour and compliance are positive outcomes of increased engagement (Hansez and Chmiel, 2010; Wachter and Yorio, 2014; Huang *et al.*, 2016).

Workers' perception of safety culture has been found to be closely linked with their engagement (Nahrgang, Morgeson and Hofmann, 2011). Nahrgang et al. (2011) showed that in order to overcome the safety performance plateau in a company, work engagement (WE) is beneficial for workers as well as the company, as workers must be motivated to 'go the extra mile' when it comes to their own and their peers' H&S (Griffin and Neal, 2000; Prussia, Brown and Willis, 2003). This was also supported by a hierarchical regression analysis of 421 railway-maintenance workers by Morrow et al. (2010) who uncovered that safety climate measures (such as management safety, co-worker safety, work-safety tension) were majorly responsible for behaviour in hazardous actions. The importance of workers' active involvement and engagement was recognised within the concept of Safety-II (Hollnagel, 2014b; Hollnagel, Wears and Braithwaite, 2015). This concept views humans as clever, proactive, flexible resources in safety management, who show their resilience through their performance variability and are considered the reason that things 'go right'. Nevertheless, as research around this topic is mostly focused on processual and system-based factors rather than the psychological implications, and it indicates that H&S engaged workers are a crucial, cooperating part of a Safety-II approach. However, very few practical guidelines for companies have been published that take the psychological, affective state of workers into account and give guidance on how to foster an engaging environment and support workers to adopt a Safety-II mindset.

From a corporate perspective, the link between a positive climate and engagement was highlighted in the Molson Coors beverage company which reportedly saved $1.7 million in safety expenses by increasing employee engagement (Vance, 2006; Raines, 2011). Within the same

publication, engaged workers were found to be five times less likely than non-engaged workers to be involved in hazardous incidents and seven times less likely to have to stay at home due to injuries. Not surprisingly, that meant a reduction of costs associated with safety incidents by an average of $329 through employee engagement (Vance, 2006; Raines, 2011). While these reported outcomes cannot be clearly attributed to engagement alone, they show that large multi-national companies see the value in worker engagement, considering the number of incidents in MF settings alone in the UK, which could be avoided if workers were more engaged in safety issues. However, a brief exploratory literature search in Scopus brought to light that engagement in the context of safety (behaviour) and focusing on production-line (PL) workers was still rare:

Search terms:

- PL context: manufac* OR production OR "shop floor" OR "blue collar" OR automotive OR car OR assembly (all fields)
- Engagement (abstract, title, and keywords search)
- And to make sure that researcher retrieves publications on the psychological state of engagement, consideration of work by the following authors must have been included in the references: schaufeli OR harter OR saks OR kahn OR maslach OR macey (references)
- And consideration of safety context through the key words: "Safety different*" OR "safety-ii" OR "safety performance" OR "safety compliance" OR "safety behaviour" OR "health and safety" OR "safety culture" OR "safety climate" (abstract, title, and keywords search)

The literature search (from May 2021) revealed only thirty-one publication. Notably, most of the identified research did not focus on manual PL workers but on mixed samples of unclear proportions, only managers or had no incorporation of either safety or PL workers. After having reviewed the papers, only three[1] publications were found to have a focus on

[1] This number does not include Homann et al. (2021) which is a result of this research (see Chapter 5)

manual workers' experiences of engagement in the context of safety (performance), though none of them was solely focused on the PL worker's experience, instead two were focused on construction workers (Lee *et al.*, 2020; Ni *et al.*, 2020), one on mining workers (Yuan, Li and Tetrick, 2015). In addition, none of the papers considered qualitative research methods or interventions. Therefore, the combined lack of qualitative research on workers' sense making of their level of safety engagement as well as the lack of consequent empirical intervention recommendations revealed a clear gap in WE research within a safety context.

1.2 Emergence of the Research

To this date, there is limited evidence of WE insights and evidence-based interventions in samples of PL workers within the context of safety. Even research on engagement intervention overall is scarce and there is no clear agreement on guidelines on how to increase engagement in organisations, with tested interventions varying including mindfulness exercises, job redesign approaches or trainings on soft skills (Knight, Patterson and Dawson, 2019). This research project broadly aimed to synthesise the findings from primary and secondary research into a proposal for an intervention framework in a production plant for PL workers.

This research was a project sponsored by the Knowledge Economy Skills Scholarships (KESS 2), a scholarship fund that is focused on bringing together Higher Education and Welsh companies supported by European Social Funds (ESF) financed through the Welsh Government. This project was conducted in cooperation with the Ford Engine Plant (BEP) in Bridgend, Wales. The Partner Company sponsored this research as they perceived elevated levels of accidents and of non-compliance with safety rules and procedures, which raised concerns. The BEP initiated this research project to help them increase what they referred to as 'engagement with H&S', beginning with an in-depth examination of their 'safety engagement climate'.

It should be noted that this research was impacted by two events: The announcement and consequent closure of the BEP plant and the COVID-19 pandemic. This means that an adaptive and flexible approach were needed in order to be able to proceed with the project, while ensuring academic rigour. In June 2019, one year after starting the project, it was announced

that the plant would close in 2020. Therefore, the scope of this research project had to be adapted. The research originally planned to include safety climate considerations into the project and derive a safety engagement climate questionnaire from the research, as well as pilot a final intervention proposal in the plant. However, negotiations and discussions about the future of this research project in terms of company involvement lasted for more than a year, and during this time the outcome was very uncertain. Finally, an agreement was reached to keep on working with the original plant which meant having to adapt and working with a limited and potentially polarised sample during the de-commissioning phase. Furthermore, the focus of the research project was shifted from taking the climate consideration into account to solemnly and thoroughly focusing on engagement. Also, planned field work had to be refocused. While not having a concrete pilot to test the intervention in its target environmental setting might be seen as limitation, this approach has been recommended to first explore the practicability and acceptability on a draft level before looking at the effectiveness of a full pilot (Hallingberg *et al.*, 2018). This may allow a more detached look of the participants undergoing the intervention to identify possible improvements. Furthermore, the prospect of the plant closing allowed for the opportunity to consider a wider, more transferable research approach.

Having adapted the research plan in the light of the plant's circumstances, the global COVID-19 pandemic hit in the beginning of 2020, again requiring adaptability and flexibility to quickly amend the research plan. Focus groups were planned with the remaining BEP workers to create a primary intervention proposal using co-design workshops. Despite the COVID-19 lockdown of unknown duration bringing the research to a halt again, it was decided to bridge the time by developing a first draft for the proposal of an intervention framework based on the research and the supervisor team as a sounding board. This was then evaluated by the BEP workers in individual interviews to ascertain their perception on its practicability and possible improvements to still admit a level of co-design and ensure fit to the environment. This approach added strength to the research since individual interviews allow for deeper insights into the subject than focus groups (Sullivan and Forrester, 2019). As can be seen, despite these two events massively impacting the original research plan, through a pragmatic approach, flexibility and reflectivity within each step of the project, the quality of the research and its output was ensured.

1.3 Introduction to the Partner Company[2]

The research (June 2018 - September 2021) was set in the BEP, an automotive MF facility of the Ford Motor Company, located in Bridgend, Wales (see Figure 1). While the Ford Motor Company heritage goes back as far as 1903, first founded by Henry Ford in Detroit (Dearborn), in the US, the Welsh plant first started its production of petrol engines in 1980 and during the period of this study it was operating three production-lines (i.e. Sigma, AJ133/126 and Dragon) with about 1,700 employees on site, 1,350 of which were working in shop floor-vicinity jobs (such as assembly and machining lines). The total site covers over 59 acres, and the plant floor covered over 1,500,000 ft2. The site produced engines for a variety of Ford vehicles (including Fiesta, B-Max, C-Max) as well as for Jaguar and Land Rover (Ford Bridgend Engine Plant, 2019).

In 2018, the plant produced over 535,000 engines, equating to almost two engines every working minute, which were distributed worldwide (Germany, Spain, Russia, USA, Vietnam, Thailand, Mexico, UK, Slovakia, etc.) (Ford Bridgend Engine Plant, 2019).

[2] The information about the plant was gathered from talks with the then vice plant manager and an internal induction document, as no official documentation could have been provided.

Figure 1: Ford Bridgend Engine Plant (Aerial View)

The employees were represented by a trade union and the plant had a SMS. The plant used both corporate and legislative (e.g. HSE) documents and guidance. In-house safety standards and policies detail how the plant seeks to manage H&S with respect to standards, reporting, responsibilities, and practices. H&S is documented as the number one company value and forms the core principles of an extensive body of safety communication measures (including regular H&S management meetings with H&S professionals, plant department heads and union representatives).

An internal H&S culture questionnaire study was conducted in 2015 by the plant's H&S department. The safety culture survey consisted of a questionnaire that had been developed for Ford by the Health and Safety Laboratory (HSL) and included two demographic questions (i.e. hierarchy level, working area [e.g. PL]), 25 statements with a 4-point Likert-Scale focusing on culture, including: "The company's concern for H&S is at least equal to its concern for productivity and profit", "At this location, management is taking H&S issues seriously", "At this location, overall attitudes to H&S are improving", and one open-ended question asking for respondents' suggestions for improvements ("Please add your own Top 3 improvement actions which you feel would best improve the overall safety within your area of work").

From the 373 surveys issued, responses were received from 182 people (i.e. 48.8%). In hindsight, the responsible safety engineer admits that this low participation rate was possibly due to a lack of promotion of the study within the plant. While no in-depth statistical analysis was conducted, the overall results show an almost balanced perception on all questions with neither positive nor negative weight. Specifically, 3,088 questions were answered positively and 1,462 negatively. The BEP communicated the following findings from the 2015 survey:

- 96% of employees confirmed that they would follow an issued safety rule/procedure;
- 93% of employees wanted to be more involved in safety walks or risk assessments;
- 91% of employees confirmed that safety was their number one priority;
- 87% maintained that they ensured that safe work practices were followed;

- 53% suggested that improvements are required on how we feedback on raised safety concerns/near misses;
- 51% said that they wanted a better understanding of risk assessments.

While these results sound rather positive, they need to be interpreted with caution, considering that only 373 surveys were issued in a plant of about 1,700 employees and only half of the distributed surveys were answered. It is possible that workers who felt disengaged might have refused to take part in such an initiative (de la Rocha, 2015).

Within the plant, the documented safety reports indicated occasional severe safety events, with managers and internal H&S professionals also indicating an observed elevated level of non-compliant worker behaviour, e.g. minor incidents and accidents as well as a generally negative perceptions of H&S topics.

In an e-mail from 26/01/2021, the vice-plant manager explained the following:

> *"The trend in performance from 2013 to last year is very good in terms of first-time occupational visits [(FTOVs; see Figure 2)] but [2020] is not a representative year and this still means that up until 2018 we were still having 100 accidents per year. When you take into account a workforce that diminished from 2175 in 2013 to around 1500 in 2018 (these are not exact figures) we have not improved as much as it appears."(Davis, 2021)*

He then continued:

> *"If you look at our lost-time case rate [(LTCR; see Figure 3)], which is a measure of how many accidents that cause people to be off work we have per 100,000 hours (a measure that takes into account our diminishing workforce), we have a much shallower trend albeit slightly improving. I think we felt that there was very limited opportunity to improve the statistics without making the people change and that is why we attempted a cultural approach."(Davis, 2021)*

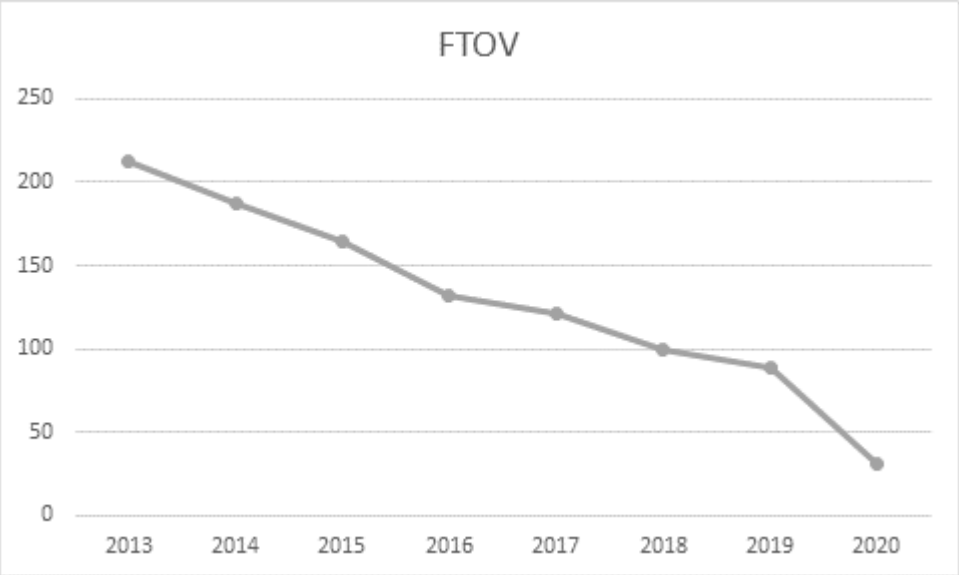


Figure 2: First-Time Occupational Visits in BEP 2013 – 2020 (Davis, 2021)

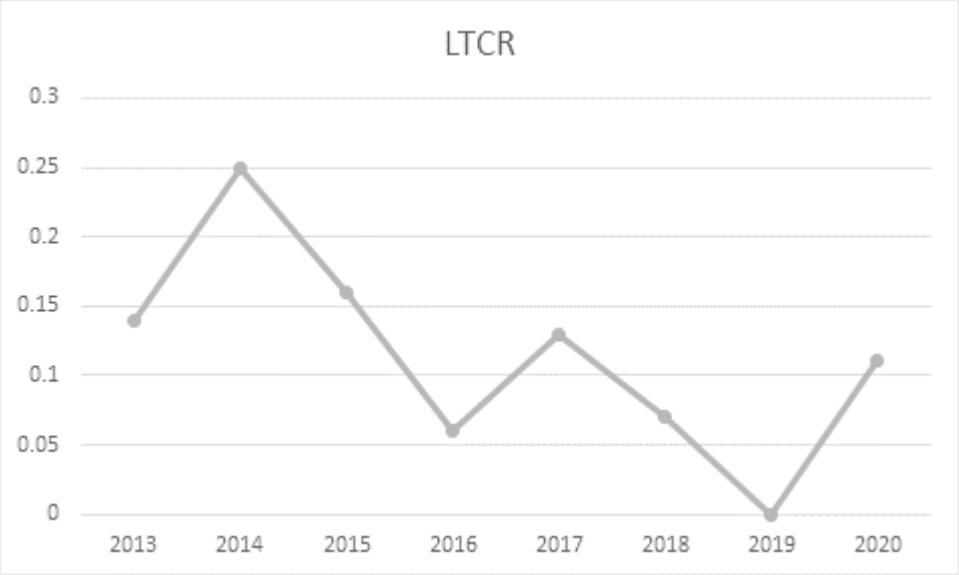


Figure 3: Lost-Time Case Rate in BEP 2013 – 2020 (Davis, 2021)

Therefore, the plant management in correspondence with the H&S department decided to take a more in-depth look into the safety culture of the plant and develop an intervention that increased the workers' engagement with H&S. Consequently, discussions with the H&S academic team at Cardiff Metropolitan University took place and the scope of the project was developed. Hence, this research project was initiated based on the perception of the plant manager and the H&S department that the workers do not show the safety engagement that

management would hope for, despite the company's efforts to provide a safe environment through adequate personal protective equipment (PPE), standardised procedures and H&S awareness initiatives.

1.4 Research Aim and Objectives

The aim of this research project was to develop a proposal for an intervention framework which could be applied to increase engagement levels with H&S amongst the PL workers' and potentially provide a framework which could be transferred to other MF organisations.

In order to achieve this aim, the research met the following objectives:

- Objective 1: Identify and synthesise the current literature to assert empirical evidence that links WE with H&S behaviour and mindset, and its connection to the Safety-II principle through a literature review.
- Objective 2: Evaluate the existing body of research on WE interventions in a production environment to derive measures of good practice and impact on increasing WE by conducting a narrative literature review.
- Objective 3: Utilise a qualitative approach to identify factors influencing H&S engagement in the plant through semi-structured interviews.
- Objective 4: Synthesise the findings from the interviews and the narrative literature review to design a template intervention framework specific to the target group to improve workers' H&S engagement in the production plant.
- Objective 5: Collect and analyse qualitative perceptions on the template intervention framework proposal via a preliminary/exploratory feasibility study involving semi-structured interviews: a) with the target group to assess and critically evaluate the fit, feasibility and practicability, and b) with external practitioners to assess and critically evaluate external validity and the transferability of the framework as well as to identify possible improvements.
- Objective 6: Synthesize the findings of previous studies in the development of a proposal for an intervention framework and guidelines improving H&S engagement in PL workers within the Safety-II mindset.

1.5 Philosophical Underpinning

In order to understand the design of the research and the personal subjectivity and bias that influenced this research, this section provides a reflection of the researcher's motivation to conduct the research, her experience, perceptions and beliefs. This will later build the base for the research's underlying ontological and epistemological assumptions, the philosophical research approach that guided the research methodology and design.

1.5.1 Personal Background and Motivation

In the following section, the researcher describes what motivated her to get involved with this research project and the experiences she has experienced so far in similar settings. Since these are anecdotal and personal information, this section is written in the first person. Additionally, this personal piece is supported by 'anecdotal side notes' reporting the researcher's first impressions in BEP which were recorded at the time, supporting the researcher's story. It should be noted that these anecdotal notes were merely the researcher's observations and first impressions and are not based on scientific evidence. However, they were identified as potential sources of researcher bias and therefore, the researcher, throughout her research, put particular care into being aware of these potential biases and not allowing them to mitigate the research. The following is a personal statement from the researcher:

Throughout my academic and professional career, I have been excited to understand why people behave as they do, and how and what different cues influence their behaviour.

In my earlier role as a business consultant in the automotive industry but also already as a Bachelor student working in different production environments, I had the opportunity to have a look into most departments of a variety of global car manufacturers as well as different production companies, from the production department via quality to aftersales, and I was always fascinated by the differences that existed in culture, mentality and processes of standardisation and execution not only across departments but also between companies. However, one thing that was the same in all departments, companies and industries was that when talking about H&S, people from management as well as shop floor level started to cringe or became sarcastic.

To me, when first visiting BEP, I had similar experiences, such as described in the following anecdotal side note:

Anecdotal side note:

During my first days at the plant, I was introduced as a PhD student to many different employees across all hierarchy levels. When explaining what the project was about the response by the interlocutor was almost the same every time: A "Good luck!" with a (smirk) grin and an under-tone which I interpreted as being somewhere along the line of ironic, amused and/or patronising. This could be interpreted as an indication that firstly, employees have a personal aversion to H&S related topics, which leads to them not taking attempts to change the current climate and procedures seriously. Secondly, it could indicate that employees are aware of strong barriers between the H&S practices as driven by BEP management and the respective department and the workers on the shop floor. This interpretation can be supported by something, the senior safety engineer said to me: "There seems to be a clear divide between staff and management when it comes to H&S.".

More often than not, the workers I have met communicated that they perceived most safety policies or rules as inconvenient, simply useless or as being treated like children who cannot apply common sense and therefore, they tried to use short cuts or made it their personal challenge to avoid those procedures without being caught.

Again, on my first visit to the plant, I came across a similar example of a worker neglecting safety rules due to a lack of perceived practicality:

Anecdotal side note:

When I first visited the plant, me and my supervisor were taken on a safety walk with one of the safety engineers. We came across a forklift truck whose driver had the seat belt closed behind him, so the alarm was not set off, but it was not securing him either. When approached by the safety engineer and asked if he was aware that there is a rule that seat belts must be closed when operating the vehicle, the worker confirmed that he is aware of this rule. However, he added that closing the seat belt is impractical since he must move in and out of the seat regularly to do his job and he cannot do that fast enough, if he must lock and unlock his seat belt every time. That is why he chooses to use a short-cut.
This encounter can be seen as an example that employees at the plant are aware of the policies yet choose to outmanoeuvre them because they feel they are inconvenient or hinder them to achieve other goals they must achieve. Additionally, it may indicate a general lack of communication between the creators of the rules and the people who must work with them on the shop floor.

This applies to shop floor workers who, for example, were not wearing proper PPE because it was inconvenient or uncomfortable, as well as to supervisors, who, for example neglected safety walks or communicating safety information because they 'had other things to do'.

Even though I could relate to those views to a certain degree, I was always a bit puzzled by them: Were those measures, policies and procedures not designed to avoid harm for the employees and therefore every single one of them should very much care for them, since no one wants to be harmed at work or wants one of their co-workers to experience harm? Should it not be in the interest of each employee, no matter the hierarchical level or role description, to create an environment of wellbeing with 'no one gets harmed' as the minimum goal? And considering the number of policies, procedures and directions that usually existed around H&S despite the reactions towards the topic that I encountered, should there not be a more efficient way to transfer H&S (and consequently wellbeing) awareness and sensitivity onto workers' behaviour and ultimately mind-set?

In an Austrian magazine it was once stated the following leadership advice:

> *"What is thought is not yet said,*
>
> *what is said is not properly heard,*
>
> *what is heard is not properly understood,*
>
> *what is understood is not always accepted,*
>
> *what is accepted is not always applied,*
>
> *what is applied is not always kept."*

(translated from German; Salfenauer, 1986)

I am often reminded of this quote when talking to people not only about H&S but generally when it comes to policies and procedures. In most companies, many resources are occupied by designing, agreeing on and writing up pages and pages of policies, directions and similar documents. I have met employees, who were passionate about their ideas and output. However, due to a lack of communication (quality, quantity or simply penetration or focus), those ideas and output never really reached the target group or were not properly implemented. This is the same impression I got from BEP. The whole H&S team seems to me passionate about their work and genuinely cares for the BEP workers' wellbeing.

Anecdotal side note:

When asking the H&S team why they are doing the job and what motivates them, they all replied that they want to make sure that their colleagues are safe and that no harm happens to them. Plus, they show creativity and willingness to listen to the workers as well as taking the workers' opinions seriously. They offer special campaigns to raise awareness (e.g. hand safety awareness week), offer different channels of conversation (e.g. an idea /comment box where (anonymous) notes can be sent to the team) and their general openness towards the researcher is an indication of them being open for change and outside feedback.

The safety team assured me that BEP has an impressive number of H&S documents, the team were diligent and thorough when it comes to safety walks and audits and were open to try new approaches. Yet, this passion it appears, is not perceivable by those working on the shop floor.

Anecdotal side note:

On one of the safety walks with a safety engineer, a situation was approached where two workers were on a cherry picker, while the supervisor on the floor was not wearing appropriate PPE (i.e. he neglected to wear his safety helmet). While the safety engineer approached the supervisor to discuss the situation, the two employees on the platform were smirking about their supervisor 'being told off' and were rolling their eyes about the situation. This reaction and behaviour can be interpreted as an indicator for an absence of respect towards the safety team and their agenda and/or a lack of 'taking the safety rules seriously'.

Scenes like this could be seen as an indication that the workers do not look out for themselves or for each other, yet others show a strong community spirit between the workers, as can be shown by the next anecdote:

Anecdotal side note:

A safety engineer, some workers and managers told me individually from each other that in order to warn each other that one of the safety engineers or managers is walking the shop floor and might be monitoring them, the workers developed 'secret calls' that are transported via walkie-talkie or simple yelling. For example, a Tarzan-like yell means

that one of the safety engineers is on the floor, while the call 'The eagle is landed.' or 'The duck is in the pond.' means that a certain manager is around. Every manager and safety engineer has its own individual call or yell. When the workers hear this alarm, they adapt their behaviour accordingly.

This behaviour can be seen as an indicator for a few different situations:
1. An aversion to being monitored and controlled, so by being warned the workers know when to change their behaviour so they do not get caught. This may also relate to a great sense of community and 'having each other's back': the workers are looking out for each other and trying to keep each other safe from negative feedback, thus showing social support which might be linked to engagement (Crawford et al., 2010).
2. A divide between the management as well as H&S department and the workers: The workers see them as their 'enemies' and try to outsmart them. Thus, this might be negative reciprocal behaviour based on the social-exchange-theory (Cropanzano and Mitchell, 2005; Agarwal, 2014)
3. It may give them a sense of being in control and having power - which is recognised as paramount to employee motivation and wellbeing in the literature wellbeing (Eatough and Spector, 2014).

Indications for a great community spirit can also found all around the plant. The researcher was told that poker tables, table tennis tables, and other equipment for group activities are being hidden on the premises by the workers. Yet, those group events are not official events that the company officially knows about or supports. They are unofficially organised and secretly conducted by the workers.

Even though these anecdotal side notes were just individual snap-shot views of the plant, there were clear issues with H&S. On a positive note, the workers also showed a sense of unity and appeared to look out for each other. This encouraged me to pursue this project, as

there was a strong sense that the aim of the research could be met, to create a climate where the workers do not see management or the H&S team as the enemy, rather they can all work together to keep each other safe and contribute to each other's wellbeing. The H&S challenge present called for further investigation before proposing any interventional recommendations.

In my previous role as a business consultant, I was responsible for running change management projects including the design and implementation of effective training, communication, and involvement concepts. Therefore, I have a deep understanding of the challenges that come with successfully realising behavioural and mind-set changes by engaging employees in the change as the drivers for the development. After working for years in the corporate world, I appreciated using my knowledge, experience and capabilities to change the situation regarding H&S engagement levels of the workers in the plant and apply my skills to something meaningful for people's well-being. Therefore, my goal has been to make not only a meaningful contribution to the current body of research, but also to develop recommendations on how to build interventions that would contribute to everyday well-being and safety in the workplace. Also, based on my own experience, I understand that in this kind of environments, prior to designing an intervention it is of supreme importance to acknowledge the complexity of the organisation and focus on identifying and analysing the underlying drivers and factors first. In this research project with BEP, I saw an opportunity to achieve this goal and I felt that offering a 'fresh pair of eyes' to challenge Ford's H&S culture would be beneficial for the project and consequently, the company.

The anecdotal notes give a clear indication of the importance of understanding the workers' behaviour and mindset as well as the factors driving these. However, as mentioned before, the anecdotes as well as the initial motivational statement also served as a reflection on potential initial bias. Hence, I was aware that this research could not be completely isolated from my own personal experiences, values and beliefs, which would always have had an impact on the interpretation and perception of the information consumed as well as the data analysed, also noted by Mays and Pope (2000). Therefore, it is important for a researcher to be aware and reflective about their underlying presuppositions, which could influence the view and interpretation of all aspects – input and output – translated through the researcher.

This view is supported by Weber (2004), who claims that there is no such a thing as objective research since all social research is fundamentally biased.

Personally, I am a very driven and motivated person. I always enjoy learning new things as well as facing and overcoming challenges and am always looking for ways to improve the environment for myself and my peers. In my time as a business consultant, and previously during my undergraduate projects, I often came across people who strongly differed from me in that respect, who saw work as a means to an end to earn money, who either did not enjoy what they did and/or had no interest in improving their situation. Especially when I was younger, that was hard for me to understand and come to terms with. During my coaching qualification training I reflected a lot on the fact that every individual has their own 'map' of the world and their own belief system, and while they may not always share my motivation and view, individuals usually have a positive intention. I learned that in order to achieve a mindset or behaviour change, it is important to understand what motivates and drives the individual and what their 'map' looks like. Being aware of what my ethnographical vignette means to my research, I am particularly interested in the qualitative input of workers, yet need to be careful to not judge my participants' input by my own standards or have my own value system manipulate my research. While the impact and limitations arising from the researcher as an instrument of the research, especially in qualitative research (Starks and Trinidad, 2007), is acknowledged, using reflective methods can help in taking the respective precautions to be sensitive to the effect and consequence on my research (Gearing 2004). This was done by keeping a research diary in which I reflected upon my progress and experiences on a regular basis (Houghton *et al.*, 2013). Furthermore, the use of a structured and transparent process (e.g. using a structured question guide in the interviews) was used to add to the rigour of my research (Hiles, 2008).

1.5.2 The Research Paradigm: Ontology and Epistemology

Doing research always involves striving to reveal a new piece of truth and knowledge. Therefore, it is important for a researcher to reflect on their own philosophical beliefs, at the outset, in order to explain the methodological approach. Lacey (2018) referred to this as the 'research paradigm', a set of beliefs and practices that guide the research, consisting of the ontology, the epistemology and the methodology. Those beliefs also have an influence on

the researcher's way of interpreting the observations and studied data (Matthews and Ross, 2010).

The way that individuals make sense of the world, how they perceive and what they believe about the world, reality and nature, is called ontology (Creswell and Poth, 2018). Should the social entities be considered as objective reality, or are they formed by social constructs such as beliefs and experiences, or by external factors? Simply put, the ontological stance is concerned with the characteristic of reality and how reality is defined.

Within the present research a critical realist view has been applied from an ontologist's perspective, it is believed that there is a truth and reality, though it is accepted that it is impossible (or at least exceedingly difficult) to observe or to measure it. A realism approach postulates that a reality exists, though there are dimensions that are hidden from senses and therefore not measurable. However, the impact those dimensions have is observable. Therefore, hidden mechanisms and implications can be identified by theorising based on observable outputs. Conjoining this with critical realism, it implies that power dynamics and hidden structures as well as mechanisms might be uncovered through the measuring of their outcomes by using qualitative and quantitative research methods (Matthews and Ross, 2010). Critical realists argue that while there is a reality, humans can only perceive an image or sensation of such reality not the actual reality, thus individual mental processing of the sensations are added onto the image perceived (Saunders, Lewis and Thornhill, 2009). However, within this stance it has been recognised, that the researcher's own experiences may influence the researcher's interpretations as well as the positions within the research. Hence, close to constructivism (Madill, Jordan and Shirley, 2000), it is further acknowledged that the truth or reality that is believed to be perceived, is an individual construction of interpretations, interactions and perceptions. Each participant of the research will have an individual view on how to make sense of the world.

Engagement is defined as "a positive, fulfilling, work-related state of mind that is characterized by vigour, dedication, and absorption" by Schaufeli *et al.* (2002, p. 74), it is assumed that beliefs, values, state of mind as well as emotions (i.e. vigour, dedication, and absorption) are highly subjective, internal and unconscious. However, the output that those subjective

elements in an interaction create might be an observable construction of reality and people's behaviour can be assumed to be influenced by the individual's perceptions of reality.

Closely linked to the discussion about the researcher's ontological stance, lies epistemology as the theory of knowledge: it defines the view of what knowledge is and how humans can gain knowledge as well as what can be seen as acceptable knowledge (Blaikie, 2007). Considering that psychological states, such as WE, attitudes towards H&S or topics, such as an organisational culture, are not tangible 'things' but are subjective constructs of individual views that only the individual can help understand and vice versa (Sunstein and Chiseri-Strater, 2012), a social constructivist's view was adapted for this research. It is acknowledged that the truth or reality that is perceived, is an individual construction of interpretations, interactions and perceptions, and each participant of the research will have an individual view on how to make sense of the world and throughout those different realities. The researcher aimed to establish meaning relative to the subject under study (Creswell and Poth, 2018). Therefore, the research can only aim to capture a combined reconstruction of multiple perceptions of truth which will also be tainted by the researcher's interpretation of the data, since the researcher will co-construct the perceptions formulated by the participant (Guba and Lincoln, 2013). However, considering the subjective construction of reality, people's behaviour can be assumed to be influenced by the individual's perceptions of reality.

Therefore, prior to designing the intervention recommendation, it is important to understand how the workers in the plant perceive their safety engagement levels, the relationship dynamics surrounding that topic with co-workers and attitudes towards those relationships, and what resources and demands support or hinder their safety performance and engagement as well as how those dimensions influence their behaviour. Through those insights, the goal is to identify driving factors, such as promoters and hindering factors, such as barriers, and thus, design interventions that address those perceptions and dynamics leading to an increased H&S performance, engagement, and consequently, engagement in safety culture. Even though it has been argued that reality is difficult to measure due to the (co-)construction of knowledge and reality, the resulting complexity can only be assessed and aimed to be understood through personal interactions (e.g. a qualitative approach). Furthermore, a pragmatic approach has to be adopted to derive recommendations for enhancing the perceived shared H&S engagement culture and climate in either one or several areas in the plant.

1.6 Research Methods

Since the aim of the research was to explore and understand the BEP workers' H&S engagement drivers and then design a tailored intervention for these workers, the research can be considered a case study setting, in which the BEP served as the case. A 'case' is defined as a particular and defined phenomenon that is selected to be studied and the focus in such studies is on the 'how' and 'why', instead of 'how much' and 'how many' (Schwandt, 1997). In a case study design the expectation is on gathering information about the singular subject of study (i.e. case) at hand and exploring its complexity and specification (Stake, 1995).

In research, three different kinds of case studies have been identified (Stake, 1995):

1. The intrinsic case study, in which the focus is on exploring a particular case.
2. The instrumental case study, in which the study of one case is conducted to derive solutions for a general problem and to follow an external interest.
3. The collective/multiple case study, in which an instrumental case study is enhanced into several cases that are being studied to gain a deeper understanding.

As this research focused entirely on the BEP and aimed to consequently develop recommendations to enhance the plant workers' H&S engagement, this research could be defined as an intrinsic case study. A common misconception of case study research is that one single case cannot provide generalisable knowledge (Flyvbjerg, 2006). While not formally generalisable, research from case studies may still offer the potential of additionally adding valuable insights to the body of knowledge and contribute to scientific progress (Flyvbjerg, 2006). In this case specifically, by adding insight into drivers for safety engagement among PL workers, as well as potentially transferable intervention guidance for other production plants to consider. Case studies are known to support multiple methods to provide insight into the specific social world (Coffey and Atkinson, 1996). Indeed, generalisability is a concept often used in qualitative research that is deemed by many qualitative researchers a pointless goal since qualitative research aims for a deeper understanding of a particular sample and the context-bound knowledge generated (Johnson, 1997). However, if the context of the research is described in great enough detail, readers can make an educated decision as to

how far the presented research can be transferred to their own context (Lincoln and Guba, 1985), hence a flexible generalisability can be assumed (Braun and Clarke, 2013).

Considering the complexity of developing H&S interventions, the Medical Research Council's (MRC) guidelines[3] were used to guide the design of the intervention in this research (Craig *et al.*, 2019; O'Cathain *et al.*, 2019) (see Figure 4). The present research first focused on identifying an evidence base rooted in the research, as well as relevant theories ("Development" Step 1; Chapter 2 to 5). Throughout the process of identifying and analysing the evidence base, theory was developed as a base for the intervention design ("Development" Step 2; Chapter 2 to 5 and Chapter 6.2) Then based on the synthesise of the previous findings, the first draft of an intervention proposal was designed ("Development" Step 3; Chapter 6). Next, the research tested and evaluated the intervention proposal for feasibility and potential effectiveness under consideration of recruitment as well as the change process ("Feasibility/ Piloting" Step 1; Chapter 7). Hence, it can be seen, that within the four key elements of the MRC, only "Development" and "Feasibility/ Piloting" were addressed in this research project (see Figure 4), while the other two elements could not be tackled within this project, due to the limited scope (i.e. closure of the plant; for details refer to Section 1.2).

[3] Following, when referring to the Medical Research Council's (MRC) guidelines and framework, the acronym 'MRC' will be used.

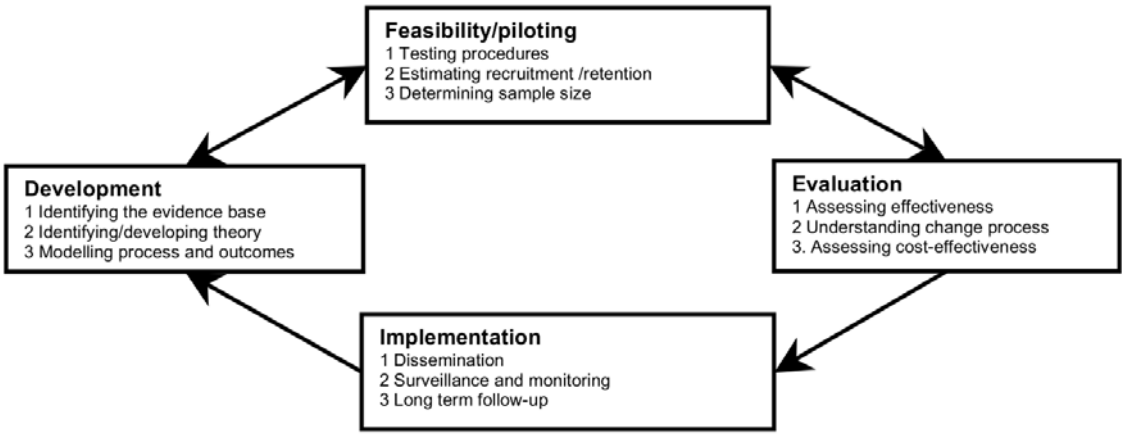


Figure 4: Key Elements of the MRC (Reproduced From Craig et al. (2019)

As H&S engagement can be considered a complex psychological construct, it is important to understand the underlying perceptions and mindset, as well as the significance of the factors that impact workers' behaviour and meaning-making. This will aid in designing interventions that increase the workers' H&S performance and engagement. While a mixed method design was considered, for practicality reasons and due to the nature of the investigation, it was decided that the aim of the research could best be met using a qualitative research approach (Hughes *et al.*, 2016; Sullivan and Forrester, 2019), with semi-structured interviews offering the right level of flexibility; adapting to the flow of conversation and meeting the participants' needs whilst also addressing the specific areas of investigation through an in-depth qualitative approach (Turner, 2010). However, it should be acknowledged that several researchers have stressed that information gathered in interviews can only be recalls and observations of experiences and understanding, not a reproduction of the real world (Mason, 2002; Charmaz, 2006). This is supported by the philosophical consideration of constructivism, which needs to be taken into account when interpreting the data. However, interviews met the right level of pragmatism such as fitting into the busy environment of a running plant (Braun and Clarke, 2013). Based on the findings of the interviews, and evidence from a narrative literature review on engagement interventions and their effectiveness, a proposal regarding an intervention framework to enhance the BEP workers' H&S engagement was designed. The acceptability and workability of the draft intervention proposal were then evaluated using semi-structured interviews with the BEP employees. Furthermore, in

order to test for external validity and transferability of the intervention proposal interviews with external practitioners were conducted as well. The following diagram summarises and outlines the research process under consideration of the research objectives as well as the presented research theory and gives an indication of the structure of the thesis (see Table 1).

Table 1: Research Outline

Research Aim:
Develop a proposal for an intervention framework which could be applied to increase engagement levels with H&S amongst the PL workers' and potentially provide a framework which could be transferred to other manufacturing organisations.

MRC stage	Objective	Approach	Output
Development and identification of the evidence base, developing theory on underlying impact and success factors in the context of the intervention target-group	**Objective 1:** Identify and synthesise the current literature to assert empirical evidence that links WE with H&S behaviour and mindset, and its connection to the Safety-II principle through a literature review.	**Method:** Literature review	Initial literature background on WE and with a focus on H&S (Chapter 2) WE with a focus on PL workers (Chapter 3)
	Objective 2: Evaluate the existing body of research on WE interventions in a production environment to derive measures of good practice and impact on increasing WE by conducting a narrative literature review.	**Method: N**arrative literature review	Literature Review: Engagement Interventions in a PL Worker Context (Chapter 4)
	Objective 3: Utilise a qualitative approach to identify factors influencing H&S engagement in the plant through semi-structured interviews.	**Method:** Semi-structured interviews **Participants:** BEP employees	Interviews on engagement level and drivers in the context of safety in BEP (Chapter 5)
Modelling of a draft intervention	**Objective 4:** Synthesise the findings from the interviews and the narrative literature review to de-sign a template intervention framework specific to the target group to improve workers' H&S engagement in the production plant.		First Draft of a proposal for an evidence-based intervention framework (Chapter 6)
Feasibility, practicability and transferability testing of the intervention	**Objective 5:** Collect and analyse qualitative perceptions on the template intervention framework proposal via a preliminary/exploratory feasibility study involving semi-structured interviews: a) with the target group to assess and critically evaluate the fit, feasibility	**Method:** Semi-structured interviews **Participants:** a) BEP employees, b) External practitioners	Exploratory feasibility study evaluating the intervention framework (Chapter 7)

MRC stage	Objective	Approach	Output
	and practicability, and b) with external practitioners to assess and critically evaluate external validity and the transferability of the framework as well as to identify possible improvements.		
	Objective 6: Synthesize the findings of previous studies in the development of a proposal for an intervention framework and guidelines improving H&S engagement in PL workers within the Safety-II mindset.		Considerations for improvement on the proposal for an intervention framework (Chapter 7) Development of the '9-Point Plan for H&S Engagement in PL Workers' (Chapter 8)

Chapter 2 - Literature Background:

An Initial Review of the Literature

2.1 Introduction

Over the past 50 years there have been a number of global catastrophic industrial incidents that have captured the concern and attention of society, such as the Three Mile Island incident in 1979 in the USA, the reactor accident in Chernobyl (Ukraine) in 1986 or the Continental Express Flight 2574 crash (Texas, USA) in 1991. These events have drawn the public's attention to safety (Meshkati, 1997; Cox and Flin, 1998; Jin and Chen, 2013). The investigations of those events have highlighted the role of human behaviour as an underlying cause of incidents (Mason, 2004; Griffith, Livesey and Clayton, 2010). However, public inquiry reports have also proposed that these behaviours reflect or are a manifestation of the 'safety culture' of the organisation.

2.1.1 A Brief History of Safety Management Approaches

Within the first half of the twentieth century, the focus of safety was on technological problems and the cause-effect approach, whereas in later years, the focus has switched to human-based problems and safety culture, as well as resilience engineering (e.g. Hollnagel, Woods and Leveson, 2007). This observation is supported by Nazaruk (2011), who identified four evolutionary stages of safety (Zohar, 2014):

(1) From 1940 to 1960 machinery malfunction was the main contributor to accidents, therefore the focus was on hardware improvements (Cooter and Luckin, 1997).

(2) From 1960 and 1980 human error was considered to be the link to most accidents and humans were seen as the frailest linkage in the system (Gordon *et al.*, 1996).

(3) The focus then shifted to the interoperation of human and technical factors (Cooter and Luckin, 1997).

(4) Taking safety culture into account is the current stage of safety (Wiegmann *et al.*, 2004; Health and Safety Executive, 2005).

Recently, a fifth stage can be included: Safety-II, focusing on workers as valuable sources of resilience and safe working (Hollnagel, 2014b).

In support of this historical development, Hollnagel (2004) stated that human error accounts only as a tenuous link to accidents since a series of events connected to individual human error is usually accountable for a negative event. Thus, only focusing on the error and the direct cause-related dimensions may not show the whole picture and important underlying factors might be missed. Hollnagel and his colleagues (2007) argued that safety is not something that the organisation *has* due to safety-proof systems and processes but more as a result of what the system *does*. In addition, H&S definitions neglect to explicitly consider the psychological wellbeing of individuals, and one could argue that psychological safety is an aspect of an individual's physical health and welfare.

2.1.2 Safety Culture and Climate

While the Chernobyl International Nuclear Safety Group's (INSAG) Summary Report did not reference any academic investigations, they were the first to coin the term 'safety culture' (Choudhry, Fang and Mohamed, 2007), defined as:

> *"the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management"* (Advisory Committee on the Safety of Nuclear Installations, 1993, p. 23).

From an academic perspective, the term 'safety climate' was derived from the study of organisational climate by Schneider (1975), later described by Zohar (1980, p. 96) as the sum of staff's shared perceptions on their work environment that guide their behaviour. Most renown is the definition of organisational culture by Schein (1985, p. 19):

> *"A pattern of shared basic assumptions that was learned by a group as it solved its problems. The group found these assumptions to work well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems."*

Culture and climate are often used synonymously and within the literature researchers struggle to agree on a clear distinctive definitions (Wiegmann and Von Thaden, 2002; Wiegmann

et al., 2004; Nazaruk, 2011). Safety culture is often associated with a focus on values and beliefs that guide behaviour and represents a stable construct, based on the concept of organisational culture by Guldenmund (2000). Safety climate is often described as a surface portrait of the culture and, therefore, a more fluid construct (Cox and Flin, 1998). Cox and Flin (1998) described culture as the personality of an organisation while the climate is the current mood. This perception is supported by Wiegmann et al. (2002) who defined safety culture as 'enduring' and safety climate as 'situational'. However, until now, the academic world has not settled on a clear and unambiguous definition for either. In accordance with the previous definition, in this research project, the term 'safety climate' will be used because of its relevance in assessing the current 'state of mind' and feelings towards H&S.

In spite of the different attempts to define and distinguish the two concepts, no collective understanding could be found (Jeffcott, Pidgeon, Weyman, & Walls, 2006).

Several studies have been undertaken in order to understand, what factors influence safety culture and consequently how to measure the state of safety culture (among others: Clarke, 2000; Flin et al., 2000; Wiegmann et al., 2004). Nazaruk (2011) prepared an overview that compares six meta-analyses of factors influencing safety culture identified in all studies . He coded the similar topics in similar colours and found that some factors are mentioned in almost all analysed studies, such as leadership and employee involvement\ empowerment, others are more rarely mentioned, such as communication, competence, and management system. He concluded that the variety of factors means that there is still an incongruence in definitions and in regard to indicators. Further, he drew the conclusion that leadership and management involvement in H&S topics, as it is mentioned in six out of six meta-analysis, is the most important influencer of safety culture.

While much research has been conducted to understand the factors that promote a successful safety climate, there is a lack of a single clear solution (Mearns, Whitaker and Flin, 2003). However, a systematic literature review by Shannon and colleagues (1997), including ten papers that offered comparisons between at least twenty organisations, showed that a combination of safety management and cultural/social contributors influenced safety performance. One could argue the result may be skewed since synthesising these various study findings could prove problematic due to the differences in definitions of the term climate

and its underlying factors, as well as issues due to different research designs (e.g. the assessment tools) and the lack of quantitative pooling. However, the overall conclusions of the literature review were still in line with other findings, which linked safety climate scales and safety management practices with lower accident and incident rates (Mearns, Whitaker and Flin, 2003).

Further research suggests that a combination of safety management and cultural/ social contributors influence safety performance (Shannon, Mayr and Haines, 1997; Mearns, Whitaker and Flin, 2003). While safety management factors are important, the social aspect in terms of empowering leadership and building a trusting relationship between supervisors/ management and workers is believed to be a strong contributor of safety performance (Shannon, Mayr and Haines, 1997; Pidgeon and O'Leary, 2000; Mearns, Whitaker and Flin, 2003). Ultimately, workers have their own individual beliefs and values which in-fluence their motivation and behaviour (Griffin and Neal, 2000). To enhance safety performance those beliefs and values toned to be fulfilled for workers to engage in health and safety at work (Wachter and Yorio, 2014). Supporting this, Nahrgang, Morgeson and Hofmann (2011) found that there is a positive relationship between the perception of safety culture and safety engagement of workers.

This has manifested itself in more practical H&S guidance by the HSE in the UK, such as HSG65. It should be noted that in the HSE report, worker engagement was defined as employees "have[ing] the opportunity to influence both management and other workers' decisions" (Cameron *et al.*, 2006, p. ix), indicating a more participatory or involvement-based understanding of the term engagement.

2.1.3 Initial Observations of the Link between Safety Culture/Climate and Engagement

Focusing on the social cultural factors, when defining safety culture, Cooper (2016) acknowledged the importance of employee engagement in safety culture, a major contributor to what he called a 'Safety Partnership', a cooperation construct between workers, leaders and managers to work together on safety. However, that study made no clear reference to how they specifically considered engagement to be defined. Similarly, Lawani et al. (2017b) proposed a worker engagement maturity model for the construction industry, having used Cameron et al.'s (2006) HSE report on worker engagement as a basis. Thus, while these

models incorporate the notion of WE, they may have an alternative, more behavioural view of the term WE (see more on the subject of synonymous use of the term WE in Section 2.3.3).

Furthermore, as already briefly mentioned in the introduction (see Section 1.1), it has been previously shown that engaged employees are found to be more likely to work safely (Nahrgang, Morgeson and Hofmann, 2011).

2.1.4 Objective of the Literature Review

As it shows potential to improve safety climate and performance, the literature review in this chapter aims to analyse and determine whether H&S outcomes in the MF industry could be enhanced by improving workers' engagement. In order to achieve this aim, the literature review had the following objectives:

(1) to examine and define worker engagement;

(2) to identify factors that are associated with worker engagement;

(3) to identify literature investigating the role of engagement in relation to H&S outcomes; and

(4) to categorise specific topics that should be explored through surveys or interviews in a PL context to identify whether the antecedents for a positive H&S engagement are present, or take a unique form in the automotive context.

By meeting these specific study objectives, the overall Research Objective 1 will be achieved:

Objective 1: Identify and synthesise the current literature to assert empirical evidence that links WE with H&S behaviour and mindset and its connection to the Safety-II principle through a literature review.

2.2 Change in Approach Regarding H&S

Responding to research findings and following the lessons learned from the negative safety events which have been reported in the media, practical approaches need to be developed for organisations to adopt as part of their H&S approach. Building on from their previous

work on resilience engineering, Hollnagel et al. (2004; 2015) went on to consider the development and mindset shift within safety that has to be reached in order to achieve an increased safety performance and robustness to changeable circumstances. This publication distinguished between two concepts, which they called 'Safety-I' and 'Safety-II' (Hollnagel, Wears and Braithwaite, 2015).

2.2.1 Safety-I

Safety-I describes a safety culture in which humans are perceived as a liability whereby things go wrong because of failures in or due to technology, procedures, organisation or workers. Safety is presumed to be the absence of accidents or failure and risk assessments determine the likelihood of their occurrence. From a Safety-I perspective, safety investigations focus on finding causes and contributory factors of a specific event. Consequently, occupational safety is seen from a ratio-logic perspective with linear cause-effect relations (i.e. the 'causality credo'), whereby systems are presumed to be bimodal: they either function or they do not. Therefore, in Safety-I, safety management starts when a negative event occurs or a risk has been identified and, hence, the effectiveness is dependent on the level to which safety risks are known, predictable and manageable (Hollnagel, 2008b, 2008a). However, even though humans are seen as one of the major error sources, positive aspects, such as their flexibility or resourcefulness are not considered in this concept.

The mindset of Safety-I is reflected in sequential accident models, such as Heinrich's 'Domino theory' or his 'Accident triangle' (Heinrich, 1954), building on the assumptions that accidents arise sequentially and therefore can be prevented by removing the faulty unit, nursing a linear accident causality while ignoring the complexity of systems.

2.2.2 Safety-II

Contrary to the Safety-I concept, Safety-II assumes that humans are clever, proactive, flexible resources, who show their resilience through their performance variability, for example, being able to match their behaviour and change their routines depending on the individual circumstances. Furthermore, they are considered the reason that 'things go right'. Aside from this major difference, Safety-II cannot be seen as the opposite to Safety-I, rather it is an evolution of it that still incorporates certain aspects of Safety-I but adds additional elements and broader views (see Table 2 to compare the two approaches). The focus of Safety-II is on

things that go right and appreciating these, instead of only focusing on the negative events, however, risk assessments and the analysis of negative events is still part of safety management. Consequently, the aim is to understand how a generally safe working state (i.e. 'things going right') is achieved and what benefits it, instead of focusing on events or things that could occasionally 'go wrong'. In terms of assessing risks, attention should be focused on where performance flexibility can be challenging or difficult to monitor and where necessary resources are missing. Proactive anticipation of events and situations should be developed in order to drive a Safety-II culture.

Table 2: A Comparison of Safety-I and Safety-II (Reproduced From Hollnagel (2014b, p. 145))

	Safety-I	**Safety-II**
Definition of safety	As few things as possible go wrong.	As many things as possible go right.
Safety management principle	Reactive, respond when something happens, was categorised as an unacceptable risk.	Proactive, continuously trying to anticipate developments and events.
Explanation of accidents	Accidents are caused by failures and malfunctions. The purpose of an investigation is to identify cause and contributory factors.	Things basically happen in the same way, regardless of the outcome. The purpose of an investigation is to understand how things usually go right as a basis for explaining how things occasionally go wrong.
Attitude to the human factor	Humans are predominantly seen as a liability or a hazard.	Humans are seen as a resource necessary for system flexibility and resilience.
Role of performance variability	Harmful, should be prevented as far as possible.	Inevitably but also useful. Should be monitored and managed.

Note: Table reproduced with permission of the author

In summary, Safety-II advocates safety through establishing robustness as it is acknowledged that systems frequently change and are complicated and thus, can never be fully understood. Therefore, the organisation, as well as the individuals, must be able to adapt their performance to meet the ever-changing requirements and demands. However, this system may propose some challenges in terms of practicality as the consideration of (all) systemic factors impacting work safety may prove difficult, sometimes to a certain extent impossible.

2.2.3 Concepts Similar to Safety-II

Safety-II is not a new or unique concept, it is based on resilience engineering, fragility engineering and is similar in many ways to what Dekker (2015) called 'Safety Differently' or Sharman (2018) called 'Naked Safety'. All definitions have set their focus on the same problem, they have a system approach, though their approaches may differ slightly when looking into the details (Hollnagel, Wears and Braithwaite, 2015; Salmon *et al.*, 2017; Thoroman, Goode and Salmon, 2018; Martinetti *et al.*, 2019). All forms of Safety-II approaches emphasize the need to de-bureaucratise safety and trust the workers in their ability to understand their job and make educated decisions, while additionally focusing more on the resilience of processes through human behaviour (i.e. why do things usually go right), allowing workers more flexibility to react to the ever-changing work environment. Furthermore, safety resilience is considered to be impacted by multiple factors, as well as influenced by performance inconsistency (Thoroman, Goode and Salmon, 2018). The lean towards involving workers more in business development and decisions can be seen as similar and linked to the evolution in HR practices, beginning in the 1980s (Lawler, 1986; Lawler, Mohrman and McMahan, 1995; McMahan, Bell and Virick, 1998).

For the purpose of this research project, 'Safety-II' will be the term that will be used to refer to the summarised principles of Safety-II, Safety Differently and similar concepts. It is acknowledged that the researcher condensed characteristics that may not be necessarily part of Hollnagel et al.'s (2015) Safety-II definition, some characteristics are concepts by Dekker (2015) or others. Consequently, in this research project, the term 'Safety-II' refers to a blend of the different concepts discussed above.

2.2.4 Application of Safety-II in the Business World

In the everyday business world, practitioners often use a mixture of the Safety-I and Safety-II approaches, depending on certain factors: the experience of the people, nature of work and tasks, management (Hollnagel, 2014b; Hollnagel, Wears and Braithwaite, 2015). In his master's thesis investigating the application of Safety-II measures, Turner (2017) found that to implement Safety-II procedures into cognitive work analysis in order to understand the work done, risk analysis for measuring resources and giving workers authority and recognition were most often utilised. However, most specialists reported that they were also still using

traditional methods due to the management's fear of change and their trust in the established methods (Turner, 2017). These findings are supported by a critical literature review by Thoroman and colleagues (2018), who analysed 155 papers on twenty near-miss incident reporting systems and identified a gap in the implementation of analyses focusing on systemic rather than linear factors in the study of near miss incidents.

2.2.5 A Discourse: A Scoping Literature Review on Safety-II Interventions

A scoping literature review on Safety-II intervention recommendations was conducted. The literature review aimed to draw from the findings made in Safety-II intervention studies and explore what intervention designs have been used so far to promote Safety-II.

Study Design

The search was conducted in April 2020, within Scopus, for interventions applied in the context of a Safety-II approach. An overview of the process can be found in Table 3.

Results

After an in-depth search, nineteen papers were found to be relevant to the scope of the literature review, presenting an intervention with the aim to promote or in the context of Safety-II.

Most papers focused on the assessment of the procedural landscape and only mentioned derived intervention recommendations on the side without offering further details. Fifteen papers aimed to assess 'work-as-done' to derive recommendations for interventions, and of these seven used Functional Resonance Analysis Method (FRAM) (details see Table 4).

Only two papers offered designated interventions: a training programme for reflection skills regarding actions and behaviour (Chain *et al.*, 2018), and an intervention that increased morale, balanced feedback and possibly performance (Wahl, Kongsvik and Antonsen, 2020).

Two papers offered recommendations on how to improve safety behaviour, through changes in the supervisor role (based on a literature review) (Provan *et al.*, 2020) and through the introduction of an Individual Latent Error Detection method (development described in the paper) (Saward and Stanton, 2018).

An overview of all relevant studies as well as their focus can be found in Table 4.

Table 3: Process Scoping Review Safety-II Interventions

Process Step	Action	Details	Result	Reasoning
1	Search Scopus for publications	Data base: Scopus Search terms: (TITLE-ABS-KEY("Safety-II" OR "safety differently") AND REF(hollnagel OR dekker OR wood) AND TITLE-ABS-KEY(intervention OR program OR measure OR scheme OR activity))	Twenty-six papers identified	Data base: In the past literature reviews, the other data bases just very rarely added any additional publications. Search terms: Aim was to make sure that Safety-II interventions were identified.
2	Checking through the identified publications based on the inclusion criteria	Inclusion criteria: Participants: no restriction Intervention: needs to aim to enhance Safety-II principles Comparison: not needed Outcome: enhanced Safety-II mindset/behaviour Language: English and German Quality: Clear description of intervention	Ten papers were excluded as not relevant: Seven were reviews or overviews of safety systems/approaches and three were studies that were not relevant to the aim of the review (i.e. understanding blood flow during resilient behaviour). Three papers were added as they were referred to within the reviewed papers and deemed relevant. Hence, nineteen papers were identified as relevant and analysed in more detail.	The aim was to find what kind of interventions have been used so far to enhance Safety-II principles within organisations and with what result.
3	In-depth analysis of the identified papers that meet the inclusion criteria.	Extraction of the relevant information.	Only two papers offered designated interventions (a training programme for reflection skills regarding actions and behaviour & intervention that increased morale, balanced feedback and possibly performance. Fifteen papers aimed to assess 'work-as-done' to then derive recommendations for intervention (but the focus was on the assessment) of which seven used FRAM. Two papers offered recommendations on how to improve safety behaviour (through changes in the supervisor role [based on literature review] and introduction of an Individual Latent Error Detection method [based on study]).	The aim was to dissect the individual findings and learnings from the identified papers and analyse them accordingly.

Table 4: Safety-II Intervention Literature Review: Included Publications (n=19)

Citation	Overview	Intervention
Pardo-Ferreira et al. (2020)	Tool: Functional Resonance Analysis Method (FRAM) Industry: Construction Aim: Understanding everyday activities to improve resilience Method: Questionnaires & Observations Findings: Factors that influence H&S as well as resilience (e.g. production pressure, operations) as well as documents that are not being used.	A - FRAM
O'Hara, Baxter and Hardicre (2020)	Tool: Functional Resonance Analysis Method (FRAM) Industry: Health care Aim: Understanding transitional care activities and stakeholders and develop change theory to guide future intervention development Method: Data from two previously conducted studies (incl. observations, interviews, and "go-alongs") Findings: Functions and their dependencies were identified that impact long-term transition care success.	A - FRAM
Provan et al. (2020)	Tool: Safety professionals' role Industry: General Safety professional focus Aim: Presenting a changed role for safety professionals Method: Literature synthesizing Findings: The role of the safety professional must change to 'guide adaptability' within organisations	R - Safety professionals' role
Wahl, Kongsvik and Antonsen (2020)	Tool: Simulator-based manager training Industry: Maritime Aim: Presenting a changed role for safety professionals Method: Observations, document review and interviews Findings: Important skills include the ability to prevent adverse events by recognising anomalies and solve problems in a flexible manner, the capability to utilise collective knowledge to identify challenges and the capability to manage and utilise the system confidently. Similarly, it was demonstrated that experimental learning takes place through simulations and reflection on experiences.	I - Simulator-based training programme

Citation	Overview	Intervention
Saldanha et al. (2020)	Tool: Functional Resonance Analysis Method (FRAM) Industry: Artisanal fishing Aim: Improve raft fishing safety in a typical Brazilian beach community. Method: Observations, interviews, conversational actions, workshops for validation and solution search Findings: Fishermen's sensemaking affects safety trade-offs and broader, systemic and continuous approach as well as improving survival conditions are needed.	A - FRAM
Waefler, Nisoli and Gugerli (2019)	Tool: Measure Evaluation Tool (MET) Industry: Aviation Aim: Developing a tool that identifies variances between work-as-planned and work-as-done Method: Interviews for requirement collection Findings: Safety-II should be implemented in SMS through implementation of the MET.	A - Measure Evaluation Tool (MET)
Kim et al. (2018)	Tool: Model of Resilience in Situation (MRS) Industry: Nuclear power plant Aim: Developing a quantifiable resilience model for safety evaluations based on Safety-I and Safety-II Method: Quantitative report analysis Findings: Resilience is influenced by anticipation (training, procedures, organisational culture, human resources, HSI), robustness (Execution, decision-making, system response), adaption (verification, reconfiguration), collective functioning (team work, communication) and learning organization, though learning organization was only found to be related to anticipation.	A - MRS
Patriarca et al. (2018)	Tool: Resilience Analysis Grid (RAG) Industry: Hospital/neuro-anaesthetists Aim: Defining a semi-quantitative analytic framework (based on RAG and the analytic hierarchy process) to measure organizational resilience in complex sociotechnical systems Method: Literature review and case study with staff and resident neuro-anaesthetists Findings: Design of a resilience assessment tool based on RAG and using the analytic hierarchy process (AHP) to prioritise and organise resilience factors	A - RAG

Citation	Overview	Intervention
Raben et al. (2018)	Tool: FRAM Industry: Hospital Aim: Understanding variability and unforeseen factors in the process of the early detection of sepsis Method: Multiple-case study with ethnographic approach which included document reviews, interviews and participant observations through informal interviews. Findings: FRAM is helpful to analyse processes and detect success factors that are not usually in the focus, such as asking the right questions during referral, experience and clinical judgement during assessment and good collegial relationship between all stakeholders	A - FRAM
Leaver, Griffiths and Reader (2018)	Tool: Near-miss report analysis Industry: Financial trading Aim: Understanding operators' influence on near-misses and incident prevention as well as their skills involved Method: Near-miss incidents were scrutinised using distribution, mean, chi-square, and a qualitative measure to describe the data (thematic analysis) Findings: Situation awareness and teamwork capability showed importance as a "last line" of defence for capturing faults.	A - Near-miss report analysis
Jones, Phipps and Ashcroft (2018)	Tool: Interviews Industry: Pharmacies Aim: Understand procedural violation from a Safety-I and Safety-II perspective Method: Interviews utilising critical incident technique and template analysis Findings: From a Safety-II standpoint, staff violations were done to adapt to situations but also to increase H&S and productivity	A - Interviews
Albery, Tepe and Borys (2018)	Tool: FRAM Industry: Seat manufacturing Aim: Identifying risks and variability within processes and activities Method: Comparison with procedural documents with worker observation and discussion Findings: Importance of communicating gaps in the system design affecting H&S and productivity and FRAM effective risk assessment tool	A - FRAM

Citation	Overview	Intervention
Chain et al. (2018)	Tool: Positive reporting program ("Yaytix") Industry: Hospital (all ward staff) Aim: Introduce positive counterpart to the reporting tool Datix for clinical incidents and increase morale and balanced feedback. Method: Comparison questionnaire (t1 to t2) Intervention: Reporting tool to nominate someone who had demonstrated clinical excellence Findings: Individual and team morale was improved through the positive feedback, perceived potential for performance improvement	I - Positive reporting program ("Yaytix")
Saward and Stanton (2018)	Tool: Individual Latent Error Detection Industry: Naval air engineering Aim: Mitigating system-induced latent error conditions Method: Observations and experiment Intervention: Individual Latent Error Detection approaches Findings: A 'stop, look and listen' method is shown to be the most effective	R - Individual Latent Error Detection: Stop, look, listen.
Häring et al. (2017)	Tool: Resilience management Industry: Not specified Aim: Develop framework that describes combined approach for resilience management and calculation for system design and improvement Method: Literature review to develop it and case studies to test it Finding: The frameworks effectiveness was confirmed.	A - Framework
Blokland and Reniers (2017)	Tool: TR3M Industry: Not specified Aim: Creating a holistic framework that takes all aspects (incl. value, leadership, management and excellence) of the organisation into account Method: Literature review Findings: The framework was designed.	A - Framework

Citation	Overview	Intervention
Ross et al. (2014)	Tool: Interviews Industry: Hospital (diabetes patient care) Aim: Explore how inpatient diabetes care is carried out and how resilience is shaped or breaks down, and to recognise the consequences for quality development Method: Interviews based on Critical Decision Method Findings: More resources needed and better knowledge exchange between roles	A - Interviews
Anderson et al. (2018)	Tool: Focus groups Industry: Hospital/Paediatrics Aim: Understand influence of Safety-II behaviour on drug events Method: Focus groups Findings: Four domains were identified: (1) individual characteristics, (2) relationships and interactions, (3) structural and environmental characteristics, and (4) innovation approaches. Only (4) applies to Safety-II.	A - Focus groups
Merandi et al. (2018)	Tool: Observation/Interviews Industry: Care/Older person Unit Aim: Gain and use resilience engineering insights to improve quality Method: Observations and interviews Findings: Processes need strengthening	A - Observations & Interviews

Note: The following key applies:

A=Assessment; I=Intervention; R=Recommendation for intervention

Discussion

The review revealed that most published papers described attempts that only focused on the analysis of the system, not the psychological factors associated with the workers. Hereby, the Functional Resonance Analysis Method (FRAM) created by Hollnagel (2012) was mostly used to identify and analyse 'work-as-done' (as opposed to 'work-as-planned') to consequently define improvements that can be implemented to increase resilience.

FRAM is an analysis tool that facilitates understanding of how variability is distributed within a socio-technical system, designed by Hollnagel (2012, 2014). It aims to understand how work is being done (including the understanding of systemic functions and their dependencies), thereby the function variability, and how to increase adaptability to unforeseen situations. The presented review shows that most of the previous approaches focus only on the identification and analysis of 'work-as-done' versus 'work-as-planned' and the procedural aspects of resilience and safety and, to a lesser extent, the psychological factors that support function variability and safety resilience. The essentially quantitative tools identify and analyse the structure and behaviour of a system. However, the review showed that very little research suggested practical advice beyond the assessment of an organisation. Understanding the resilience produced by the workers' unofficial work ('work-as-done') is a vital component of Safety-II that should not be neglected, and offers valuable learning regarding process improvements but also risk assessments. Despite this, to date, publications have offered few insights beyond the analysis of work behaviour and process adaptions.

The publications focusing on assessments, as well as some intervention papers, have highlighted the importance of reflection on decision-making and behaviour. Wahl et al. (2020) suggested that part of their intervention success with their simulator-based training was due to the joint reflection of participants on events. Similarly, in their research comparing different Individual Latent Error Detection techniques, Saward et al. (2018) found 'Stop, look, listen' to be the most efficient and effective approach for identifying system-induced errors through identification of system cues. Hence, implementing designated processes and times to reflect on past and present safety (positive and negative) events, how they have been handled and what could be improved, might be beneficial to enhance resilience and, therefore, safe behaviour.

Provan et al. (2020) recommended, based on their own synthesis of the literature, that in order to support organisations and workers in a Safety-II approach the understanding of their own role needs to adapt. Thus, they coined the term 'Guided Adaptability' which describes the approach that safety professionals need to support their workers, through a guiding and coaching role concerning the workers and supporting them in their work in becoming more adaptable and autonomous (Provan et al., 2020). In the paper, the authors held the view that Safety-I is characterised through 'centralised control' which utilises the SMS, behavioural safety and safety culture to align and control the individuals' behaviour with respect to the occupational safety regulations and procedures. In contrast, 'Guided Adaptability' through the enablement of the individuals and the organisational structures was described to be the aim of Safety-II. In this system, it is acknowledged that fixed plans and procedures are fundamentally flawed and therefore not able to provide for the complexity and disruptions in the world today. This underpins the capability of the workers in the system to react and adapt flexibly based on their own personal expertise and synchronise tasks with other workers and units to achieve common goals and resolve conflicts. This results in a changed role for safety management and, thereby, the safety professional. Instead of controlling and monitoring, the main activity now lies within guidance and facilitation of resources. For an organisation to implement 'guided adaptability' the four main characteristics of Hollnagel's (2014) Resilience Analysis Grid (RAG) must consider the efforts provided by the organisation: anticipation, readiness to respond, synchronisation and proactive learning. To incorporate these main principles, a 'Just Culture' (Dekker, 2012) needs to be created, in which employees can make their own decisions without fearing repercussions. However, safety professionals need to adapt their understanding of their role and activities to support safe adaptation at work. While this view by Provan et al. (2020) entirely focuses on the role of safety professionals and neglects the influence of other safety leading roles, such as leaders and supervisors, it highlights the importance of adapting role understanding in these safety relevant roles in order to guide and support workers.

The research surrounding the 'Yaytix' programme by Chain et al. (2018) in a hospital setting displayed how balanced feedback through the implementation of a positive feedback mechanism can impact morale, as well as safety behaviour positively. Through the implementation of a tool to which employees can nominate someone in the organisation who showed

‘excellent’ performance, the morale within the team was improved and development potential was identified. The perceived increase in morale might be explained by an increase in meaningfulness for the individual workers via the positive feedback and therefore the acknowledgment of their work – one key antecedent of WE (Kahn, 1990). While the study’s generalisability is limited through the small sample-size and potentially through the bias that was being introduced through the subjective measurement techniques, indications can be drawn to the importance of balanced feedback, which is in line with this research’s findings from the interviews. Interestingly, the authors reported that not only were outstanding performances nominated, they also appreciated meeting the expected standard of behaviour under higher pressure or workload. The researchers theorised that the acknowledgement of ‘even’ standard behaviour, including under challenging circumstances should not just be taken for granted but acknowledged through the organisation (Chain *et al.*, 2018).

Summary of the Findings of the Review on Safety-II Interventions

In summary, this review revealed that most studies in the context of Safety-II approaches focused on understanding the factors that provide resilience and analysing what ‘work-as-done’ looks like within the organisation while utilising frameworks to aid the identification of relevant factors (e.g. FRAM, RAG). Furthermore, while actual interventions aiming for changed behaviour/mindset were rare, the importance was highlighted for interventions to focus on:

- reflective practices to learn from past events and present cues;
- designing support for workers to create resilience, through role adjustments for safety professionals, leaders and supervisors; and
- a balanced feedback culture and a ‘just’ culture in which positive behaviour and performance is being acknowledged.

2.2.6 Human Error in Safety Management Systems

As mentioned before, and opposed to the development in safety culture, human factors are not majorly considered in the commonly used SMS approaches aligned with the standards, e.g. ISO 45001 (International Organization for Standardization, 2018), ANSI/AIHA Z10-2012 (American National Standards Institute, 2012), and the OSHA’s Voluntary Protection

Program (VPP) (Occupational Safety and Health Administration, 2011) (Wachter and Yorio, 2014). Yet SMS alone cannot prevent negative events and errors considering that they are bound to policies and procedures that are not easily amended and not all potential situations can be planned and controlled for. Therefore, it is important in order to achieve the needed flexibility, sustainability and, consequently, resilience, to take behaviour-based system components into account and place the worker in the centre of all safety efforts (Fisher, 2012; Wachter and Yorio, 2014).

To account for human factor, engaged workers in H&S appear to be a crucial part of cooperating in a Safety-II approach. It was presumed by Wachter and Yorio (2014), based on their research outputs, that engaged workers are more prone to proactively adapting their performance and interpretation of procedures in order to meet demands, making things go right. They recommend that the nurturing of employee engagement should be embedded in the SMS (Wachter and Yorio, 2014). Thus, while the evidence presented from the safety literature indicates that the concept of engagement has potential for impacting safety outcomes within a Safety-II mindset, so far little research has considered the psychological implications of a Safety-II mindset on the workforce.

2.2.7 Derivation of Safety-II Mindset Principles

In conclusion, taking together the principles of Hollnagel (2014b), Dekker (2018b) and other resilience researcher (among others: Hollnagel, Woods and Leveson, 2007; Madni and Jackson, 2011; Righi, Saurin and Wachs, 2015), for an organisation applying a Safety-II mindset the following principles have to be taken into account:

- Safety as an integral part of decision-making and conversations: Safety is a natural part of everyday conversations and discussion regarding all areas of the business (e.g. production, time planning, quality, health, wellbeing) among workers and between managers and workers. Workers' health and wellbeing is an incremental part of management's conversations, discussions and decision-making.
- Focus on and learning from the ‘work-as-done’ and the ‘good’ in daily work: Check the procedures that usually go right because potentially there will be a difference between ‘work-as-planned’ and ‘work-as-done’, because work requires variability. Plans are usually either too specific (i.e. they provide no variability) or they are too

general (i.e. they do not really describe the work). The organisation needs to understand what is happening within their work, because success and failure emerge from the same conditions: How people adjust performance to deal with complexity is the reason things work and the reason they sometimes fail. Thus, organisations need to understand how things work to understand how they sometimes do not work.

- Frequency over severity in events: Resources should be spent on understanding everyday events that add barriers to work and prevent people from getting the resources they require to do their jobs properly and safely in order to understand how the system in the organisation works and improve on it.
- Sensitivity to the possibility of failure and acknowledging the unpredictability of events: Failure as well as success should be accepted as a usual occurrence which should be reviewed, and lessons learned should be shared for betterment and improvement. Plus, the organisation should be aware that not all events and circumstances can be planned and instructed on. Deviations from the plan should be seen as a learning opportunity. Due to the complexity of modern work environments, it is impossible to predict and plan for all possible events through strict procedures. Hence, an organisation needs to be resilient to those disruptions.
- Workers as flexible resources: Workers' ability to react flexibly to make decisions based on experience and knowledge to ensure safety (i.e. adaptive capability), have to be acknowledged and fostered through empowering training and learning (e.g. risk assessments, learning about the work environment, transactive memory systems (who knows what), learning additional skills), effective leadership and communication as well as organisational structures (e.g. allowing autonomy).

2.3 Definition of Engagement

While the previous section already touched upon the positive impact of engaged workers on safety performance and climate, in the following section a deeper look into the concept of engagement is given.

2.3.1 Growing Interest in Engagement

The positive outcomes of WE are particularly interesting for the practical world: The European Agency for Safety and Health at Work (2012) claims that WE in relation to H&S performance can be considered a frequently reoccurring theme in the UK. After the first mentioning of 'engagement' in academia in 1990 by Kahn (1990), much interest has been paid to the topic by academics and practitioners (Shuck and Wollard, 2010). While describing the evolution and birth of interest in engagement, Crawford and colleagues (2014) referred to similar factors as those previously mentioned that were said to be responsible for the mindset change from Safety-I to Safety-II. They claimed, that the 'psychologization' of work led to the need of employees acquiring psychological capabilities and that workers are expected to "bring their entire person to the workplace" (Schaufeli, 2014, p. 16). These comments were in line with the mindset change in Safety-II, in which the employee is considered a valuable asset and their contribution through proactivity and commitment valued (Hollnagel, Wears and Braithwaite, 2015). This section of the chapter aims to examine the term 'engagement'.

2.3.2 Confusion Surrounding the Definition of Engagement

As stated by Macleod and Clarke (2009) there are over fifty different definitions of engagement in use, and some researchers (e.g Macey and Schneider, 2008; Christian *et al.*, 2011) criticized the concept's inconsistency in terms of definition and operationalisation. Within those debates and the variety of definitions, even the label of the term itself provides a confusion. Looking up 'engagement' a reader comes across a variety of terms including 'work engagement', 'personal engagement', 'job engagement', 'staff engagement', 'employee engagement' and 'engagement' which in turn at times also lead to slightly different definitions each, mostly distinct through the encompassing of the psychological state (i.e. WE is focused on the work itself, while employee engagement is considered wider) (Truss *et al.*, 2014). The divide in term and characteristic definition is also represented in a gap between academics, seeing engagement as a psychological state, and practitioners who describe it as a workforce strategy (Truss *et al.*, 2014).

2.3.3 Synonymous Use of the Term 'Engagement'

While four major engagement definition approaches have been identified (Shuck, 2010) (presented in Section 2.3.4), there is still considerable confusion about the concept and its

definition. Especially in a practical setting, engagement is often used synonymously with terms like job satisfaction, job involvement, participation and organisational commitment and in the H&S context particularly with safety citizenship behaviour (SCB), hence several researchers have set out to explore the relationship between those concepts. While sounding similar at first sight, commitment (i.e. being captivated and devoted to one's work), involvement (i.e. being dedicated, passionate, and stimulated by one's work) and WE were found to be empirically distinct concepts (Hallberg and Schaufeli, 2006) and, accordingly, deserve careful distinction.

Synonymous Use of Engagement With Safety Citizenship Behaviour

In the context of H&S (engagement), the term SCB, first introduced by Hofmann and colleagues (2003), is often used, sometimes synonymously with engagement, but was also found to be mediated by WE (Chmiel, Laurent and Hansez, 2017). However, Saks (2006) separates the two by pointing out that

> *"engagement is not an attitude; it is the degree to which an individual is attentive and absorbed in the performance of their roles. And while OCB [that is organisational citizenship behaviour, the superordinate of safety citizenship behaviour. F.H.] involves voluntary and informal behaviours that can help co-workers and the organization, the focus of engagement is one's formal role performance rather than extra-role and voluntary behaviour" (p. 602).*

Hofmann and colleagues (2003) structured SCB into six elements: 1) helping, 2) having/using a voice, 3) stewardship, 4) whistleblowing, 5) civic virtue and 6) initiating safety-related change. They found that if employees see participating in safety activities as part of their job they also act on them. Hence, adding 'Safety Citizenship Role Definitions' to the job description makes it more likely for them to comply with safety regulations (Hofmann, Morgeson and Gerras, 2003). Saks (2006), as well as other researchers, confirms that engaged workers are more likely to show organisational citizenship behaviour and improved task performance (Schaufeli, Bakker and van Rhenen, 2009; Alfes *et al.*, 2013). Supporting this, Liang and colleagues (2017) found that if workers are engaged and show SCB they use their voice and identify safety concerns as well as ideas for improvement. Additionally, they

were found to show personal initiative in terms of H&S outside their usual role description (Rich, Lepine and Crawford, 2010).

Empirical research has suggested that engagement leads to citizenship behaviour moderated by positive organisational support and supervisor relationship (Alfes *et al.*, 2013; Reader *et al.*, 2017) but truly engaged workers will surpass SCB by also performing their own duties to a higher quality (Saks, 2006; Soane *et al.*, 2012). Research identified a mediating influence of WE between safety qualification and safety leadership (i.e. transformational, passive) and social citizenship behaviour (Vignoli, 2018). Hence, workers follow the rules but have flexibility in their actions and thinking, through which they can react appropriately in challenging situations and questioning the *status quo* in order to develop H&S improvements (Dekker and Pitzer, 2016). Therefore, the potential improvement of PL workers' safety behaviour and mindset in line with a Safety-II concept might be due to a higher SCB level.

Synonymous Use of Engagement With Involvement and Participation

Equally, while an individual concept, 'involvement' (i.e. measures to promote communication top-down and bottom-up (Morrow *et al.*, 2010)) is often used synonymously with engagement, it was found to advance safety performance (Geldart *et al.*, 2010; Zanko and Dawson, 2012), thus, the inclusion of workers in decision-making processes and information, which can be achieved by various measures, such as including workers in reporting, assessing risks as well as joint task briefings (Shearn, 2004; Cameron *et al.*, 2006). Similarly, the distinct concept of safety participation (i.e. behaviours that "may not directly contribute to workplace safety but they do help to develop environments that support safety" (Griffin and Neal, 2000, p. 349)), often used synonymously with engagement, was found to be an antecedent of safety violations, which may result from the workers' influence on safety decisions through participation (e.g. safety meetings), and thus, development in future safety-relevant implementations that may have provoked safety violations otherwise (Neal, Griffin and Hart, 2000; Chmiel, Laurent and Hansez, 2017). However, to build an environment and relationship with the employees, in which the employees feel they and their work is valued, which encourages them to interact in H&S measures, managers need the respective skills which include following up and keeping a continuous dialogue about the actions undertaken

following risk (Shearn, 2004; Lekka and Healey, 2012). Not surprisingly, employee engagement has been associated with the level of involvement that workers have in their work processes (Lockwood, 2007). Mechanisms to promote workers' involvement include a continuous dialogue with the workers through which managers can learn from the workers' insights and make joint decisions (Wachter and Yorio, 2014). Further, research suggests that this may change workers' behaviour into acting more proactively and by improving their H&S awareness, the workers are therefore more willing to comply (Wachter and Yorio, 2014). Hence, even more involved with H&S are workers when they are not only involved with the topic but truly 'engaged'.

Reflections on the Synonymous Use of Terms

The synonymous use of the presented terms may reflect the existing debate on what engagement actually is: motivational (Harter, Schmidt and Hayes, 2002), behavioural (e.g. Halbesleben, Harvey and Bolino, 2009) or an affective-cognitive state (Maslach, Schaufeli and Leiter, 2001), and consequently, a behaviour or a state (Bakker, Albrecht and Leiter, 2011; Parker and Griffin, 2011). Thus, this indicates that SCB, safety participation and involvement may simply be behavioural reflections of the state of engagement (Halbesleben, Harvey and Bolino, 2009). In addition, several meta-analyses explored the differences and similarities of the different concepts and their links to engagement (Crawford *et al.*, 2010; Newman, Joseph and Hulin, 2010; Christian *et al.*, 2011): While one meta-analysis consisting of 23 studies, 25 independent samples, and a total sample size of 18,039 participants provided evidence that what they termed the 'the A(ttitude)-factor' (i.e. a combination of job satisfaction, job involvement, and affective organizational commitment) is closely connected with behavioural engagement (Newman, Joseph and Hulin, 2010). Others disagreed and showed that in-role and extra-role performance (after checking for job satisfaction, work involvement, and commitment to the company and even offsetting those factors) predicted engagement (Crawford *et al.*, 2010; Christian *et al.*, 2011). Schaufeli (2014) therefore assumed that the energetic component of engagement relates it more to job performance rather than satisfactory experiences.

2.3.4 The Four Main Definitions of Engagement

Shuck (2010) identified four major definition approaches in a systematic review of engagement definitions:

(1) The needs-satisfying approach by Kahn (1990), which stressed the relationship between engagement and role performance. Kahn (1990) was the first to describe 'personal engagement' as "the behaviours by which people bring in or leave out their personal selves during work role performance" (p. 694) and expressing themselves on a cognitive, physical and emotional level during work. However, this approach is only occasionally used in in the academic world (May, Gilson and Harter, 2004).

(2) The burnout-antithesis approach based on work by Maslach and colleagues (1997; 2001) which focused on engagement's influence on employee's wellbeing and stress levels. Under this category falls also the most widely used definition of worker engagement which was formulated by Schaufeli et al. (2002, p. 74) who stated that engagement is a positive extensive affective-cognitive psychological state and further is defined by vigour, dedication, and absorption. Many researchers consider vigour and dedication as direct counterparts of enervation and cynicism, –essentially, the two main indicators of burnout (González-Romá *et al.*, 2006; Schaufeli and Salanova, 2011) and thus, some researchers suggested that engagement can be perceived as negatively associated with burnout (Maslach, Schaufeli and Leiter, 2001). Grounded in this definition, the Utrecht Work Engagement Scale (UWES) was designed. Absorption was later added to the concept to build a contrast to the two components vigour and dedication. Researchers have not yet reached an agreement on whether or not engagement and burnout are opposite poles of the same concepts. While Schaufeli (2012) first suggested that they are related, he later claimed that they are two distinct concepts that have different promoting factors (Schaufeli *et al.*, 2014).

(3) The satisfaction-engagement approach derived from the Gallup Organisation (Harter, Schmidt and Hayes, 2002), was named 'employee engagement'. It is defined as "the individual's involvement and satisfaction as well as enthusiasm for work" (Harter, Schmidt and Hayes, 2002, p. 269) based on their emotional connectedness

and their level of alertness (‘cognitive vigilance‘). Yet, an overlap can be detected between the concepts of involvement and satisfaction with engagement encapsulated in this definition, which is also illustrated in the measurement tool developed as the basis of this definition, the Q12. Acknowledging this, the authors claim that the Q12 focuses on the antecedents of engagement rather than measuring engagement itself and thus, provides organisations with insights and action points on how to design a satisfactory working environment (Harter, Schmidt and Hayes, 2002).

Further, Schaufeli (2014) made a distinction between ‘WE’ as a person’s engagement with his or her work and the broader term ‘employee engagement’ which includes the person’s engagement with his or her company.

(4) The Multidimensional approach is based on Saks’ (2006) definition of employee engagement and its distinction between organisational and job engagement. It brings together the idea of engagement as a concept entailing cognitive, emotional, and behavioural elements which are linked to role performance, yet this definition distinguishes between job and organizational engagement.

In an attempt to merge all elements of engagement found in the literature, Macey and Schneider (2008) conceptualised employee engagement into three components: (1) ‘psychological state engagement’ (e.g. empowerment, satisfaction, involvement); (2) ‘behavioural engagement’ (e.g. extra-role behaviour) and (3) ‘trait engagement’ (e.g. proactive personality, conscientiousness, trait positive effect).

2.3.5 Engagement as a Fluid State

A number of recent studies have concentrated on other dimensions of engagement and pointed out that engagement varies across time, place and context, thus it is not a fixed state but situationally dependent (Bakker and Albrecht, 2018), e.g. workers being more engaged during workdays when they are well rested or are provided with sufficient resources (Sonnentag, 2003; Bakker, 2014). In addition, empirical evidence suggested that engagement is a volatile concept and engagement levels shift throughout the day (i.e. ‘affective shift model’) (Sonnentag, Dormann and Demerouti, 2010; Bledow *et al.*, 2011). As such it may be that engagement needs to be assessed both on individual (Schaufeli *et al.*, 2002) and collective levels (Kulikowski, 2017). Further, is differentiation between the overall ‘habitual

work engagement', 'day-level work engagement', i.e. engagement levels according to the day, and 'task engagement', i.e. the engagement level towards a specific task (Schaufeli and Salanova, 2011).

2.3.6 Engagement as a Personal Disposition or Trait

Additionally, engagement has also been considered partly a personality trait and personal disposition (Macey and Schneider, 2008; Schaufeli, 2014). Indeed, while to date the number of studies on personal disposition's association with engagement are limited, some studies found that conscientiousness in particular relates to engagement and shows considerable similarities (showing a 15% overlap) (Macey and Schneider, 2008; Kim, Shin and Swanger, 2009). Further, a study found that engagement was negatively associated to neuroticism (i.e. a disposition to feel distressing emotions like frustration and anxiety) and positively to extraversion (i.e. a disposition to feel joyfulness and outgoing), however, the effect size was small for both. However, the relationship with neuroticism could not be confirmed in a study by Kim, Shin and Swanger (2009). However, some studies investigated the role of disposition as an antecedent of engagement as shown in Section 2.5.5).

2.3.7 Identified Limitations in Engagement Definition Research

While the disagreement of definitions of engagement can be confusing, it should be noted that defining engagement only as a psychological concept neglects its behavioural implications, yet a broadening of the definition may carry the risk of blurring the line to comparable concepts (Schaufeli, 2014). Practitioners, in particular, in consultancy firms, often were found to intertwine or use WE as a synonym for the terms job satisfaction, commitment and extra-role behaviour (Schaufeli, 2014). In addition, although much research has been conducted on the nature as well as the consequences of engagement, Bakker and Albrecht (2018) pointed out, that there is still only a limited body of studies on successful interventions promoting engagement.

2.3.8 Summary Definitions of Engagement

In summary, the overview of definitions shows the disjointed nature of engagement research. Empirical evidence suggested that engagement is a separate concept describing a psychological state experienced by workers that showed distinctive positive relationships with demands, resources and job performance and a mediating role of engagement in respect to

motivational and health processes. Yet, by defining engagement more broadly and taking the resulting behaviour into account, the concept threatens to become indistinct from concepts such as commitment and extra-role performance (Schaufeli, 2014). Yet, Shuck and Wollard (2010) found that most definitions share the view that engaged workers support their company's values and goals as they have a positive perception of their workplace.

In consideration of the vast variety of terms and definitions and taking into account particularly the definition presented by Christian, Garza and Slaughter (2011) based on Kahn (1990), in respect to this research, the term 'H&S engagement' is defined by the researcher as follows:

> "a fluid psychological experience affecting social, affective and intellectual facets influenced by personal and environmental/job resources that may result in increased inter and extra-role behaviour related to H&S".

2.4 Outcome/Effect of Engagement

Employing and fostering engaged workers should be the ultimate goal for every organisation considering that it promotes creativity, task performance and organisational citizenship behaviour (Bakker, Demerouti and Sanz-Vergel, 2014). Further, engaged workers are eager and able to 'go the extra mile', which when compared to non-engaged employees, was illustrated in that engaged employees worked more overtime (Beckers *et al.*, 2004). Thus, while offering so many positive outcomes, WE is also negatively related with absenteeism (Airila *et al.*, 2012; Merrill *et al.*, 2013; Rongen *et al.*, 2014), presenteeism (Admasachew and Dawson, 2011). Thus, this section of the review aims to give an overview of the outcomes linked to engagement.

2.4.1 General Outcomes to Engagement

Several studies gave evidence that links engagement to positive results such as occupational citizenship behaviour (Sulea *et al.*, 2012; Alfes *et al.*, 2013), organisational commitment (Hakanen, Perhoniemi and Toppinen-Tanner, 2008), less sick leave (Schaufeli, Bakker and van Rhenen, 2009) as well as increased job performance (Xanthopoulou *et al.*, 2009; Bakker and Bal, 2010; Salanova *et al.*, 2010) and fewer errors (Mark *et al.*, 2007; Prins *et al.*, 2010).

In their cross-sectional meta-analysis of 130 studies from the (semi)public (i.e. hybrid companies encompassing private and public components, e.g. health care organizations) and private sector, Borst et al.'s (2019) results indicated that (semi-)public organisation results showed usually stronger engagement in general as well as more positive outcome effects than engaged workers of private companies, which may be due to public workers seeing WE more as a personal resource (i.e. impacting meaningfulness and purposefulness), and that those workers show different motivations and characteristics due to the nature of (semi-) public organisations. It was hypothesised, that, considering that (semi-)public organisations include job types such as teachers and nurses, these employees might consider their jobs as more purposeful than maybe private company employees do (Borst *et al.*, 2019). However, they supported the aforementioned findings in relation to the degree of attitudinal products (job satisfaction, behavioural outcomes (in-role performance, extra-role performance, and turnover intention)) (Borst *et al.*, 2019). Two meta-analyses prepared by the Gallup group also showed a positive association between engaged workers and organisational success, the greatest effects were identified relative to employee turnover, customer satisfaction–loyalty, and safety (Harter, Schmidt and Hayes, 2002; Harter *et al.*, 2009). However, these results should be read carefully, since engagement was measured using the Gallup's engagement measurement tool, the Q12, which rather measures resourceful working environment and job satisfaction instead of engagement in the sense of a psychological state.

2.4.2 Engagement Outcomes related to H&S

Research by the NHS studied the engagement of medical staff and found that the more engaged the staff, the stronger the outcomes in terms of the organisation and patients, particularly in terms of H&S (Ham and Dickinson, 2008). However, 'engagement' in this study was perceived as involvement, since the National Health Service UK (NHS) claims that engagement is promoted when organisations "engage staff in decisions that affect them and the services they provide, individually, through representative organisations and through local partnership working arrangements" (Department of Health (NHS), 2015, p. 10).

While clear outputs of engagement are hard to measure, it was shown that safety behaviour and compliance are outcomes of increased engagement (Hansez and Chmiel, 2010; Wachter and Yorio, 2014; Huang *et al.*, 2016). Harter and colleagues (2002) found in their meta-

analysis that engaged workers were involved in fewer accidents at work. Indeed, these findings were supported by a meta-analysis across 179 studies by Nahrgang, Morgeson and Hofmann (2011) as well as by Wachter and Yorio (2014). In a similar vein, Hansez and Chmiel (2010) found by using confirmatory factor analyses in a sample of 3,506 Belgian employees directly concerned with safety problems within an energy company that engaged workers of a chemical plant were more committed to safe working performance than non-engaged workers.

2.4.3 Engagement Outcomes Related to Health

On top of that, WE was found to impact workers' health. A study by Black and colleagues (2017) on 200 employees of the UK's welfare and service sector found that workers with higher WE showed lower systolic blood pressure and heart rate than those with lower WE, suggesting a reduced biological stress state. However, it should be considered that due to correlation no causality can be established confidently, which may mean that there could also be a link between health issues and lower WE levels.

2.5 Antecedents and Promoting Factors of Engagement

So how can the organisations support and promote engagement in their workers? The following section will provide an overview of the factors influencing and promoting WE.

2.5.1 Job Demands-Resource Model

As much as there is confusion and differences in WE definitions, perhaps not surprisingly, there is also a lack of a clear agreement on what impacts WE. Thus, much research has been conducted in order to identify antecedents that promote engagement in the working environment. Based on the burnout-engagement approach, the Job Demands-Resource (JD–R) model was designed (Bakker and Demerouti, 2007, 2008; Bakker, Demerouti and Sanz-Vergel, 2014; Schaufeli et al., 2014) (see Note: *Image reproduced with permission of the author*

Figure 5) and has since been supported by a substantial amount of evidence. This framework is based on the assumption that resources and demands moderate a worker's psychological state either positively or negatively; thus, leading to engagement when positively influenced

(‘motivational process’, i.e. high resources and positively challenging demands), or to burn-out when a negative imbalance between demands and resources occurs (‘health impairment process’, i.e. lack of resources and high draining job demands).

Research has shown that cognitive job challenges (Bakker, Demerouti and Schaufeli, 2003, 2005; Lorente Prieto *et al.*, 2008), work responsibility (Rothbard, 2001) and a challenging workload (Bakker, Demerouti and Schaufeli, 2003; Britt, Castro and Adler, 2005; Xanthopoulou *et al.*, 2008) can also benefit WE. Those findings were supported by two meta-analyses, which identified that job responsibility and workload (Crawford *et al.*, 2010), in addition to job complexity and problem-solving, were positively associated with engagement (Christian *et al.*, 2011). Those job challenges were perceived as motivational because they potentially can provide a sense of achievement, personal development and mastery (Lazarus and Folkman, 1984).

2.5.2 Resources and Demands

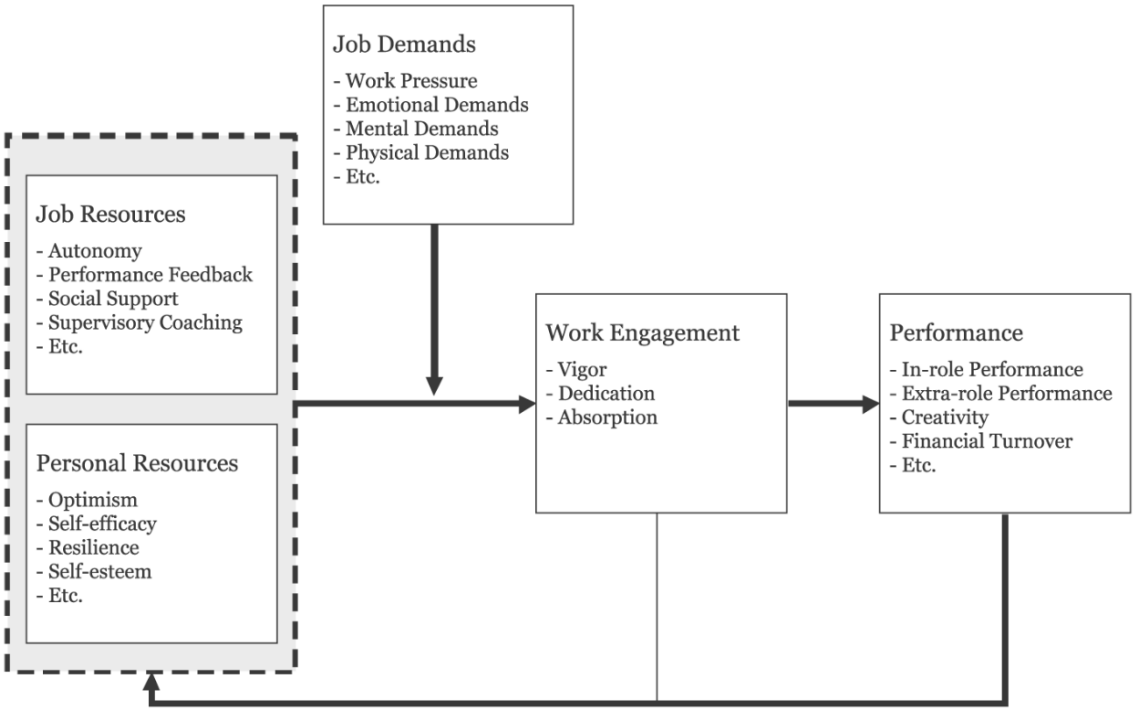
These resources can be distinguished between job resources which fulfil general human needs and support in reaching work-related targets resulting in workers facing the challenging job demands, and can be assets, such as colleague support, flexible work times, settings, equipment and involvement in decision-making; and personal resources which include individual assets, such as resilience, self-efficacy, positivity, personal beliefs and personal emotional state (Mäkikangas *et al.*, 2013; Bakker, Demerouti and Sanz-Vergel, 2014; Schaufeli, 2014). While many studies investigate resource and demand factors influencing WE, no overall meta-analysis or structural equation modelling study could be found (to the author’s knowledge) comparing and thus ultimately defining what factors are resources impacting WE. Similarly, the potential similarities, dependencies and overlaps make contrasted evaluation of the factors difficult (e.g. differences between leader-member exchange (LMX), leader support and leadership style).

Longitudinal studies supported the JD-R, with additional empirical evidence of engagement being linked to less absenteeism, and organisational commitment and burnout being linked to depression and negative future absence predictions (Hakanen, Schaufeli and Ahola, 2008; Schaufeli, Bakker and van Rhenen, 2009). In addition, in a later study over a period of eighteen months, a positive association was found between job and personal resources with WE

(Xanthopoulou *et al.*, 2009). On top of that, empirical evidence suggested that a feedback loop existed between engagement and resources (Salanova *et al.*, 2010; Weigl *et al.*, 2010). That means that an engaged worker who completed a task successfully may nurture his or her level of personal resources (e.g. higher self-efficacy, positive feedback by a superior).

2.5.3 Kahn's Initial Framework of Engagement

Looking at the whole body of engagement research to date, most antecedents fit Kahn's (1990) initial framework of engagement based on meaningfulness, i.e. the characteristics of the work (i.e. the feeling of getting something in return for the self-invested in role performance; e.g. task and role features), psychological safety which is affected by the social environment (i.e. the sensation of being capable to present one's self without stress of punishments; e.g. relationships, norms, leadership style), and availability of e.g. personal resources (i.e. the feeling of owning the physical and psychological resources to engage one's self at work; e.g. energy) (Crawford *et al.*, 2014).



Note: Image reproduced with permission of the author

Figure 5: JD–R Model (Reproduced from Bakker and Demerouti (2008), Based on Bakker and Demerouti (2007))

Kahn (1990) later broadened his framework by adding the factor of psychological presence as a pre-antecedent, which included attentiveness, connectedness, integration and focus, which when brought together with feeling safe and experiencing meaning in one's work while being provided with all necessary internal and external resources will lead to feeling engaged. This model was tested by May and colleagues (2004) who also found evidence for a positive relationship between meaningfulness and job enrichment as well as role fit, safety being linked to supportive superiors and pleasing colleagues, and personal resources to availability. This, in conclusion, means that engagement is promoted by a secure and supportive working environment, feeling that the job is challenging and purposeful, and a high personal energy level.

2.5.4 Interconnectedness of Kahn's Dimensions

However, as Crawford and colleagues (2014) pointed out, it should be considered that some of the factors influence and span across two or all three antecedent dimensions (e.g. transformational leadership not only influences the feeling of psychological safety but may also support meaningfulness in the work and availability of resources). Thus, this reflects the overall confusion with respect to antecedents, as to this date, it is not yet clear and distinct how the presented factors influence each other due to overlaying effects and relationships and what impact that has on WE.

2.5.5 Presentation of Engagement Antecedents Based on Kahn's Framework and Crawford et al.'s Research

In the following section, the research evidencing the three engagement dimensions and their underlying factors will be presented along the structure by Crawford et al. (2014). Considering this research's focus is on PL workers and H&S, example studies considering manual workers or a safety context where presented.

Engagement Antecedents: Psychological Meaningfulness

Psychological meaningfulness refers to an individual's perceived significance in one's work and the feeling that there is a reward for the investment of the self into the work (Crawford *et al.*, 2014). Several studies have identified factors impacting psychological meaningfulness such as autonomy, task variety, feedback, personal fit, opportunity for development or training as well as reward and recognition (see Table 5).

Table 5: Antecedents: Psychological Meaningfulness

Antecedent	**Definition/Theoretical link to engagement**	**Studies which propose that this antecedent influences engagement**	**Particular links to blue-collar (BC) workers and/or H&S**
Autonomy	Consistent with self-determination theory (Ryan and Deci, 2000a), individuals who had freedom over their work schedules and procedures and thus could take responsibility and ownership over their performance and results, were expected to feel more engagement and be more proactive within their work.	Hackman, 1980; Kahn, 1990; Llorens *et al.*, 2007; Christian *et al.*, 2009; Crawford *et al.*, 2010; Nahrgang, Morgeson and Hofmann, 2011; Vera, Salanova and Lorente, 2012; Conchie, Moon and Duncan, 2013; Inoue *et al.*, 2013; Siddiqi, 2015	(Perceived) autonomy and higher decision latitude were found to have a positive relationships with WE in MF workers (Shin and Jeung, 2019).
Task variety	Through task variety, individuals needed to learn and access more skills and thus develop wider knowledge and abilities within their job (Kahn, 1990).	Kahn, 1990; Hakanen, Bakker and Demerouti, 2005; Defranc *et al.*, 2008; Salanova and Schaufeli, 2008; Crawford *et al.*, 2010; Christian *et al.*, 2011	
Feedback	Kahn (1990) argued that feedback was linked to worker's engagement as the performance evaluation by others (e.g. supervisors) allowed the worker to appreciate their growth and thus feel valued and appreciated.	Kahn, 1990; Bakker, Demerouti and Schaufeli, 2003; Schaufeli and Bakker, 2004; Hakanen, Bakker and Schaufeli, 2006; Hallberg and Schaufeli, 2006; Bakker *et al.*, 2007; Van Den Broeck *et al.*, 2008; Salanova and Schaufeli, 2008; Crawford *et al.*, 2010; Christian *et al.*, 2011; Sexton *et al.*, 2018	A positive significant relationship was found between safety walks with feedback about actions undertaken as a consequence of the walk and higher engagement and safety climate scores (Sexton *et al.*, 2018). Further, research findings revealed that performance feedback mediated the relationship between Psychological Safety Climate (PSC) and job engagement in a multilevel study of Malaysian employees of divers industries (Lee and Idris, 2017).
Personal fit	A less studied, but evidenced driver of engagement is an individual's personal fit with the job role, based on the self-image, pride, status and influence	Kahn, 1990; May, Gilson and Harter, 2004; Crawford *et al.*, 2010; Hamid and Yahya, 2016	

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to blue-collar (BC) workers and/or H&S
	they perceived about themselves and how that matched with their job. Kahn (1990) suggested that if an individual could feel important and needed as well as being able to influence one's environment it may foster engagement by adding to the feeling of meaning.		
Opportunity for development or training	Opportunities for development or training were found to have a positive relationship with engagement and be important to the individual's growth and ability to tackle challenges and job variety, as they provide an opportunity for the individual to acquire the necessary knowledge and skills to grow and find fulfilment in one's work (Kahn, 1990).	Kahn, 1990; Bakker, Van Emmerik and Euwema, 2006; Salanova and Schaufeli, 2008; Bakker and Bal, 2010; Crawford *et al.*, 2010	Development opportunities and training were found to predict WE in several studies in the BC industry (Choo, Mat and Al-Omari, 2013; Gajdzik, 2013; Alzyoud, 2018; Morgan, 2018; Peláez, Coo and Salanova, 2019). Controversially, Johari et al. (2013) found that training and development to be non-significant.
Reward and recognition	Direct and indirect rewards and recognition was considered associated with WE. The research findings with respect to reward and recognition (i.e. direct, such as salary and benefits, and indirect, such as praise and appreciation) are mixed. While Bakker et al. (2006) stated that monetary rewards were negatively associated with engagement, other research findings suggested otherwise (Jackson, Rothmann and Van De Vijver, 2006; Saks, 2006; Gorter *et al.*, 2008).	Siegrist, 1996; Bakker, Van Emmerik and Euwema, 2006; Jackson, Rothmann and Van De Vijver, 2006; Saks, 2006; Bakker *et al.*, 2007; Gorter *et al.*, 2008; Crawford *et al.*, 2010; Owen, Bailey and Dollard, 2016; Nasima and Shalini, 2018	Within a BC setting, rewards, recognition and performance appraisal were significantly related to WE (Choo, Mat and Al-Omari, 2013; Gajdzik, 2013; Alzyoud, 2018). Further, financial and non-financial recognition positively empirical link to employee engagement (Johari *et al.*, 2013).

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to blue-collar (BC) workers and/or H&S
	Later, researchers (Bakker *et al.*, 2007; Crawford *et al.*, 2014) found that non-monetary recognition was positively related to engagement. Thus, research showed that extrinsic rewards do not necessarily enhance an individuals' willingness to invest themselves in their work. However, in Owens et al. (2016) study on PSC and the Effort Reward Imbalance model (ERI; Siegrist, 1996), they found that investing work without adequate rewards (thus an imbalance according to the ERI model) led to lower engagement levels in workers.		

On the practical side, the research summarised in Table 5 means that factors that enhance workers' engagement may lay in the job design and social environment and could be implemented with little to no financial effort (such as giving regular feedback, autonomy and variety) (Crawford *et al.*, 2014).

Engagement Antecedents: Psychological Safety

Not fearing for negative consequences when emerging and investing oneself into the work is the meaning of the key driver of engagement: Psychological safety (Kahn, 1990). Thus, a clear understanding of behavioural consequences as well as an honest, protected and stable working environment is crucial to create this level of safety (Crawford *et al.*, 2014) and it is impacted by the factors: social support, transformational leadership, LMX, workplace climate, organisational justice and job security (see Table 6).

Particularly LMX has hereby shown a relevant impact on workers' engagement. It focusses on the special dynamic between leaders and their subordinates shown to impact outcomes on behaviour and mindset, and is based on social exchange theory as well as role theory (Breevaart et al., 2013). Elevated levels of LMX are associated with trust and support, and promotes psychological safety through those trusting relationship (Dienesch and Liden, 1986). Positive relationships between LMX and engagement were found in several samples, such as call centre agents and teachers (Bakker and Bal, 2010; Bakker et al., 2003), electronic and fast-food workers (Xanthopoulou et al., 2007; Xanthopoulou, Bakker, Demerouti, and Schaufeli, 2009b). Further information on LMX's relevance on engagement are given in the relevant areas throughout the thesis (e.g. 3.3.1).

Table 6: Antecedents: Psychological Safety

Antecedent	**Definition/Theoretical link to engagement**	**Studies which propose that this antecedent influences engagement**	**Particular links to BC workers and/or H&S**
Social support	An environment where an individual feels that their contributions are being valued and the organisation supports their workers and cares about their well-being, so-called social support, was found to be the most empirically researched driver for engagement (Crawford *et al.*, 2014). This, in consequence, may lead to the individual feeling more safe to take risks and, based on social-exchange theory (SET), the individual feels subliminally obligated to care for the company and support it in reaching its goal as an exchange for the trust, support and care the individual feels it receives from the company (Kahn, 1990; Saks, 2006). This perspective of feeling sup-	Kahn, 1990; Rhoades and Eisenberger, 2002; Schaufeli and Bakker, 2004; Nembhard and Edmondson, 2006; Saks, 2006; Crawford *et al.*, 2010, 2014; Christian *et al.*, 2011; Nahrgang, Morgeson and Hofmann, 2011; Brunetto *et al.*, 2013; Conchie, Moon and Duncan, 2013; Freeney and Fellenz, 2013; Siddiqi, 2015; Huo and Boxall, 2017; Mitonga-Monga and Hlongwane, 2017; Naeem *et al.*, 2018; Taylor *et al.*, 2019	Nahrgang et al. (2011) identified a supportive environment, whether from leadership, social support or safety climate, as the most reliable job resource in terms of explaining variance in engagement. In addition, in an extensive grounded theory study amongst firefighters, Taylor et al. (2019) found that supervisor support was positively linked to engagement and safety compliance. Moreover, it was found in a hospital setting that greater support services availability was related to higher levels of WE, which in turn predicted enhanced safety climate and reduced negative safety events (Mark *et al.*, 2007). The relationship between support and WE and in turn OSH improvement

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to BC workers and/or H&S
	ported and cared for is fostered by interactions with representatives of the organisation (e.g. supervisors, co-workers) (Rhoades and Eisenberger, 2002). Thus, the degree of social capital, as in feeling close to and trusting in other members of the organisation and the quality of social interactions, was found to have an impact on WE (Brunetto *et al.*, 2013).		was supported by several studies (Benedicto, 2017; Laurent, Chmiel and Hansez, 2018). In a sample of Japanese MF workers, Inoue et al. (2010) found that worksite support significantly mediated between the positive relationship of procedural justice or interactional justice and WE. This finding was supported in that other studies with BC samples also reported a positive relationship between social (leadership/organisational) support and WE (Shantz, Alfes and Latham, 2016; Morgan, 2018), with one finding WE to be a mediator between co-worker support and safety performance (i.e. safety compliance and participation) (Yuan, Li and Tetrick, 2015).
Transformational leadership	Transformational leaders inspire their employees to reflect on their decisions, find new solutions and be creative (Sosik, 2006) and thus, was found to encourage workers to take risks without fearing negative behavioural consequences. Supportingly, a transformational leadership style would also allow the employee to make changes to their job and tasks in terms of resources, challenges and reduction of hindrances (i.e. autonomy),	Whitford and Moss, 2009; Christian *et al.*, 2009; Tims, Bakker and Xanthopoulou, 2011; Nazaruk, 2011; Aryee *et al.*, 2012; West and Dawson, 2012; Schultz and Bezuidenhout, 2013; Breevaart, Bakker and Demerouti, 2014; Mishra and Mohanty, 2016; Bakker and Van Wingerden, 2017; Gordon *et al.*, 2017; Moletsane, Tefera and Migiro, 2019; Naeem *et al.*, 2019	Cheung and Qinbin (2016) developed a framework in which leaders' WE is positively related to safety-specific transformational leadership behaviours, which in turn then may improve workers' H&S engagement. Further, research found that job resources such as safety climate, leadership and knowledge explained the highest amounts of variance in engagement in the MF industry (Nahrgang, Morgeson and Hofmann, 2011). On a

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to BC workers and/or H&S
	which can also affect the individual's engagement state (Bakker and Van Wingerden, 2017; Gordon *et al.*, 2017).		higher level, several studies found that leadership (style) influenced WE and thus safety behaviour (Benedicto, 2017; Gyensare *et al.*, 2017; Vignoli, 2018; Lawani, Hare and Cameron, 2019). In a shop floor MF sample using a quantitative, descriptive correlational study the relationship between perceived supervisor leadership style and WE was examined (measured by Q12) and a moderate positive link between perceived transformational supervisor leadership style and employee engagement, as well as a moderate negative relationship between perceived laissez-faire supervisor leadership and employee engagement was identified (Lockwood, 2008).
Leader-member exchange (LMX)	The general relationship between leader and worker was found to be positively linked to engagement though relatively little research has been done on this subject so far (Crawford *et al.*, 2014). This relationship refers to the level of trust, interaction and support that is being established between leader and follower and efforts and investments both parties make in an effort to create/maintain such a relationship (Nahrgang,	Nahrgang, Morgeson and Ilies, 2009; Xanthopoulou *et al.*, 2009; Aryee *et al.*, 2012; Crawford *et al.*, 2014; Benedicto, 2017; Lawani, Hare and Cameron, 2019; Naeem *et al.*, 2019	Lawani and colleagues (2019) found that workers who perceived the organisation as trustworthy, because they feel it had invested in them and made them feel valued were more likely to repay the company by becoming more engaged with their work and involved with H&S matters due to reciprocity/SET. Further, Trinchero et al. (2019) identified in a study of 648 healthcare workers that employee engagement

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to BC workers and/or H&S
	Morgeson and Ilies, 2009). Thus, establishing a trusting and supportive leader-worker relationship makes workers more likely to engage with their job.		(directly affected by LMX) had direct effects on situational aspects and indirect effects on the behavioural aspects of safety culture (leading to in-role performance and safety compliance). Thus, safety behaviours of clinical staff are associated with the characteristics of the supervisor-employee relationship, their engagement, their perceptions about H&S and the quality of organisational support.
Workplace climate	The factor 'workplace climate' is made up of the social, organizational, and situational components of the organisation and provide the worker with stability within the organisation as it defines organisational behavioural norms and expectations (Kahn, 1990). Through supportive and healthy climates, research found that organisations can promote engagement (Crawford *et al.*, 2014). From a critical perspective, it could be argued that the promoting factor 'workplace climate' is merely a consequence of several anteceding factors, which may also have a direct influence on engagement (e.g. leadership style, feedback).	Kahn, 1990; Bakker, Denessen and Brus-Laeven, 2007; Hakanen, Perhoniemi and Toppinen-Tanner, 2008; Xanthopoulou *et al.*, 2009; Crawford *et al.*, 2010, 2014	Using an indirect and direct path model analysis on a sample of 3,371 participants, Muhonen et al. (2014) revealed that social organisational climate mediates the relationship between bullying and engagement (as well as health, and wellbeing). Moreover, Lee and Idris (2017) discovered that job engagement takes a mediating role on the relationship between psychological safety climate and team climate linked to job performance.
Organisational justice	Organisational justice, as in the fairness in respect to	Saks, 2006; Siltaloppi, Kinnunen and Feldt, 2009; Agarwal, 2014	In a study with 243 MF workers in the Japanese factory, Inoue et al. (2010)

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to BC workers and/or H&S
	processes, decisions, explanations and outcomes, provides safety and stability through perceived equity and mis-distribution in respect to power and resources (Kahn, 1990).		revealed that worksite support significantly mediated between the positive relationship of procedural justice or interactional justice and WE.
Job security	Job security referred to as a worker's perceived stability with respect to the future in the organisation and role and thus the predictability and safety of future situations (Kahn, 1990).	Mauno *et al.*, 2005; Mauno, Kinnunen and Ruokolainen, 2007; Elst *et al.*, 2010	

In summary, as demonstrated in Table 6, most research suggested that psychological safety is provided through perceived support by colleagues and superiors and other findings give evidence that managers have a considerable influence on their workers' engagement through their relationship and leadership style.

On the practical side, the findings give hope that slight changes in practice can make a difference to workers' engagement levels. A case study by Barling et al. (1996; 2002) showed, that organisations can learn from those findings and provide transformational leadership training to their managing employees, as it was found to increase engagement.

Engagement Antecedents: Psychological Availability

An individual who obtains the personal cognitive, emotional and physical resources, skills and confidence from inside as well as outside the organisational context to engage and invest in its performance attained so-called 'psychological availability', which makes it more likely for an individual to invest such resources in its performance (Kahn, 1990). Availability is described by the following factors: workload, work-role conflict, family-work conflict, resources, recovery, personal disposition and personal resources (see Table 7).

Table 7: Antecedents: Psychological Availability

Antecedent	**Definition/Theoretical link to engagement**	**Studies which propose that this antecedent influences engagement**	**Particular links to BC workers and/or H&S**
Workload	Feeling overwhelmed with the workload that has to be completed in the available amount of time impacted the individual's feelings of psychological availability. While a challenging workload can add to meaningfulness, an overwhelming abundance of work will have the opposite effect and was found to be negatively linked to engagement (Crawford *et al.*, 2010). Several studies found similar outcomes where workers who felt constantly overpowered by the amount or complexity of work had less energy to invest in their work and thus their engagement level decreased (Lorente Prieto *et al.*, 2008; Kulikowski, 2017).	Bakker, Van Emmerik and Euwema, 2006; Lorente Prieto *et al.*, 2008; Schaufeli, Taris and Van Rhenen, 2008; Korunka *et al.*, 2009; Crawford *et al.*, 2010; Conchie, Moon and Duncan, 2013; Van Wyk *et al.*, 2016; Kulikowski, 2017; Frone, Reis and Ottenstein, 2018	In a mixed study of white and BC workers, evidence was found that work overload was negatively related to engagement (Korunka *et al.*, 2009). These findings were supported by research within a sample of 1,922 Belgian steel workers (Laurent, Chmiel and Hansez, 2018) and 69 construction supervisors (Conchie, Moon and Duncan, 2013), both linking WE to positive safety behaviour, however work and role overload to lesser WE levels.
Work-role conflict	Work-role conflicts arise when the individual feels torn between conflicting demands, such as expected behaviour and performance and as a result, feels like it cannot satisfy the expectations with any amount of effort (Kahn, 1990).	Kahn, 1990; Hakanen, Schaufeli and Ahola, 2008; Crawford *et al.*, 2010	Tsuno and colleagues (2009) examined the group conflict's effect on stress and engagement between genders within a sample of 247 employees of MF factory in north-central Japan and identified that for males, intragroup and intergroup conflict at work may enhance psychological distress; for women, intergroup conflict may elevate both psychological distress and WE.
Family-work conflict	Conflicts that arise due to incompatible demands from inside and outside	May, Gilson and Harter, 2004; Mauno, Kinnunen and Ruokolainen, 2007;	

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to BC workers and/or H&S
	work, thus work interfering with private duties (i.e. family) may lead to distraction and strained resources (Kahn, 1990). However, conflicting results were found when exploring the relationship between family-work conflicts and engagement.	Halbesleben, 2010; Inoue *et al.*, 2013; Crawford *et al.*, 2014	
Resources	Another reason for strain and thus reduced engagement is the lack of sufficient resources, such as data or physical inventory as the effort to correct the insufficiency costs the individual energy that could have been invested differently (Kahn, 1990; Sonnentag, 2003).	Kahn, 1990; Bakker, Demerouti and Schaufeli, 2003; Sonnentag, 2003; Mostert and Rothmann, 2006; Crawford *et al.*, 2010	
Recovery	The factor 'recovery', thus the ability to 'switch-off' when not at work and recharge resources, showed a positive link to engagement (Sonnentag, 2003; Sonnentag, Dormann and Demerouti, 2010).	Totterdell *et al.*, 1995; Sonnentag, 2003; Crawford *et al.*, 2010; Sonnentag, Dormann and Demerouti, 2010	Frone et al. (2018) found in a study with 489 German workers from different companies that mental and emotional work fatigue predict WE.
Personal disposition	The personal disposition to perceive a psychological and emotional state was found to have an influence on engagement (Macey and Schneider, 2008). Within disposition, certain personality traits (e.g. conscientiousness, positive and negative affect) were identified to be positively and negatively linked to engagement.	Mostert and Rothmann, 2006; Macey and Schneider, 2008; Halbesleben, Harvey and Bolino, 2009; Sonnentag, Dormann and Demerouti, 2010; Christian *et al.*, 2011; Ghorbannejad and Esakhani, 2016	Nakamura and Otsuka (2013) found in their study that job resources had a positive impact on positive affect and meaningful work, leading to higher WE. Support from supervisor was correlated with job control, and this in turn had a significant effect on positive affect and meaningful work. Furthermore, both positive affect and meaningful work had strong effects on WE. Support from

Antecedent	Definition/Theoretical link to engagement	Studies which propose that this antecedent influences engagement	Particular links to BC workers and/or H&S
			co-workers had a significant effect on positive affect, but not for meaningful work.
Personal resources	It was found that an individual's personal resources, such as self-efficacy and optimism, are positively related to engagement. These resource types support the individual's availability through feeling confident and balancing work's demands and their own performance (Kahn, 1990).	Xanthopoulou and Demerouti, 2007; Xanthopoulou *et al.*, 2008, 2009; Stearns, Shoji and Benight, 2018	In a study with 263 technical experts from the automotive MF industry, it was identified that personal self-efficacy was the highest predictor of WE, followed by the conscientiousness trait (Ghorbannejad and Esakhani, 2016).

As has been shown in Table 7, empirical research has provided confirmation for the connection between an individual's psychological availability, thus the level of resources it had access to, and engagement. In practice, it may mean that companies could work on their organisational system and procedures to ensure recovery and resource (re)generation as well as building organisational practices to aid in the acquisition of relevant skills and resources (e.g. training). In this regard, personal differences in traits and characteristics in their staffing process could also be considered.

2.5.6 Engagement Antecedents: The Antecedent Wheel of Engagement

In an attempt to visually summarise the identified antecedents on engagement, the antecedent wheel of engagement was designed by the researcher to present the different antecedents and their underlying factors (Figure 6). The content of the wheel was informed by the overview by Crawford and colleagues (2014) and respectively by Kahn's (1990) research as well as evidence from two meta-analyses (Christian *et al.*, 2009; Crawford *et al.*, 2010).

Moving from the inside to the outside, the wheel's ranks display the following information:

- Rank 1: The three antecedent dimensions by Kahn's (1990) research

- Rank 2: Definition of the three antecedent dimension by Kahn's (1990) research
- Rank 3: The respective antecedents as discussed by research (Christian *et al.*, 2009; Crawford *et al.*, 2010, 2014) and presented in Section 2.5.5
- Rank 4: General definitions of the antecedents as discussed by research (Christian *et al.*, 2009; Crawford *et al.*, 2010, 2014) and presented in Section 2.5.5

The wheel aims to provide an easy overview of the identified engagement antecedents as presented by research (Christian *et al.*, 2009; Crawford *et al.*, 2010, 2014) and in consequence emphasize the areas that organisations can work on to enhance their engagement levels.

2.5.7 Engagement Antecedents: Final Remarks

Kahn (1990) theorised that the presented antecedent factors, mutually and individually, promote engagement. Yet, not much empirical evidence can be found for this hypothesis. Christian et al. (2011) in their meta-analysis, conducted a path analysis to analyse the influence of promoting factors on engagement and discovered that several antecedents from different engagement antecedent elements (i.e. safety, meaningfulness and availability) influenced engagement uniquely (i.e. task variety, conscientiousness, transformational leadership, significance). Indeed, a meta-analyses showed personal traits (such as self-efficacy, proactive personality, optimism) are most influential to WE (Peccei, 2013), hence supporting what Macey and Schneider (2008) term as 'trait engagement' where some people are just more inclined to feel engaged than others (Guest, 2014). The study further suggested strong associations of WE with reported feelings of job variety, task significance and work-role fit, while job control/autonomy was found slightly less strongly correlated with WE (Peccei, 2013).

Interactions Between Antecedent Factors

Lately, more attention has been paid to the interactions between antecedent factors, thus how they influence each other (e.g. nonlinear synergistic influence instead of additive effects) (Crawford *et al.*, 2010). Accordingly, only a few studies have so far explored the interactive relationship between antecedent factors and found for example that beneficiary contact (meaningfulness) and task variety (meaningfulness) reduced the negative influence of work-

role conflict (availability) (Hakanen, Bakker and Demerouti, 2005) while off-work-recovery (availability) reduced the negative impact of job insecurity (safety) (Kinnunen, Mauno and Siltaloppi, 2010).

Figure 6: Engagement Antecedent Wheel (Designed Based on Research by Crawford et al. (2014), Kahn (1990) and Evidenced by Christian et al. (2009) and Crawford et al. (2010)

Application to Human Resource Management

It can be derived from the antecedents of engagement that they impact capacities that are closely linked to overall Human Resource Management (HRM) responsibilities in most

companies (e.g. leadership style, values of the company) (Albrecht, Breidahl and Marty, 2018). Therefore, in order to improve H&S worker engagement, general practices within the company may need to be changed, such as showing workers that they are genuinely cared for and that they and their H&S efforts are valued by the company (Bell, Sykes and Powell, 2014; Bakker and Albrecht, 2018). Further, Bakker and Albrecht (2018) identified a need and trend to analyse how HRM practices and policies can support WE by considering "organizational context factors, job context factors, and individual psychological and motivational factors" (p. 6).

Implications of Antecedent Research on Safety-II Principles

Circling back to safety behaviour, antecedents such as management support, LMX and autonomy were found to be related to higher levels of SCB and safety participation (Hofmann, Morgeson and Gerras, 2003; Parker, Lawrie and Hudson, 2006; Laurent, Chmiel and Hansez, 2018). Supporting this, Lawani and colleagues (2019) added that in order to support engaged workers, "an open and 'no-blame' environment in which problems are resolved through consultation and the use of shared knowledge and learning" (p. 3) had to be created. Laurent and colleagues (2018), as a result of their findings, proposed that when employees feel cared for by their organisation they reciprocate that behaviour by considering and acting on extra-role behaviours, such as discretionary safety actions.

Furthermore, taking into account the Safety-II principles summarised in Section 2.2.7, some similarities can be drawn between those and the antecedents for engagement (see Table 8).

Table 8: Antecedents Safety-II and Engagement

Safety-II principles	**Possible relation and similarities to engagement antecedent**
Overall	**Workplace climate:** Enabling this principle will mean an amendment to the entire climate in the workplace as the norms and expectations will be adjusted in parallel with a sensitivity to failure possibility, a curiosity for what enables success, the awareness of a complex and dynamic work environment and its consequences as well as an understanding of the role of expertise, adaptation, and creative problem solving. Therefore, this needs to be reflected in overall organisational values as well as processes (e.g. training, decision-making, staffing). **Transformational leadership:** Workers should be supported and motivated as well as taken seriously and appreciated for their expertise in their trade by their leaders who actively supports coaches and works

Safety-II principles	Possible relation and similarities to engagement antecedent
	with the workers to identify what they need to get work done and provides it, and hence, provokes creativity and proactivity.
Safety as integral part of decision-making and conversations Safety is a natural part of everyday conversations and discussion regarding all areas of the business (e.g. production, time plans, quality, health, wellbeing) among workers and between managers and workers. Workers' health and wellbeing is an incremental part of management's conversations, discussions and decision-making.	**LMX:** There is a trusting and open relationship in which workers feel cared for by leaders and take a proactive part in H&S discussions and exhibit safe and healthy behaviours. **Feedback:** Managers are willing to openly raise or respond to any aspects of work performance that are relevant to the scenario. This could include giving or requesting feedback on individual, team or organisational performance to help all parties to understand and explain how the system is functioning.
Focus on and learning from the 'work-as-done' and the 'good' in daily work Check the procedures that usually go right because potentially there will be a difference between 'work-as-planned' and 'work-as-done', because work requires variability. Plans are usually either too specific (i.e. they provide no variability) or they are too general (i.e. they do not really describe the work). The organization needs to understand what is happening within their work, because success and failure emerge from the same conditions: How people adjust performance to deal with complexity is the reason things work and the reason they sometimes fail. Thus, organisations need to understand how things work to understand how they sometimes do not work.	**Reward and recognition:** Workers are being recognized for the good work they are doing and their expertise and critical thinking they use to overcome complexity in resilient ways **Feedback:** Feedback from workers is gathered on their perception of work (e.g. how it is going, what are current main challenges, what is needed to overcome the challenges). Also, workers get feedback for their work's quality and can learn from constructive feedback that facilitates learning and further develops strengths. Both kinds of feedback (i.e. from and towards workers) should be delivered in different forums and with different foci to ensure quality, e.g. one-to-one, collectively and within the team, or as/on the organisation. **Organisational justice:** Restorative justice principles are the base of decisions on consequences and feedback. In case of an event, all stakeholders (i.e. victim, person responsible as well as the community (directly and indirectly) affected by the event) are being considered in the analysis and consequential actions. Positive as well as negative events are equally seen as learning opportunities. **LMX:** Workers should be provided with balanced feedback from leaders that provides learning opportunities, by this the communication and relationship between leaders and workers is likely to be enhanced. **Social support:** Practicing this principle will lead to the fostering of a social network based on mutual support between the organisation and the individuals in the organisation through e.g. collaborative communication, perceived appreciation of workers' input and empowerment.

Safety-II principles	Possible relation and similarities to engagement antecedent
Frequency over severity in events Resources should be spent on understanding everyday events that add barriers to work and prevent people from getting the resources they need to do their jobs properly and safely in order to understand how the system in the organisation works and improve on it.	**Organisational justice:** Attention is being paid to minor but frequent events in order to enhance safe working. Hence, they are not being ignored in favour of very unlikely or rare big events. Safety is being incorporated in general decision-making naturally and it is demonstrated that workers on all levels are being valued. **LMX:** Leaders need to highlight and act as an example in valuing the frequency over severity in events. This has to be reflected in actions as well as direct and indirect communication by showing curiosity in understanding how 'work is done' and understanding the barriers in getting the resources needed.
Sensitivity to the possibility of failure and acknowledging the unpredictability of events Failure as well as success should be accepted as a usual occurrence which should be reviewed, and lessons learned should be shared for betterment and improvement. Plus, the organisation should be aware that not all events and circumstances can be planned and instructed on. Deviations from the plan should be seen as a learning opportunity. Due to the complexity of modern work environments, it is impossible to predict and plan for all possible events through strict procedures. Hence, an organisation needs to be resilient to those disruptions.	**Organisational justice:** Since 'zero failure' is an unrealistic goal, workers are not measured on unachievable key indicators but supported in identifying resource limitations and deviations to 'work-as-planned' are seen as valuable learning opportunities on handling complexity. The unpredictability and flexibility of situations and events is being acknowledged and therefore, deviations to 'work-as-planned' are not perceived as 'human defiance' and seen as a starting point for discussion. In the case of a negative event, the principles of restorative justice should be the main guideline to actions and investigations. **LMX:** Leaders should support and even encourage deviations from the planned work to create learning opportunities and initiate discussions about and understanding of system and resource limitations in order to achieve improvement.
Workers as flexible resources Workers' ability to react flexibly to make decisions based on experience and knowledge to ensure safety (i.e. adaptive capability), have to be acknowledged and fostered through empowering training and learning (e.g. risk assessments, learning about the work environment, transactive memory systems (who knows what), learning additional skills),	**Autonomy:** As a result, to changing circumstances and dynamic work environments, workers communicate changes in circumstances to inform about adjustments in procedures and the organisation and the individual can learn from the adapted routines. Furthermore, management trusting workers to make meaningful decisions on their own without management involvement or approval. Flexibility within the prescribed/instructed/planned procedures and routines are allowed. **Development opportunities/training:** In order to achieve more autonomy, the organisation needs to be changed and supported in accepting more autonomy. Workers should be supported in their skills and decision-making ability through learning on the job, transparent systems and sensitivity to outcomes of actions.

Safety-II principles	Possible relation and similarities to engagement antecedent
effective leadership and communication as well as organisational structures (e.g. allowing autonomy).	**Feedback:** Open dialogue about adjustments in processes as a reaction to a dynamic work environment or to increase practicability encourages transparent and direct feedback and conversations about performance on equal terms. Workers give and receive feedback 360 degrees to support each other and share learnings. **Reward and recognition:** Workers perceive trust in their decisions and expertise as recognition of positive work performance and appreciation of workers as valuable resources. **Personal resources:** Workers can use their personal strengths and resources in work. **LMX:** Relationships between leaders and workers is likely to be enhanced since part of this principle is to appreciate workers for their input, hence two-way conversations and taking workers' feedback into account is necessary. **Social support:** Practicing this principle will lead to workers perceiving more support by their organisation and the individuals in the organisation through e.g. two-way communication, perceived appreciation of workers' input and empowerment. Workers share ideas, innovations, and strategies with each other in an environment of mutual respect and with the trust of leadership, and therefore social capital within the organisation is build.

2.6 Engagement in the Context of H&S

After the previous review on the links between engagement and the Safety-II principles, it can be assumed that similar principles apply between the two concepts. In the following section, the relationship between engagement and H&S will be further explored.

2.6.1 Change towards Engagement Focus in Safety Culture Development

Within the last decade, empirical research within the context of patient care in hospitals, engagement and safety climate were explored and it was found, that patient safety culture can be predicted by engagement (though they often used Gallup's definition of engagement). Employee engagement may have a positive effect on safety culture and in consequence an indirect effect on negative safety events (e.g. injuries) (Mark *et al.*, 2007; Collier *et al.*, 2016). Mark et al. (2007) stated that in order to reduce negative safety events high levels of both, WE and safety climate, are needed. In addition, another study on Italian healthcare workers found that employee engagement (directly affected by LMX) had direct effects on

situational aspects and indirect effects on the behavioural aspects of safety culture (leading to in-role performance and safety compliance) (Trinchero, Farr-Wharton and Brunetto, 2019). Thus it is not surprising, that practitioners calls for a change from safety culture models that are characterised by plans, policies and procedures which were defined as top-down to models that are sustainable and flexible in a cooperative environment: McElveen (2019) discussed the transit strategic safety culture paradigm, which was designed to enhance safety culture processes in the US transit industry, and called for establishing a sustainable safety culture in the transit industry that focuses on employee engagement through "caring, trust, mutual respect, value creation, enterprising spirit [and] open communication" (p.40). Remarkably, these findings are also in line with the Safety-II principles (presented in Section 2.2.7).

2.6.2 Safety as an Outcome of Engagement

In accordance with the previously presented connections between engagement and safety culture, it was found in a hospital context, that initial engagement and its change were the soundest independent predictors of patient safety culture and that increased WE also led to a reduction in compensation claims (Thorp *et al.*, 2012). Although this research was conducted in a hospital setting with a focus on patient safety instead of a MF setting, and obviously working patterns are quite different between the two industries as well as differences between nurses incompliance impacting others safety and MF workers' unsafe behaviour risking harm to self, similar findings were made in a company context. WE negotiated the connection between job characteristics and job resources and safety performance (Yuan, Li and Tetrick, 2015). Furthermore, Hansez and Chmiel (2010; 2018) conducted research in an energy company context and found a significant relationship between WE and low situational and routine safety violations which might be explained by motivational theories (Bakker and Demerouti, 2007) or by SET (Laurent, Chmiel and Hansez, 2018). These results mirror similar findings placing engagement as a mediator between job characteristics and other work behaviours (e.g. performance) (Xanthopoulou *et al.*, 2008; Rich, Lepine and Crawford, 2010).

2.6.3 Trust as an Antecedent of Engagement in a Safety Context

Collier et al. (2016) found that managers have to build trusting relationships by supporting their subordinates and having two-way conversations in order to build WE and H&S performance. In line with that, Lawani et al. (2017b, 2019) highlighted the importance of trust in order to establish WE. Workers that perceived that they were not trusted (i.e. were monitored or felt that managers thought they were incompetent) reacted in retaliation (e.g. taking shortcuts, risk-taking, etc.) (Lawani, Hare and Cameron, 2019). Based on their qualitative findings, they developed a trust framework of four stages which reflect a company's trust maturity through the stages: lack of trust, ability, genuine benevolence, and company integrity. Integrity, and therefore the highest level of trust, was described as when workers perceived that they felt they were employed in a just environment in which they could confidently voice concerns and their management genuinely listened and cared for their needs and concerns and respected them as individuals, as well as in which management followed through with H&S and wellbeing matters when voiced and their actions fitted with the values they communicated (Lawani, Hare and Cameron, 2019). Further, in line with other researchers, they hypothesised that workplace trust and OSH may promote WE (Tharaldsen, Mearns and Knudsen, 2010; Conchie, Moon and Duncan, 2013; Lawani, Hare and Cameron, 2019). Consequently, the role of trust in an occupational setting grew in recognition within research (McAllister, 1995; Colquitt and Rodell, 2011; Bagraim and Hime, 2012; Lawani, Hare and Cameron, 2019) and its significance to leadership, communication (Atwater, 2007) and within teams (Bews and Martins, 2012) has been studied. Again, looking back at the Safety-II principles (presented in Section 2.2.7), while not being discussed in detail, having a trusting relationship between leaders and workers appears to be essential in order to implement empowerment in workers and more flexible, resilient procedures, as workers need to trust in the support and fair treatment of leaders when amending their work patterns to create robustness in work.

2.6.4 Leadership Behaviour as an Antecedents of Engagement in a Safety Context

The crucial role of management as an antecedent of WE was discussed in Section 2.5.5. Therefore, it is not surprising, that research shows that an employee's perception of their leaders' commitment to safety is essential for them to adopt safety behaviour themselves, in addition to acting as a predictor for accidents and near-misses (Tappura, Nenonen and

Kivistö-Rahnasto, 2017). It was reported that management commitment's influence on WE appeared to be greater than the influence of co-worker support, thus managers have to adapt their practices accordingly (Yuan, Li and Tetrick, 2015).

Conchie et al. (2013) used focus groups with sixty-eight supervisors from the construction industry to look at factors that helped and hindered the supervisors' engagement in H&S. They found the following elements to support safety leadership:

(1) Transformational and participative leadership styles with a focus on communication and coaching as opposed to disciplining employees,
(2) spending time with employees, gaining their trust and coaching them on safety behaviour rather than doing administrative tasks and paperwork,
(3) coaching employees on how to get the job done safely instead of retracting to directive, production-focused behaviour when feeling the pressure of production, and
(4) social (i.e. management support employees and acknowledge their work) as well as organisational support (i.e. safety programmes and training) instead of having no resources or capacity.

This shows that autonomy, in terms of supervisors having the power and capacity to address and change a situation, as well as a supportive environment are key factors in promoting engagement in safety leadership (Conchie, Moon and Duncan, 2013).

Again, the findings by Conchie et al. (2013) are in line with the Safety-II principles (presented in Section 2.2.7) considering that a supportive and transformational leadership style that coaches employees was found to be essential for Safety-II as well as for engagement (Lockwood, 2008; Tims, Bakker and Xanthopoulou, 2011; Gordon *et al.*, 2017).

The leaders' safety commitment as perceived by their workers balanced out the effect that work strains have on situational safety violations in a 4,297 mixed-hierarchical sample of safety relevant employees of an energy sector company (Hansez and Chmiel, 2010) as well as in 1,922 workers of mixed-hierarchical of company within the steel sector (Laurent, Chmiel and Hansez, 2018). Further, they found that job resources have a positive link to perceived management's commitment, though the researchers presumed that there are differences in that relationship depending on employees' individual resources as well as job type. Thus, they argued that management safety behaviour adds variance in safety behaviour.

In conclusion, they recommended that interventions should focus on job-related engagement and strains as well as safety-specific aspects of work environment in order to (1) balance out the impact of job demands and strains and (2) trigger the SET process, and subsequently, encourage engagement as well as positive safety behaviour (Hansez and Chmiel, 2010).

Furthermore, Lawani et al. (2017) composed a worker engagement maturity model through a Delphi study for the construction industry suggesting that (1) meaningful discussions, (2) empowerment, (3) trust, (4) motivation, and (5) commitment are all factors that are significantly impacted by management structures and leadership behaviour. This study mostly focused on a behavioural perspective on engagement rather than a psychological affective state, considering levels of involvement with the OSH system rather than inherent emergence within the work. It would be interesting to test, if the behavioural engagement promoted through this framework would also be mirrored in the engagement levels of employees.

2.6.5 Safety Environment as an Antecedents of Engagement in a Safety Context

On a similar note, it has been identified across industries that the general reduction of risks and threats and the implementation of a caring environment increased WE, and consequently, safety (Nahrgang, Morgeson and Hofmann, 2011) as a safe work environment may promote workers' sense of being safe and cared for and thus, psychological safety. With respect to the MF industry, Nahrgang et al. (2011) found in their meta-analysis of 203 independent samples across 170 studies considering in sum 186,440 participants from different industries, that in terms of demands, autonomy, physical demands and complexity made sense of the highest percentage of variance with moderate to strong effect sizes, thus being the strongest predictors of adverse events. Hence, emphasising the importance for companies to analyse the level of complexity, autonomy and exhausting physical demands. Respectively, job resources such as safety climate, leadership and knowledge explained the highest amounts of engagement variance across the MF industry (Nahrgang, Morgeson and Hofmann, 2011). Thus, highlighting the importance of organisations creating a supportive and resource-providing environment for workers to increase engagement. However, it should be noted, that these results were obtained through a meta-analysis, and it was not

specifically reported what papers were included and if there was consistency between engagement definitions and measurements in the respective papers.

2.6.6 Practical Recommendations and Implication for This Research Project

In conclusion, WE research shows potential for the H&S context. The results supporting positive H&S performance as an output of WE evidence a need for organisations to implement WE improvement measures in order to increase H&S engagement. At the same time, the findings are in line with the Safety-II principles (presented in Section 2.2.7).

In particular, trust, leadership behaviour and the safety environment were found to be linked to positive safety outcomes. Consequential recommendations for organisations summarising the findings from the previous section are presented in Table 11.

Table 9: Exemplary Practical Recommendations Drawn From the Review on H&S Engagement Literature

Level	**Consequential Recommendation**
Organisation	Organisational priority: Safety as well as workers' engagement should be made a priority for managers through providing resources for leaders to support the workers in both, alignment of values and decision-making. Develop skill: Supporting workers through respective resources in upskilling and increasing competences may support workers' confidence in their skill as well as H&S engagement in return. Supporting environment: Creating an environment in which workers' needs are satisfied through the necessary resources should be created. Specifically, resources to counteract demands resulting from work. Therefore, the organisation needs mechanisms to assess demands impacting workers as well as identify resources needed to counterbalance these.
Leadership behaviour	'Walk the talk': To build trust, leaders' behaviour should be in line with the values they communicate to show their honest commitment to the workers' wellbeing. Hence, reflecting on how (corporate or individual) safety values are reflected in day-to-day decision-making is recommended. Resource provision: Leaders should provide workers with the job resources they need to act safely. These can be identified through meaningful, open conversation between leaders and workers. Hence, leaders and managers need to be enabled to conduct those conversations.

Hence, based on the presented literature review a relationship demonstrating Safety-II increasing workers' engagement with H&S has been established (see Figure 7).

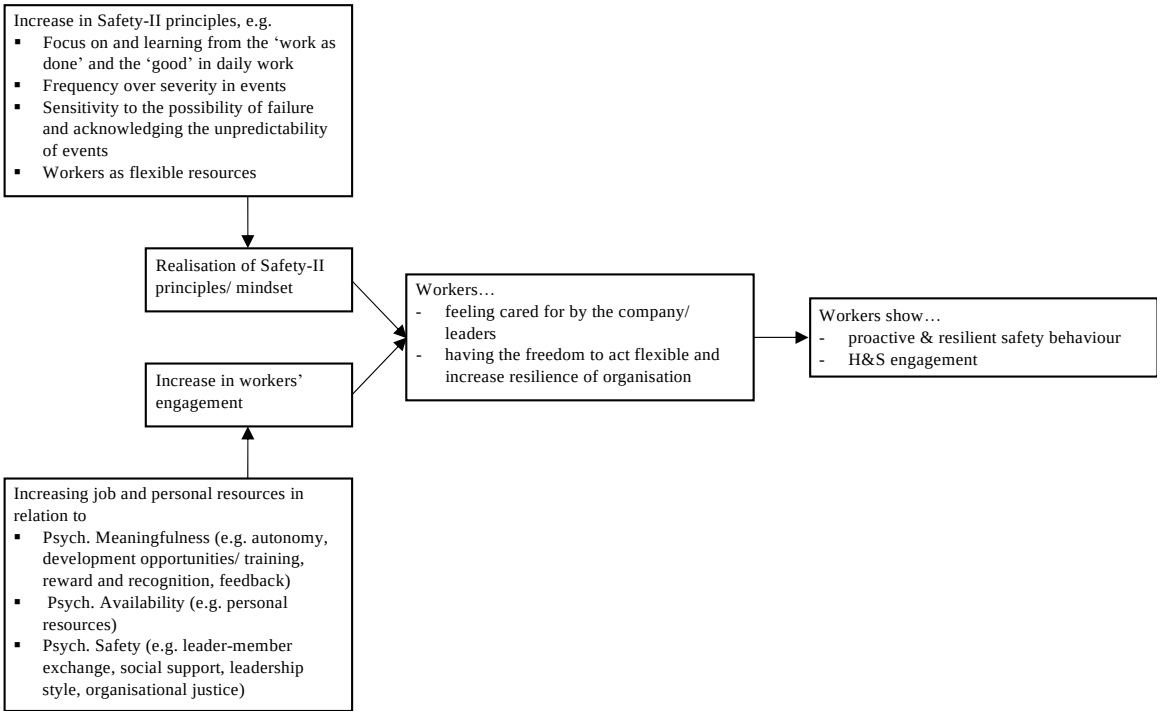


Figure 7: Theoretical Assumption Based on Literature Review

The presented review displayed the current developments in safety approaches towards focusing on the human factors and how the concept of WE can support safety performance in the workplace. Indeed, there seems to be no agreement found yet in what direction WE and safety performance and climate affect each other as evidence was demonstrated in both directions. Thus, there appears to be a gap in the academic research investigating WE in the context of OSH within a PL/MF worker sample.

Further, the ambiguity of definitions and influencing factors has been demonstrated by this literature review. Yet, there seem to be a general agreement that WE

(1) can be seen as a fluid psychological state characterised by vigour, dedication, and absorption in work which might result in behavioural outcomes, and
(2) is related to factors impacting an individual's psychological meaningfulness, safety and availability with respect to their work.

While the presented limitations do not hamper the potential that WE positively impacting safety performance and climate, it highlights to practitioners the importance of understanding the specific context-relevant circumstances that impact WE within their populations in order to attempt an increase in WE levels.

Chapter 3 - Engagement in the Context of Production-Line Workers: A Narrative Literature Review

3.1 Introduction

Chapter 2 of this thesis provided an overview of the literature relating to engagement in general and only touched on the empirical evidence relating to WE in PL/MF workers. To develop effective and successful interventions it is recommended to make sure that the current evidence base is analysed and understood (Craig *et al.*, 2008, 2019). Several literature reviews and meta-analyses have evaluated the current empirical base of engagement literature showing a growing body of research on the definitions, antecedents, outcomes and interventions in relation to WE (Attridge, 2009; Crawford *et al.*, 2010; Shuck and Wollard, 2010; Christian *et al.*, 2011; Kim, Kolb and Kim, 2013; Bailey *et al.*, 2017, 2019; Bakker and Demerouti, 2017). These reviews and meta-analyses usually focused on the whole body of WE literature with differing populations, yet it was acknowledged that there are differences in the factors related to WE in different populations and work types, e.g. white-collar workers vs PL workers (Schaufeli, Bakker and Salanova, 2006). Hence, to understand and evaluate the empirical evidence with respect to WE relevant to this research project, the focus should be set on PL workers.

To this date, no literature review has been conducted that focuses on the identification, evaluation and comparison of research on manual workers in a factory environment in relation to WE. To overcome this knowledge gap, a systematic search and synthesis of literature and narrative review and analysis was conducted, i.e. a narrative literature review, and is presented in this chapter.

The review aims to

- identify peer-reviewed literature that focuses on WE and is set in a MF environment focusing on PL/MF workers, and

- synthesise the literature to identify the current state of knowledge in this area.

3.2 Study Design

A systematic literature search was conducted between November 14 to November 21, 2018, and again between December 01 – December 08, 2020, using Scopus, Ovid (incl. Embase and PsychInfo), ProQuest (dissertations and theses within the UK and Ireland) and World of Science.

The search was designed to identify all abstracts and titles that include the word 'engagement' (string 1), and anything related to PL/ MF workers (string 2). While the focus was initially planned to be only on automotive PL/ MF workers to stay close to the BEP workers, first pre-searches showed that these produced almost no publications. Hence, the focus was broadened to PL/ MF workers in general, with no specific industry focus. Therefore, to reduce the chance of missing publications, wide terms, such as "blue collar" "factory", "manufac*" and "production" were used, however, relics from the initial search like "car" and "automotive" were still included.

Further, as there is no agreement on the definition of engagement - it is often used as a synonym for 'involvement' or other terms - and to reduce the risk of missing any relevant publications, the researcher used the names of the most published engagement authors that appeared in the list of references (string 3). Hence, for the primary search the following search terms were used:

- String 1: engagement
- String 2: AND factory OR manufac* OR production OR "shop floor" OR "blue-collar" OR automotive OR car OR assembly
- String 3: AND schaufeli OR harter OR saks OR kahn OR maslach OR macey

As each search engine works slightly differently, the search strategy, including search terms and Boolean operators, were adapted accordingly.

For practical reasons as well as to further define the search, publications were included when they satisfied the following criteria:

- Search dates: Publication between 1990 and the date of the search - As the term engagement was first mentioned by Kahn in 1990, this was chosen as the logical start date.
- Language: English and German - As the researcher is fluent in both languages, research in both languages could be considered. Publications in other languages were excluded.
- Accessibility: Online accessibility - Publications had to be accessible for the researcher online. If there was no access initially, an interlibrary loan was requested, if this was not available the respective researchers were contacted once. If there was no reply within 10 days, the publication was excluded.
- Type of study: Peer-reviewed – It was assumed from an academic point, that peer-reviewed publications ensure a certain scientific quality. Only empirical studies were included with no limitation to the sample size.

This first search revealed 537 publications. After removal of ninety-nine duplicates, 438 publications remained and were then searched by title and abstract for the following inclusion/exclusion criteria:

- Topic of the study: The research is focused on WE or a related concept (i.e. employee engagement) in an organisational context. Hence, articles about, for example, learning engagement of pupils or customer engagement with brands were excluded.
- Sample of research: The research must be primarily in a PL/ MF context. For example, research that was focused solely on a university population or hospital staff was excluded. If PL/ MF staff was mixed with other populations, these publications were further investigated for their focus on PL/MF workers.

This led to an exclusion of 316 publications, leaving 122 publications for detailed review of the whole content in order to determine if PL/MF workers were explicitly included in the

research. Due to the limited number of papers focusing solely on BC[4] workers, papers that clearly involved PL/MF workers with other varying employee types were included. Papers that either had no PL/MF workers or where it was not clear what kind of employees the sample consisted of or how many were PL/MF exactly were further excluded. After detailed evaluation thirty-one papers were deemed relevant. An overview of the screening process can be found in the PRISMA flowchart (Figure 8).

The thirty-one papers identified were then analysed and data was extracted and collated according to the following details:

- Author(s) and date,
- Sample size and characteristics
- Country
- Industry details
- PL/MF: partly vs. solely
- Measurement tool for engagement
- Intervention description (if an intervention was presented)
- Study method
- Comparison
- Outcome/Results

The summary of the included publications can be found in Table 10.

Due to the mixed nature of publications with regards to their research design as well as to satisfy the aim to explore the body of existing research and their findings, a narrative synthesis of the identified publications was conducted.

[4] Within this study, the term ‘blue-collar workers’ is being used synonymously with production-line/MF/assembly workers

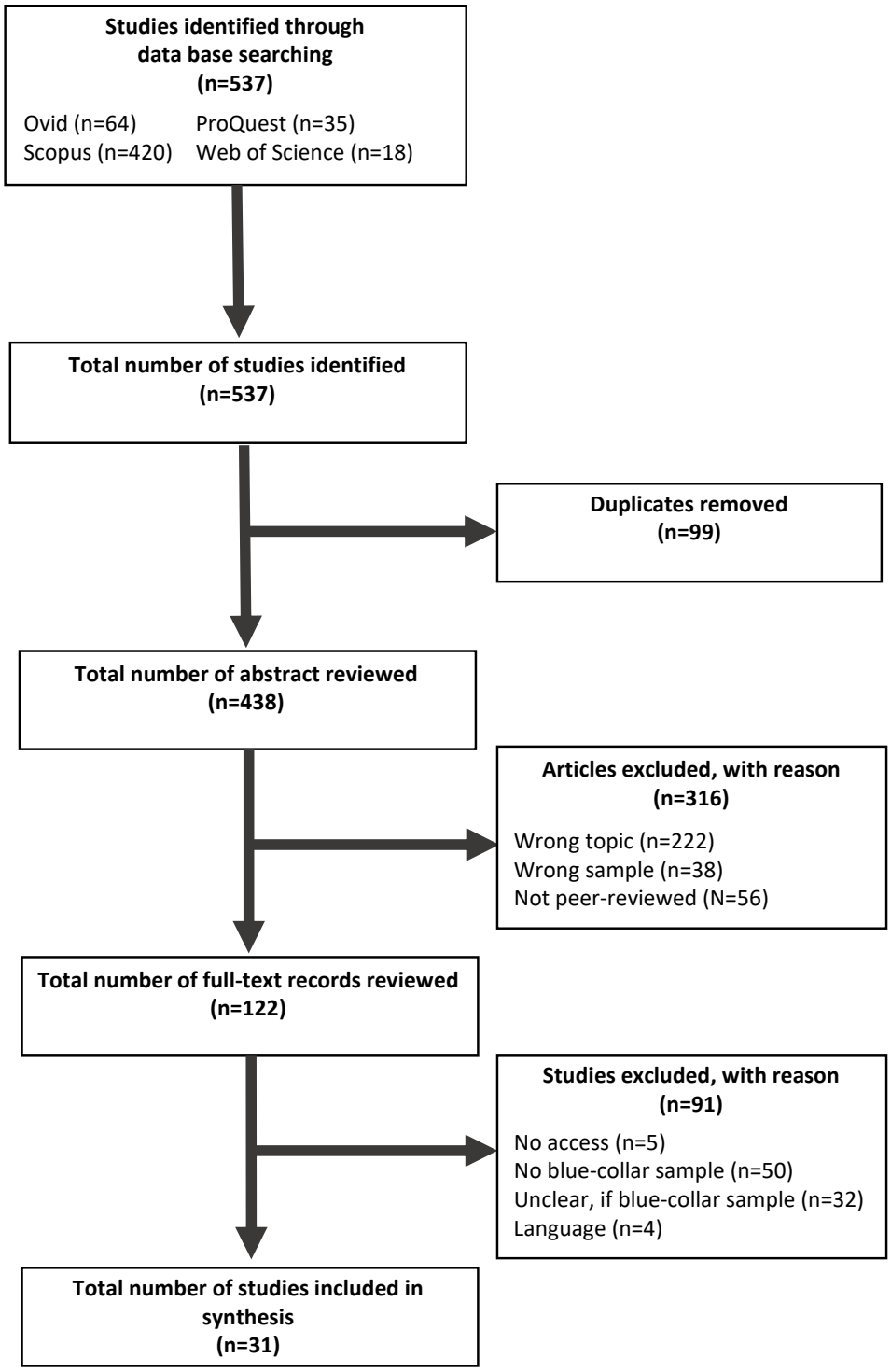


Figure 8: PRISMA Flow Diagram Displaying the Results of the Systematic Literature Screening Process (incl. Record Exclusion Reasons)

Table 10: Summary of Included Publications From Literature Review 'Engagement in the Context of PL/MF Workers'

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
1	Korunka et al. (2009); Austria; manufacturing and service industry	846 employees (674 white-collar, 162 BC)	p	UWES-9		Questionnaires; Structural Equation Modelling, Multi-Group Analysis	Between variables (i.e. quantitative workload, qualitative workload, co-workers support, supervisory support, decision latitude, exhaustion, cynicism, vigour, dedication, absorption, gastro-intestinal complaints, musculoskeletal complaints, cardiovascular complaints, turnover intention) and across gender (i.e. male vs. female) and across age-groups (i.e. 15–29 years vs. 30–44 years vs. 45+ years) and across job type (i.e. white-collar vs. BC)	Non-standardized model coefficients had shown WE in BC being strongly associated with - Job Resources - Turnover intention In the mixed sample, intercorrelations (Cronbach's alpha > 0.7) between the three variables of WE (i.e. vigour, dedication, absorption) were correlated with: - demands (i.e. qual. & quant. workload) (neg.) - support (i.e. supervisor & co-worker) (pos.) - health complaints (neg.)
2	Tsuno et al. (2009); Japan; manufacturing	247 employees (187 male and 60 females; 18 managers, 53 white-collar, 176 BC)	p	UWES-9		Questionnaire; Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), post-hoc Bonferroni corrections for multiple comparisons	Between groups (i.e. male vs. female) and variables (i.e. interpersonal conflict (intragroup conflict, intergroup conflict), worksite social support (supervisor support, co-workers support, total	Intergroup conflict negatively associated with WE. The negative relationship between intergroup conflict and WE as well as psychological distress was

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
							worksite social support), outcome variables (psychological distress, WE))	mediated by worksite social support in females, but not males. No direct association or relationship between intragroup conflict and WE when mediated by total support but for co-worker support.
3	Inoue et al. (2010); Japan; manufacturing	243 workers (18 managers, 52 white-collar, 138 BC)	p	UWES-9		Questionnaire; Multiple Mediation Analyses	Between variables (i.e. organizational justice (procedural justice, interactional justice), proposed mediator (job demands, job control, job demands/control ratio, co-worker support, supervisor support, effort, reward, effort/reward ratio), outcome (psychological distress, WE))	Procedural justice was positively associated with WE within the bivariate analysis, however within the mediation analysis they were not significant unless mediated by worksite support. The same goes for interactional justice. No mediating effect was found for reward or effort-reward imbalance on the relationship between organisational justice and WE.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
4	Cifre, Salanova & Rodríguez-Sánchez (2011); Spain; manufacturing (enamel)	Time 1 with 108 employees and Time 2 with 72 employees.	p	UWES (item 5 & 6)	Action Research approach for work stress leading to a job re-design intervention: five phases (Robbins, 2005): (1) diagnosis, (2) data analysis, (3) feedback survey, (4) intervention, and (5) post-intervention assessment.	Questionnaire, interviews, action research, non-randomised control trial; Repeated-measures Multivariable Analysis of Variance (MANOVA)	Between groups (control vs. intervention) and time (baseline vs. psychosocial factors assessment 9 months after the pre-intervention assessment and 6 months after a 2-week intervention phase) and between variables (i.e. job resources (i.e. innovation climate), personal resources (i.e. professional self-efficacy and perceived competence), motivational outcomes (i.e. WE, vigour, and dedication))	Employees showed significantly higher positive scores after the intervention in job resources (i.e. innovation climate), personal resources (i.e. professional self-efficacy and perceived competence) and motivational outcomes (i.e. WE: vigour and dedication) with small-medium effect sizes.
5	Hu et al. (2011); China; manufacturing (mechanic), health sector	625 BC workers of three mechanic factories and 761 health professionals	p	UWES-9		Questionnaire; Multi-group Structural Equation Modelling Analyses	Between variables (i.e. organisational commitment, turnover intention, WE, burnout, (exhaustion, cynicism), job demands (workload, emotional demands, physical effort, interpersonal conflict), job resources (job control, colleague support, supervisory coaching,	WE acted as a partial mediator between job resources and job demands with a negative relationship with turnover intention and a positive relationship with commitment. This was true for BC workers as well as health professionals.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
							learning opportunities, task clarity) and groups (BC vs. health professionals)	
6	Kmiec (2011); USA; manufacturing	32 production business and 31 maintenance workers	p	UWES	90-day blended-learning program based on five skills outlined by Flagello and Dugas (2009) (i.e. goal-setting, self-coaching, individual practice, reflection, sharing and self-assessment).	Questionnaire, non-randomised control group, quasi-experimental research; Mixed Design ANOVA, Levene's Test for Equality of Variance, independent Sample t-Tests, Wilks' Lambda Multivariate Test	Between and within groups (i.e. control vs. intervention) and times (i.e. one week before intervention, 45-days into the intervention, 90-days after the intervention began)	Significant increase of dedication and WE (large effect size) for workers of managers who were in the intervention group.
7	de Waal & Pienaar (2013); South Africa; manufacturing (chemical)	163 employees (8.59% Middle managers, 33.13% Supervisors, 43.56% Skilled workers, 14.11% Semi-skilled workers)	p	UWES		Longitudinal study with a cross-lagged panel design; 2-lagged questionnaire (7-21 months later); Confirmatory Factor Analysis, with a Bayesian estimator (Bayesian information criterion).	Between variables (i.e. PsyCap (hope, optimism, self-efficacy and resilience), WE)	There was a positive relationship between WE and PsyCap (hope, optimism, self-efficacy and resilience) at both time points, however WE T1 did not predict WE T2. WE did predict PsyCap (medium effect size), but not vice versa.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
9	Johari et al. (2013); Malaysia; manufacturing	306 operational level employees (i.e. production operator, trainer, assistant team leader, and team leader) from 5 companies	f	Emotional engagement to their job, colleagues and organization (Scarlett 2009)		Questionnaire; Multiple Regression Analysis	Between variables (i.e. training and development, financial recognition, non-financial recognition, fringe benefits, supervisor-subordinate relationship, EE)	Financial and non-financial recognition as well as fringe benefits predicted WE, while non-financial recognition was strongest predictor. Training and development as well as LMX were non-significant.
10	Wang & Hsieh (2013); Taiwan; manufacturing and service industry	386 employees (64.5% were general employees, 25.1% primary supervisors, and 10.4% operators; 42.7% worked in the sales sector, 36.3% in the administrative management sector, 12.7% in the PL sector, and 8.3% worked in the R&D sector)	p	UWES		Questionnaire; Hierarchical Multiple Regression	Between variables (i.e. authentic leadership, employee trust, WE) and demographics (i.e. gender, age, education level, job tenure, position level, and job type, marital status, company type)	Authentic leadership and trust correlated with WE (large effect size). Authentic leadership influenced trust. There was a positive relationship between supervisors' consistency between words and actions as well as moral perception on WE. Supervisors' consistency between words and actions was associated with trust.
								showed that there is a positive relationship between job resources and WE and negatively in burnout.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
11	Wickramasinghe & Perera (2014); Sri Lanka; manufacturing (incl. cable, gasket and solid tyre, radial tyre, polythene bags, electric accessories, school accessories, and floor tile manufacturing industries)	255 shop-floor employees of 12 firms	f	not stated		Questionnaire; Structural Equation Modelling	Between variables (i.e. organisation support, EE, organisation citizenship behaviour, quality performance)	EE showed a positive relationship with organisational citizenship behaviour towards the individual, but not towards the organisation. The indirect relationship between EE and quality performance (i.e. manufacturing performance and first-time pass rate) was partially mediated by citizenship behaviour towards the individual and organisation.
12	Chambel et al. (2016); Portugal; manufacturing (electronic) & call centre	sample 1: 1227 workers sample 2: 633 workers of two companies	p	UWES-9		Questionnaire; Structural Equation Modelling, Multiple Group Analysis, Confirmatory Factor Analysis	Between groups (i.e. flex/temporary workers vs. permanent workers) and sectors (i.e. call centre vs. manufacturing) and variables (i.e. HR practices, affective commitment, WE).	HR practice was found positively related to WE and affective commitment. WE was found positively related to affective commitment WE mediated between HR practice and affective commitment. The moderated effect was stronger in BC than call centre workers.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
13	Lo Presti et al. (2016); Italy; manufacturing (food processing)	study 1: 447 employees (370 (82.8%) men and 77 women (17.2%), the vast majority of the participants (n = 395, 88.4%) worked in BC occupations) study 2: 20 BC workers (10 male and 10 women)	p	study 1: UWES-9		study 1: Questionnaire; Hierarchical Linear Regression Analysis study 2: Anthropo-logical semi-structured interviews; Thematic Analysis	Study 1: between variables (i.e. family workload, emotional and instrumental family social support, extra household social support, family to work enrichment (i.e. impact of family on work), life satisfaction, WE, demographics (sex, age, number of children, family/job involvement))	Emotional family support, instrumental family support, extra household support, and family to work enrichment was found positively linked to WE and life satisfaction. Family to work enrichment was found to be a mediator for the relationship between emotional support and WE.
14	Mathisen & Bergh (2016); Norway; oil production	653 workers from two oil rigs (296 were company employees and 357 were contractors, while 120 of the sample were managers)	p	UWES		Questionnaire; Multiple Regression Analysis	Between variables (i.e. health complaints, emotional exhaustion, WE, action errors, violations) and groups (i.e. rig 1 vs. rig 2)	WE and emotional exhaustion were found related to fewer reports of action errors and violations.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
15	Shantz et al. (2016); UK; manufacturing (plastic)	175 employees from different occupations, i.e. senior managers (5.3%), administrative and support (5.6%), managers (15%), skilled trades (13.5%), machine operators (56%) and elementary occupations, such as janitors (1.1%).	p	UWES-9		2-wave questionnaire (1 year); Hierarchical Moderated Regression Analyses	Between years (i.e. baseline vs. 1 year later) and variables (i.e. deviant behaviour, turnover, organisational support, WE).	A negative relationship between WE and turnover intentions, and deviant behaviour was found. The link between WE and turnover and deviant behaviour were both mediated by organisational support.
16	Cullinane et al. (2017); European; manufacturing (pharmaceutical)	64 employees	p	UWES-9 & 4 items from UWES	implementation of lean management	Daily-wave (diary) questionnaire (general survey on the first day of their shift/week and a daily survey at the end of each 12-h shift or day of work over 4 working days); Structural Equation Modelling with the Analysis of Hierarchical Data	Between times and between variables (i.e. general questionnaire (WE, task independence, boundary control) and daily questionnaire (daily WE, daily skill utilisation, daily job crafting)	The relationship between daily job crafting and WE was found mediated by day-level seeking challenge and day-level seeking resources. Job crafting's influence on WE was associated with the opportunities that were presented to workers on a daily basis to seek resources and challenges.
17	Sakuraya et al. (2017); Japan; manufacturing	894 employees of a manufacturing company in Japan	p	UWES-9		Questionnaire; Hierarchical Multiple Regression	Between variables (i.e. structural job resources, social job resources, challenging job demands,	Structural job resources, social job resources and challenging job demands were positively related to

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
		(77% non-managers)					hindering job demands, WE, psychological distress)	WE. Hindering job demands was also positively associated with WE.
18	Guan & Frenkel (2018); China; manufacturing	455 employees working in five firms (mainly manufacturing manual workers and their supervisors)	p	UWES-9		2-wave questionnaire (two weeks); Confirmatory Factor Analysis	Between groups (i.e. supervisors vs. workers) and between variables (i.e. HR practice, job crafting, task performance, organisation citizenship behaviour, WE)	HR practices were positively related to WE. No significant correlation between WE and task performance or organisational citizenship behaviour. Significant positive relationship between WE and job crafting. The relationship between HR practice and task performance and HR practice and organisational citizenship behaviour sequential mediated by WE and job crafting.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
19	Coomer & Houdmont (2019); UK; manufacturing (incl. food, electrics, aeronautics)	311 workers from 4 organisations	f	UWES-9		Questionnaire; Hierarchical Linear Regression Analyses, Linear Multiple Regression	Between variables (i.e. work ability, core self-evaluations, psychological distress, WE)	Work ability was positively associated with WE. Core self-evaluations were moderately positively related with WE and strongly negatively linked to psychological distress.
20	Guan & Frenkel (2019); China; manufacturing (garment)	348 workers (mainly manual employees (89.1 percent))	p	UWES-9		2-wave questionnaire (one month); Confirmatory Factor Analysis	Between variables (i.e. Non-training HR practices, Training, WE, HRM system strength (HRMS), organisational citizenship behaviour, task performance)	Training was positively related to WE. WE was positively associated with task performance. WE was not positively associated with OBC. WE mediated between training and task performance but not OCB. The relationship was moderated by HRM strength.
21	Huang et al. (2019); Taiwan; manufacturing (high-tech)	60 front-line employees	f	7-item measure developed by Young (2011)		Daily-basis questionnaire (within person for 10 days); Confirmatory Factor Analysis, Hierarchical Linear Modelling	Between variables (i.e. abusive supervision, WE, organisational citizenship behaviour and voice)	Abusive supervision negatively related to WE. Daily WE was found to have a positive relationship with voice and extra-role behaviours.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
								The relationship between abusive behaviour and both, voice and citizenship behaviour was mediated by daily WE.
22	Santhanam & Srinivas (2019); India; manufacturing	1,197 BC employees working at three facilities	f	Saks' (2006) 12 items		Questionnaire; one-way ANOVA, Confirmatory Factor Analysis	Between variables (i.e. WE, happiness, turnover intention, burnout) and gender (i.e. male vs. female)	WE showed a negative relationship with burnout and turnover intention, but a positive one with happiness. The relationship between WE and turnover as well as with burnout was significantly moderated by happiness (though small path coefficient).
23	Węziak-Białowolska (2019); Mexico; manufacturing	2278 workers of 3 factories (50.1% of respondents were operators, 11.0% were supervisors, 8.4% were quality auditors, and 7.4% were assistants)	p	UWES		Questionnaire; Path Analysis, Confirmatory Factor Analysis	Between variables (i.e. work performance outcomes (i.e. job satisfaction, self-assessment performance at work, WE), worker wellbeing (i.e. human flourishing measure), work-related factors (i.e. job demands), job resources (i.e. physical job resources, organisational job resources, social or job resources, mental resources), work family balance)	No relationship was found between WE and wellbeing. WE was positively related to trust, respect and recognition as well as decision authority/job autonomy. Social support (positive), job demand (negative) work-family conflict (negative) and living conditions (positive) had a relationship with wellbeing moderated by WE.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
24	Yang et al. (2018); China; manufacturing	6921 workers (58.7% frontline employees, 26.9% line managers, 11.6% middle managers and 2.7% senior managers or executives) of 264 manufacturing firms	p	6-item scale from the voice project at Macquarie University (Langford, 2010)		Questionnaire; Moderated Hierarchical Regression Analysis	Between variables (i.e. high-performance work system, trade union, WE, industrial relations climate, employee characteristics (age, gender, education level, years of tenure, working position, and employment status), company characteristics (size of company))	High-performance work systems and industrial relations climate was found positively related to WE. Union members showed a negative relationship to WE. Older and better educated employees showed higher levels of WE, but contract type did not make a significant difference.
25	Farooq & Salam (2020); Pakistan; manufacturing (garment)	320 staff members (non-managerial)	p	11-item measurement instrument borrowed from Rich et al. (2010, p. 634).		Questionnaire; Structural Equation Modelling, Importance-performance Map Analysis, Partial Least Square	Between variables (cleaner production practices, service quality, corporate social responsibility, organisational pride, organisational identification, desire to have a significant impact through work, EE)	WE was found strongly related to cleaner production practices, service quality, corporate social responsibility and led to a desire to have a significant impact through work.
26	Govender & Bussin (2020); South Africa; manufacturing	20 employees (9 shop floor worker, 2 office personnel, 4 first-line manager, 5 director and site leadership)	p	thematic analysis		Interviews; Thematic Analysis	Between groups and questions	Lack of meaningful feedback and communication between workers and managers impacted engagement and therefore, performance. It was important to the workers in order to feel

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
								engaged, to feel informed properly and engage in two-way communication. Workers considered EE to be having a voice and sharing the same values as the organisation.
27	Huo et al. (2020); China; manufacturing (FMCG)	357 front-line workers	f	UWES-9		Questionnaire; Structural Equation Modelling	Between variables (i.e. Production pace, role overload, distributive justice, line manager support, intrinsic motivation, WE, physical health, job satisfaction)	Line manager's support's effect on WE was mediated by intrinsic motivation and distributional justice.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
28	Molino et al. (2020); Italy; manufacturing	598 workers of two sites (white-collar = 220, BC = 378)	p	8 items of the Oldenburg Burnout Inventory (Demerouti et al. 2010)		Questionnaire; Multi-Group Structural Equation Modelling	Between variables (i.e. WE, technology acceptance, resilience, opportunities for information and training, goal orientation) and groups (BC vs. white-collar).	There was a positive relationship between WE and each, technology acceptance, resilience, goal orientation and opportunities for information and training for both groups. The relationship between opportunities for information and training and WE was found to be higher for BC workers. Technology acceptance acted as a mediator between resilience and WE (fully) and opportunities for information and training and WE (partially) for both groups. There was no difference in WE level between the samples.
29	Peláez et al. (2019); Spain; manufacturing (automotive)	56 employees with technical or engineering positions with non-supervisory	p	UWES-9	Strengths-based and RE-GROW micro coaching program over a period of five weeks.	Questionnaire & open questions inquiring, non-randomised controlled trial; repeated-measures ANOVA, Paired-	Between times (i.e. before starting the programme, after finishing the program for the intervention group, after finishing the program for	After the intervention, the intervention group showed increased levels of WE (small effect size) and Job performance (intermediate effect size).

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
		or executive responsibilities				Sample t-Tests, Thematic Analysis for qualitative data	the control group, and four months after finishing the program each group) and groups (control vs. intervention) and between variables (i.e. WE, job performance evaluated by supervisors)	
30	Rahmadani et al. (2020); Indonesia; manufacturing (agricultural; mainly produces crude palm oil and other agricultural products)	224 BC workers, nested in 54 teams	f	UWES-9 teamWE: 9 item version of the TeamWE Scale (Costa et al., 2014)		Questionnaire, multi-level longitudinal study; Multi-Level Confirmatory Factor Analysis, Random Coefficient Analyses, Multi-Level Analysis	Between levels (i.e. group or individual) and variables (i.e. WE, engaging leadership, performance, learning, and innovation) and time (baseline vs. 1 year later)	At team level, engaging leadership at T1 was associated with team learning and team innovation (but not team performance) at T2, mediated by team WE at T2. At team level, engaging leadership at T1 was associated with individual job performance (but not employee learning and innovative work behaviour) at T2, mediated by team WE at T2. At team level, engaging leadership at T1 was associated with individual job performance, employee learning, and innovative work behaviour at T2, mediated by WE at T2.

#	Author(s) & Date; Country; Industry	Sample size & characteristics	BC	Measurement tool for WE	Intervention description	Study method/analysis	Comparison	Outcome/Results
31	Zondo (2020); South Africa; manufacturing (automotive)	BC workers (Plant management 4.7%, Support administration staff 9.2%, Team leaders 7.1%, Line functional employees 79.0%)	f	based on behaviour	employee engagement strategy (not defined how exactly)	Data from observations before and after EE was introduced (2 years after); normality test by Kolmogorov–Smirnov and Shapiro–Wilk; Ordinary Least Squares Model; t-Test; Factorial Analysis of Variance, Assumptions of Normality; Bartlett's Test for Homogeneity of Variances; Levene's Test of Equality	Between variables (i.e. absenteeism, labour productivity, rate of employee participation in quality circles)	No relationship was found between WE and labour productivity.

Note: The following key applies:

p = partly; f = fully

3.3 Results

The literature review encompassed a narrative analysis and synthesis of publications that met the inclusion criteria describing research that examined engagement in a BC working environment. Thirty-one publications were identified having BC workers in their sample.

Out of 117 peer reviewed publications focusing on engagement in a MF or blue-colour context, e.g. construction, fifty publications had only white-collar workers, mainly executives and managers, as their sample, and thirty-two publications did not clearly outline if BC workers were involved. From the thirty-one identified papers clearly studying BC workers, only eight were solely focusing on BC workers and twenty-three had a mixed sample with BC workers involved. This illustrates the lack of designated research on this particular sample.

The studies identified were conducted in eighteen different countries across five continents (though one country was not specified and was only described as 'Europe'), highlighting the global interest in the topic. Most studies were conducted in Asia (n=16) and Europe (n=10).

From a research design perspective, most studies used a simple cross-sectional design (n=27), while only four used a more complex design (i.e. two longitudinal study, two diary studies). In terms of research method approach, most studies utilised questionnaires (n=29), one used data from a prior observational study and one solely relied on interviews. The UWES was the preferred measurement tool, with twenty-two studies using some form of it to measure WE. Moreover, only four papers used qualitative methods (i.e. interviews or open questions), from which only one was solely a qualitative study and the other three were mixed-method designs.

3.3.1 Antecedents

Twenty-seven studies looked at the antecedents of WE. Adopting the headings proposed by Bailey et al. (2017), the identified studies are further synthesised.

Individual Psychological States

Seven studies explored the influence of individual psychological states on WE. Most studies focused on the workers' personal perceptions of the abilities that they bring into work, such as resilience, self-efficacy or personal strengths and competences.

Coomer and Houdmont (2019) demonstrated in a small sample of 311 MF workers from different departments that the perceived ability to work was positively associated with WE, and regression analysis revealed that changes in WE levels could mostly be explained through work ability and core self-evaluation, a psychological concept encompassing self-esteem, locus of control, self-efficacy and emotional stability traits. Similarly, WE was also found to have increased after introducing an intervention improving workers' personal strengths through coaching (Peláez, Coo and Salanova, 2019). Another study evidenced a similar effect after implementing an intervention concerning job re-design, a stronger advertisement of training opportunities and through strengthening self-efficacy and perceived competence levels (Cifre, Salanova and Rodríguez, 2011). In addition, a study using eight items of the Oldenburg Burnout Inventory (Demerouti, Mostert and Bakker, 2010) and applying a Multi-Group Structural Equation Modelling on 598 workers of which 378 were BC workers identified that higher resilience and goal orientation were positively related to workers (Molino, Cortese and Ghislieri, 2020) emphasising the importance of personal resources influencing WE levels.

Emotions and affective states were found to mediate WE in manual workers. Happiness was associated with impact WE and mediate the relationship between WE and turnover intention and burnout (Santhanam and Srinivas, 2019), while emotional exhaustion was negatively associated with WE (Mathisen and Bergh, 2016). Furthermore, intrinsic motivation was found to be a mediator for the relationship between line manager support and WE (Huo, Boxall and Cheung, 2020).

Consequently, the body of research included in this review provided evidence of the importance of personal individual resources on WE in PL workers.

Individual Perceptions of Organizational and Team Factors

There were thirteen studies identified that explored the relationship between factors that were related to the organisational setup or to the co-worker relationship and WE.

Four studies explored the impact of the HR or work system on WE. Two studies found that HR systems were associated with WE (Chambel, Castanheira and Sobral, 2014; Guan and Frenkel, 2018). Chambel et al. (2014) found that permanent workers showed a stronger association between HR practices and WE than flex/temp workers, which they presumed was due to temporary workers often receiving fewer benefits through HR systems. One study gave evidence that cleaner production practices, corporate social responsibility and service quality in an organisation was related to higher levels of WE (Farooq and Salam, 2020). Closely related, high-performance work systems that were associated with higher investment in employees, and industrial relations climate were identified to be positively related to WE in 6,921 Chinese MF workers of which 58.7% were frontline workers (Yang *et al.*, 2018). With respect to investing in employees, in a cross-sectional study of 306 Malaysian operational level employees, financial and non-financial recognition, as well as fringe benefits, were found to be positively related to employee engagement, while non-financial recognition was the strongest predictor for WE, while no significant impact could be found on WE through training and development (Johari *et al.*, 2013). Contrastingly, no mediating effect was found for reward or effort-reward imbalance on the relationship between organisational justice and WE (Inoue *et al.*, 2010), but it was found for the effect of development opportunities on WE (Hu, Schaufeli and Taris, 2013), both potentially through a greater perception of OCB or personal gain from work. Furthermore, distributional and interactional justice were associated with engaged workers (Inoue *et al.*, 2010; Huo, Boxall and Cheung, 2020).

Moreover, three studies found the importance of two-way communication to be relevant for MF workers. On the one hand, research found that in order to be engaged, workers need to feel well-informed and communicated to (Govender and Bussin, 2020; Molino, Cortese and Ghislieri, 2020), while on the other hand, workers need to have the opportunity to voice their concerns (Govender and Bussin, 2020). Being a union member, by role provided with a voice, was found to be negatively correlated with WE when analysing bivariate correlation,

but in the moderated Hierarchical Regression Analysis, union membership showed a negligible effect on engagement, while also a positive and significant interactive effect of high-performance work systems and union membership on WE (Yang *et al.*, 2018). Furthermore, the existence of a union body was found to moderate the otherwise insignificant relationship between high-performance work systems (i.e. where organisations invest in their employees and their well-being) and engagement in 6,921 workers of which 58.7% of respondents were frontline employees (Yang *et al.*, 2018), highlighting the importance of workers' opportunity to raise their voice.

From a social interaction perspective, the relationship between workers and co-workers was found to influence WE levels in five studies. Industrial relationships were shown to be positively related to WE (Yang *et al.*, 2018). Supporting, intergroup conflict, however not intragroup conflict, was identified to be negatively linked to WE, and found to be further mediated by worksite support in females, but not in males (Tsuno *et al.*, 2009). Remarkably, they discovered that females showing high intergroup conflict were also higher in WE levels, possible due to increased self-esteem through positive differentiation in their own group (Tsuno *et al.*, 2009). The mediating effect of workplace support was further revealed in two more studies (Inoue *et al.*, 2010; Shantz, Alfes and Latham, 2016) as well as found to be positively related to wellbeing moderated by WE (Węziak-Białowolska, Białowolski and McNeely, 2019).

The findings of these thirteen studies evidence the importance of social and organisational factors on workers' WE level.

Experienced Job-Design-Related Factors

Seven studies were found to discuss antecedents that are related to the design of the work.

Three of the identified studies showed job crafting to be positively related to WE (Cullinane *et al.*, 2017; Guan and Frenkel, 2018; Węziak-Białowolska, Białowolski and McNeely, 2019). A diary study conducted on 64 European MF workers revealed that the relationship between daily job crafting and WE is mediated by the day-level of seeking challenge and resources (Cullinane *et al.*, 2017). Hence, job crafting's influence on WE may be impacted by the opportunities that are presented to workers on a daily basis to seek resources and challenges and may show an impact on WE due to the increase in perceived self-efficacy.

Five studies explored and confirmed the positive relationship between job resources and WE and respectively the negative effect of job demands on WE. Structural job resources, social job resources and challenging job demands were positively associated with WE, while hindering job demands was also negatively linked to WE (Sakuraya *et al.*, 2017), specifically job control and task clarity (Hu, Schaufeli and Taris, 2013), decision latitude/authority and autonomy (Korunka *et al.*, 2009; Węziak-Białowolska, Białowolski and McNeely, 2019). In addition, WE worked as a partial mediator between job resources and commitment and respectively, job demands and turnover intention (Hu, Schaufeli and Taris, 2011). The finding by Hu et al. (2011) within their cross-sectional study on 2,006 Chinese workers of which 625 were manual workers confirmed the additional effect of the JD-R model, yet confirmation of their interaction effect was found to be neither robust nor strong which might be due to the mixed sample of manual workers and nurses who have different domain-oriented demands.

In summary, enhancing job resources and limiting job demands through BC workers' work flexibility, e.g. through job crafting or increased autonomy measures, seems to be strongly linked to increased WE levels.

Perceived Leadership and Management

Six studies explored antecedents related to the manager-worker relationship and the management style.

Wang and Hsieh (2013) conducted a Hierarchical Multiple Regression on data of 386 Taiwan MF and service workers of which 12.7% worked on the PL and their findings proposed that authentic leadership and trust were related to WE and that the relationship between authentic leadership and WE is further mediated by trust. Furthermore, they found that supervisors' consistency between words and actions was associated with trust and that this can be further extended to WE (Wang and Hsieh, 2013). While Wang's and Hsieh's (2013) findings were from data only consisting of approximately 13% line workers, the importance of trust on WE was further supported by Węziak-Białowolska (2019) who's sample consisted of more than 1,100 MF operators. In support, a ten-day diary study of 60 Taiwanese MF frontline workers showed that abusive supervisor behaviour was negatively related to WE (Huang *et al.*, 2019). However, one study could not confirm a significant relationship between the

leader member relationship and WE in research using a mere operational level sample (Johari *et al.*, 2013), which might be due to a limited need for good relationships due to the directive nature of BC jobs.

The findings of a multi-level longitudinal study in 224 Indonesian BC workers showed that at team level, perceived engaging leadership (i.e. a leadership style that fosters WE through fulfilment of workers needs for autonomy, competence and relatedness) is associated with team learning and innovation (but not performance), mediated by team WE (Rahmadani *et al.*, 2020), thus leaders who want to promote team learning and innovation should increase team WE through e.g. increased perception of peer-support. Similarly, at team level, engaging leadership at time one is associated with individual job performance (however not employee learning and innovative work behaviour) at time two, mediated by team-WE at time two (Rahmadani *et al.*, 2020). This difference between team and individual perceptions might be influenced by the strongly collectivist view in Indonesian culture. Supporting, Govender and Bussin (2020) found in their qualitative interview study with 20 employees of which 9 were shop floor workers that a lack of meaningful feedback and communication between workers and managers impacts engagement most strongly.

While some findings were mixed, the overall research has demonstrated the relationship between leaders and workers and an empowering, 'engaging' leadership style to be key for PL workers' WE level. This might be due to the impact of leadership style on fulfilment of needs as in fostering or hindering reception of personal resources or job resources.

Non-Work-Related Antecedents

Two publications found that social support from outside work, i.e. family support, impacts WE (Lo Presti, D'Aloisio and Pluviano, 2016; Węziak-Białowolska, Białowolski and McNeely, 2019). In their mixed method study consisting of interviews and questionnaires on 447 Italian food processing workers which consisted to 88.4% of BC workers, Lo Presti et al. (2016) identified that emotional family support, instrumental family support, extra household support, and family to work enhancement was positively linked to WE and life satisfaction, hence indicating the importance of outer-work factors on engagement in work.

3.3.2 Consequences of Engagement

Out of the thirty-one studies considering BC workers, seventeen have explored the outcomes of WE.

From a health-related perspective, while Węziak-Białowolska (2019) found in 2,052 employees of three Mexican apparel factories of which 50.1% were operators no relationship between WE and wellbeing (measured through the Flourish Index), other studies showed that WE was negatively related to health complaints (Korunka *et al.*, 2009) and psychological distress (Coomer and Houdmont, 2019). One study confirmed a negative relationship with burnout, but a positive one with happiness (Santhanam and Srinivas, 2019).

Considering work-related outcomes, four studies were found to evidence a negative link between WE and staff's turnover intention (Korunka *et al.*, 2009; Hu, Schaufeli and Taris, 2011; Shantz, Alfes and Latham, 2016; Santhanam and Srinivas, 2019).

Eight studies supported evidence that WE leads to increased performance (Peláez, Coo and Salanova, 2019; Govender and Bussin, 2020; Rahmadani *et al.*, 2020; Zondo, 2020), specifically task performance (Guan and Frenkel, 2019). One study focused on safety performance, finding that increased WE led to fewer reports of action errors and violations (Mathisen and Bergh, 2016). Closely related, Shantz et al. (2016) found a negative relationship with workers' deviant behaviour. However, one study could not confirm a correlation between WE and task performance (Guan and Frenkel, 2018) which might have been due to a lack of moderating resources, such as job crafting or LMX.

Three studies showed a positive relationship with extra-role behaviour, particularly organisational citizenship behaviour (Guan and Frenkel, 2018, 2019; Huang *et al.*, 2019). In their diary study, Huang et al. (2019) found that daily WE had a positive relationship with extra-role behaviours. In addition, organisational commitment was found to be impacted by WE (Hu, Schaufeli and Taris, 2011; Chambel, Castanheira and Sobral, 2014) and personal attitudes were found to be the result of WE in two studies, namely PsyCap (i.e. hope, optimism, self-efficacy and resilience) (de Waal and Pienaar, 2013) and the desire to have a significant effect through work (Farooq and Salam, 2020).

3.3.3 Interventions

Three studies were identified that used non-randomised controlled trials in which the effect on WE of implemented interventions was tested.

Cifre et al. (2011) introduced an Action Research Approach for reducing work stress which led to a job re-design and advertised training intervention to T1=108/T2=72 workers within a Spanish MF company. After the intervention, employees showed significant higher positive levels of job resources (i.e. innovation climate), personal resources (i.e. professional self-efficacy and perceived competence) and motivational outcomes (i.e. WE: vigour and dedication). Though the sample as well as effect size was small and the participant data between time one and time two were mixed, the results showed potential for tailored job redesign interventions on WE.

Kmiec (2010) tested the implementation of a 90-day blended-learning programme based on five skills defined by Flagello and Dugas (2009) (i.e. goal-setting, self-coaching, individual practice, reflection, sharing and self-assessment) in his research project. In the intervention group, thirty-two subordinates were tested for their engagement after their managers received the training. Significant increases of dedication and WE for workers of managers who had the intervention was found in the test group while no effect was found in the control group. Later, when the control group received the intervention they showed an increase in WE as well.

A strengths-based and RE-GROW micro coaching programme over a period of five weeks was introduced to a Spanish MF business to 56 employees with technical or engineering positions with non-supervisory or executive responsibilities (Peláez, Coo and Salanova, 2019). After the intervention, the intervention group showed increased levels of WE (small effect size) and job performance (intermediate effect size).

While the body of research on interventions including a BC sample is small and all three studies only had small sample sizes, potentials in initiatives increasing personal and job resources can be derived.

3.3.4 Comparisons Between Job Type Groups

Four studies paid particular attention to the differences between BC workers and other worker types. Hu et al. (2011) compared 625 BC workers to 761 health professionals and multi-group analysis found that job resources led to increased WE in both groups. The negative relationship between job demands and burnout was shown to be mediated by job resources only in health professionals but not in BC workers. In their later research, the comparison between 625 BC workers 1,381 nurses showed no difference in WE levels between the two groups (Hu, Schaufeli and Taris, 2013). However, multi-group testing found that the JD-R model is robust for BC workers and nurses when mediated by equity, though only nurses showed that there is a positive relationship between job resources and WE and a negative one with burnout, respectively. Indeed, in PL workers there was no mediation of equity on the relationship between job resources and wellbeing, but higher job resources were linked to a decrease in wellbeing (i.e. engagement and burnout) (Hu, Schaufeli and Taris, 2013). This was explained by the researchers through the job insecurity that the workers experienced considering this as a significant lack of job resources (Hu, Schaufeli and Taris, 2013).

In a comparison between MF and call-centre workers, provided evidence suggested that for MF workers, the mediating effect of being a permanent worker on the association between WE and commitment was stronger, possibly due to differences in tenure (Chambel, Castanheira and Sobral, 2014).

Molino et al. (2020) found in their research on technology acceptance in 220 white-collar and 378 BC workers, that there was no difference in WE levels between the two samples, yet BC workers showed a significantly higher link in associations between opportunities for information and training and WE.

The number of studies purposefully drawing comparisons between BC workers and other work types is scarce, yet they showed differences in WE experiences when compared to nurses and call centre workers which should be considered when designing e.g. interventions.

3.4 Discussion

This review aimed to explore and synthesise, through a narrative lens, the current body of WE research relating to BC workers.

Six studies identified that personal individual resources, such as self-efficacy and perceived competences, support WE in BC samples. These findings are supported by the overarching body of engagement (among others: van Woerkom, Oerlemans and Bakker, 2016), and it was suggested that there might be a reciprocal effect between personal resources and WE (Xanthopoulou *et al.*, 2009). Indeed in overall WE research, self-efficacy was found to be the most impactful predictor of WE (Peccei, 2013), hence emphasising the need for companies to consider mechanisms to support workers' personal resources.

Almost half of the studies examining antecedents included factors related to increasing the job resources by the organisation through investments or social support, all of which showed a positive relationship with WE. This is in line with the JD-R model research proposing that job resources are positively associated with WE (Bakker and Demerouti, 2007). Furthermore, the association between work systems that invest in their employees may not only benefit the workers' engagement by providing more resources, but also through SET by workers reciprocating the investment through WE (Alfes *et al.*, 2013). However, the research considering organisational justice suggested that relationships as well as investments need to be fairly distributed to enhance WE (Inoue *et al.*, 2010; Huo, Boxall and Cheung, 2020). Similarly, job resources increased through job crafting, decision latitude or job control and clarity were found in a BC context. The positive link between them was also confirmed by other cross-sectional studies in the MF industry examining different work types (De Beer, Tims and Bakker, 2016) possibly explained by work autonomy, which was increased through job crafting, increasing personal as well as work resources. Within this notion, the research showed that non-work-related factors should be considered as well, such as family circumstances, as they potentially impact workers availability (Lo Presti, D'Aloisio and Pluviano, 2016). While the direct impact of these is clearly out of the reach of companies, they should consider workers as a 'whole person' whose mood and availability are affected by circumstances in and out of work. Therefore, companies may want to consider how their work systems impact life outside the company (e.g. shift patterns) and how they want to

support workers in demanding life situations (e.g. through coaching, leadership sensitisation and support).

Mixed results were found with respect to the impact of the relationship between managers and workers. While most research found a positive relationship between superiors' relationship with workers on workers' engagement levels not only in this review (Govender and Bussin, 2020) but also in general WE research (Agarwal *et al.*, 2012; Brunetto *et al.*, 2013; Cheng *et al.*, 2013), Johari et al. (2013) found no association between the superior-worker-relationship and WE. The researchers speculated that this may be due to the nature of BC jobs, presenting limited autonomy and a clear top-down directive nature of the relationship, which might be accepted by the workers and therefore did not affect WE levels, while financial and non-financial recognition did (Johari *et al.*, 2013). However, Johari et al. (2013) argued that immaterial recognition, such as praise from managers, which in their research was the strongest predictor of WE, would influence the social relationship with supervisors. Therefore, the findings indicated that within PL environments an appreciative communication and feedback style by superiors might impact workers' willingness to 'go the extra mile', possibly because praise and positive feedback may impact the perception of self-efficacy and capability as well as work-role fit (Peccei, 2013).

The importance of leadership styles on WE can partly be explained through the JD-R model, as supporting leadership behaviour and management style can provide the worker with additional job and personal resources. Furthermore, some authors propose it can be explained through Self Determination Theory since the workers needs are being fulfilled by engaging managers through e.g. inspirational behaviour and empowerment (Rahmadani *et al.*, 2020).

The comparison between health professionals and workers revealed a possible sensitivity of job insecurity on WE level (Hu, Schaufeli and Taris, 2013). Research on Chinese family-style factories found no direct relationship between past or anticipated downsizing on workers' engagement but there was a relationship with burnout (Hu and Schaufeli, 2011), which was partly in line with the findings by Hu et al. (2013). In support, Wang et al. (2014) provided evidence of the significant moderating effect of perceived organisational justice on the negative relation between job insecurity and WE. While this was not directly tested, having

to worry about one's future may reduce personal resources in terms of psychological availability, hence impacting the psychological availability to be engaged with work. In addition, the comparative studies comparing BC workers to other groups or job types confirmed that the nature of the work and consequently, the motivational dynamics and thus the impact of the different antecedents, may differ and therefore recommended conducting more research on the differences between groups. Similarly, this literature also showed that often in research papers, the characteristics of samples are not defined or considered, i.e. conducting cross-sectional studies on all hierarchical levels within a company and not considering differences in WE experience based on work type. Correspondingly, some workers considered the impact of cultural differences on perceived engagement (Rahmadani *et al.*, 2020). Also, here more research is needed to draw meaningful insights.

While more than half of the papers included in this review studied outcomes of WE, most studies focused on work-related performance factors in relation to WE. This mirrors the general WE research and is possibly motivated by the commercial interest in the research. However, considering the context of this overall research project, the studies identified in this literature review did not assess anything relating to H&S specifically.

Furthermore, very little attention seems to have been paid to developing and testing practical guidelines and interventions. In relation to interventions focusing on manual workers, only three studies were identified. All three intervention studies relevant to this review would have profited from a bigger sample size and a randomised blinded trial design to gain more robust results. The limited number of intervention studies was not surprising, considering that a systematic review by Knight et al. (2019) found only 40 empirical studies testing interventions on WE in all job contexts. All of the intervention studies identified in the review by Knight et al (2019) showed effectiveness on increasing WE through the promotion of personal resources and management support as well as increased work resources through job crafting.

While there is a vast body of research on engagement in general in a wide variety of industries and contexts, this review showed that research on manual workers is limited. Firstly, this lack of research might be due MF being a practitioner driven area, thus more might be published in practitioner magazines. Secondly, the lack could also be explained by a MF

environment being highly production driven and therefore, workers may not be an easy sample to get access to. However, a focus on WE research in MF workers would be beneficial in research in so far that it is acknowledged that different job types experience psychological states, such as WE, differently (Bakker and Albrecht, 2018), and thus, findings from mixed samples may not be reliable when applied to a specific employee group and more research is needed.

From a research design point of view, almost all studies used quantitative methods and only a few gathered qualitative data. In their narrative review, Bailey et al. (2017) identified the lack of qualitative research in WE studies proposing that this may be due to an increasing commercial interest in WE and call for more qualitative insights in relation to engagement research in order to achieve a more ethnological and phenomenological understanding of the experiences in relation to WE. Similarly, most studies used a cross-sectional design, while only a few applied more complex methods, for example exploring long-term effects in relation to WE or examining the effect of concrete interventions to improve WE levels in a randomised controlled trial. This literature review showed that to this date, there is a lack of robustness in the findings in BC samples that is the result of the shortage of reliable complex and intervention studies with large sample sizes. Also, especially with intervention and cross-sectional research more long-term studies should be conducted to test hypothesis.

The majority of studies was conducted in countries that were associated with a collectivistic culture. Hence, it needs to be considered that limitations to their generalisability to individualistic cultures may arise due to different value systems. Hence, more research in an individualistic cultural context would be beneficial.

Nevertheless, the presented narrative literature review provided a synthesis and evaluation of the current state of knowledge, conducted research as well as its limitations of research with a specified proportion of manual workers in a factory environment in relation to WE.

3.5 Strengths and Limitations

The key strength of this study is the unique focus and thus, synthetisation of WE studies having a clearly distinct PL/MF worker. This novel focus provided valuable insights into the

existing body of knowledge as well as a meaningful derivation of implications for a practical context.

While this review brought several interesting findings to light, a number of limitations should be considered. Firstly, the search was restricted to English and German publications which may lead to other relevant papers in other languages being ignored. Secondly, the inclusion was constrained to papers that clearly outlined the number of BC workers in the study. Some studies were found that most likely had a BC sample, but they were excluded as they did not clarify the exact proportion. Thirdly, to keep the number of publications to a manageable amount, the search was limited to specific search terms, which means papers that may use different terms than the ones defined would have been excluded. Lastly, only peer-reviewed publications were included, thus practitioner contributions were ignored. While it is acknowledged that some of these may have given valuable insights, the lack of scientific methods for evidencing results in practitioner publications did not agree with the aim of exploring the empirical body of research yet could offer a noteworthy contribution for future research.

3.6 Practical Application and Future Research Directions

While many of the group specific research findings agree with overall WE research, the review showed that more rigorous research needs to be conducted to understand WE in a PL setting thoroughly. The gaps revealed by the review showed that future research should focus on understanding the differences between work type groups, for example white-collar versus BC workers. Similarly, while much research focuses on executives and managers, WE level in a MF context and how WE can be influenced, most research misses the chance to explore how changes in superior WE level affect their PL workers. However, it should be noted that several papers did not specify what kind of work employees were doing therefore it could not be clearly determined if PL workers were involved and if so, to what extent. Therefore, practitioners and researchers would benefit on more research on concrete practical guidelines and tools on what is effective in increasing WE levels in BC workers.

While this narrative literature review did not reveal any major differences to the overall WE research, this is the first of its kind looking at BC worker in particular. The review revealed

that practitioners should consider investing in their BC workers' WE as it shows potential to increase performance and other personal and work-related attitudes, such as commitment and organisational citizenship behaviour. To increase WE, the body of research suggested that companies should promote workers' personal resources and psychological availability, such as self-efficacy and perceived competence through coaching and training initiatives, or their job resources through job crafting opportunities and increased decision autonomy. Furthermore, leadership style and perceived superior support through positive feedback and praise and giving workers a voice might improve workers' WE levels.

Therefore, in conclusion, the following evidence-based recommendations can be given to production companies to increase their manual workers WE levels (see Table 11)

Table 11: Exemplary Practical Implications Drawn From the Narrative Literature Review

Level	**Consequential Recommendation**
Organisation	Workers' development: Organisations should consider how to implement processes or mechanisms to support workers personal development, e.g. through coaching opportunities or conversations about growth and personal development goals. Fair contribution of resources: Systems should provide a fair distribution of resources to promote psychological safety and organisational justice. Corporate impact: Organisations should consider their impact through their perceived service quality and social responsibility to bring positive attitudes among employees, which will also impact workers' feeling pride of working for the organisation (Manimegalai and Baral, 2018). Hence, companies could investigate, what factors make their workers feel 'cared for' by the company and focus on fostering these. Also, it is recommended for companies to reconciliate how the company's values are reflected in every-day decisions and practices to bolster a clear company culture that fits with workers' values. Employee voice: Mechanism on operational as well as personal level need to be established to provide workers with opportunity to input, feedback and be involved in work decision-making, e.g. through participatory measures, representative systems.
Leadership	Engaging leadership: Leaders should be supported in adopting an engaging leadership style, e.g. through training or coaching. Positive feedback and appraisal: Supervisors as well as managers should be trained in positive feedback and enquiry mechanisms to create a positive feedback climate.

	Consideration of personal availability: Supervisors as well as managers should be trained in sensitivity with, addressing of and dealing with workers' needs – not only on a job resource level but also consideration of personal circumstances.

3.7 Implications for this Research Project

In this narrative review, the existing empirical body of engagement research, including a BC sample in a MF context, was explored and synthesised. Overall, thirty-one publications were identified that clearly outlined a BC sample. Although there is a variety of general literature reviews exploring the engagement research landscape, to the author's knowledge, this is the first narrative synthesis that focuses on PL workers within the engagement research.

Furthermore, the presented narrative literature review made the following contributions to this research:

- Displaying the limited amount of specific PL worker research.
- Highlighting a lack of qualitative research as well as practical guidelines PL worker engagement research.
- Proposing practical considerations for production environments summarised in Table 11.
- Identifying that there are differences between job types in how they experience WE, hence highlighting the importance of tailored research und understanding the specific needs of the target group.

Therefore, the next step in the research is to analyse and understand the individual factors of the BEP PL workers regarding their H&S engagement level and the factors that influence it.

Chapter 4 - Engagement Interventions in a Production-Line Worker Context:

A Narrative Literature Review

4.1 Engagement Interventions

In order to develop evidence-based complex interventions, the complete evidence-base needs to be understood (Craig *et al.*, 2019). After already giving a general overview of the research landscape with regards to WE and safety reported in Chapter 2, evaluating the particular body of research in regard to BC workers and engagement as reported in Chapter 3, it is important to also consider the empirical knowledge regarding BC engagement interventions.

Creating interventions that promote WE has become increasingly interesting for the practical but also the academic world, due to the positive outcomes on work and organisational behaviour, such as (safety) performance (Knight, Patterson and Dawson, 2017a, 2019). In their recent evaluation of the current WE research landscape, Bakker and Albrecht (2018) acknowledged the increasing interest of human resource management's practice's influence on WE and how it can be steered and managed. Further, they identified an increase in intervention literature and highlighted the importance of continuing using the accumulated theoretical knowledge around engagement to transfer it into practical applications (Bakker and Albrecht, 2018).

Yet, engagement intervention research results appear to be ambiguous and mixed, with different effects. Bailey and colleagues (2017) found in their narrative literature review that so far only very few papers present intervention research and only six interventions, out of nine papers they found, showed an effect, while one showed no effect and two reported ambiguity and complexity. Similarly, Bakker and Albrecht (2018) called for more evidence-based intervention to translate the understanding of engagement into valid, practical applications.

Similarly, in their systematic literature review and meta-analysis, Knight and colleagues (2019) found 40 papers that presented interventions and used a controlled study design with pre-and post-measures for the control and the intervention groups. Out of those forty, only twenty showed a significant positive effect on WE. They concluded from their research, that more research has to be conducted to understand the elements that influence the success of engagement interventions (Knight, Patterson and Dawson, 2019).

4.2 Research Aim

To get a thorough understanding of the current literature that links engagement to interventions and their effectiveness in a BC environment, a narrative literature review was conducted. This research stage aims to analyse and draw lessons learned from the existing body of research on WE interventions. Therefore, the research questions under study are threefold:

1. What interventions have been designed to impact WE in a BC environment?
2. What dimensions of WE did they tackle (i.e. as proposed by Kahn (1990): psychological meaningfulness, safety or availability)?
3. To what extent were they successful, and what surrounding factors (with respect to the delivery) impacted the success of the interventions?

By this, it is aimed, to answer the following sub-questions:

(1) What type of intervention is most effective for increasing BC worker engagement (i.e. what intervention style, does the intervention relate to psychological meaningfulness, safety and availability)?

(2) What additional components of interventions have to be considered to achieve the optimal technique for achieving impact on (BC) WE (e.g. delivery technique, environmental or preparation factors)?

4.3 Study Design

It is acknowledged good practice to conduct a systematic literature review to support one's research. Hence, initially, it was planned to conduct a formal systematic literature review

and draw results from that. However, in the early stages of the research, an extensive systematic literature review and meta-analysis by Knight and colleagues (2019) on WE interventions was found. Therefore, it was decided to still conduct a systematic literature search on WE intervention literature in a BC setting and synthesise the results in a narrative approach while also including the systematic literature review by Knight and colleagues (2019) to answer the proposed research question.

Following, the conducted steps are described.

4.3.1 Systematic Search of the Literature

To get a thorough overview of the field and the research undertaken, a narrative literature review was conducted. A systematic search aims to identify all relevant published (academic) work regarding a designated topic in order to answer a defined research question. In order to find the relevant academic literature specific and replicable search strategies have to be stated and explicit inclusion and exclusion criteria set (Kitchenham, Dybå and Jørgensen, 2004; Khan *et al.*, 2011). The benefit of a systematic search is, that it facilitates the identification of all relevant published research using a systematic procedure. Further, by defining a research protocol upfront, which is replicable and comprehensive, the methods to search as well as the inclusion and exclusion criteria for studies are defined in order to ensure objectivity as well as the focus on answering a defined research question (Webster and Watson, 2002).

Definition of Search Terms

As mentioned before, there is no agreement towards the definition of engagement, it is often used as a synonym for involvement or other terms and to reduce the risk of missing any publications, the surnames of the most influential engagement authors were included in the list of criteria. Based on the initial literature review and the four approaches identified by Shuck (2011) the following names were identified:

Kahn, Maslach, Harter, Saks, Schaufeli, Macey

Research has shown that there are differences between job types on how they experience WE (Hu, Schaufeli and Taris, 2013; Chambel, Castanheira and Sobral, 2014). Thus, the focus within this study was set on BC workers as they were considered closest to the target group of the overall research project.

All abstracts, titles and keywords were searched for the words ‘engagement’ and any of the following combinations of ‘intervention’ and respective synonyms as well as ‘blue-collar’ and respective synonyms (see Table 12).

Thus, as an example the final search key for Scopus:

(TITLE-ABS-KEY(engagement) AND TITLE-ABS-KEY (intervention OR program OR measure OR scheme OR activity) AND REF (schaufeli OR harter OR saks OR kahn OR maslach OR macey) AND TITLE-ABS-KEY (manufac* OR engine OR production OR motor OR "shop floor" OR "blue-collar" OR "engineer*" OR automo* OR auto OR car OR construction))

Depending on the search engine, Boolean operators and search keys were adapted.

Table 12: Search term strings

	String 1		**String 2**		**String 3**		**String 4**
Main search key term	Engagement			AND	Intervention	AND	Blue-collar
Search in	Abstract & title		Reference list		Abstract & title		Abstract & title
Terms	engagement	AND	Schaufeli OR Harter OR Saks OR Kahn OR Maslach OR Macey	AND	Intervention OR program* OR measure OR scheme OR activity	AND	manufac* OR engine OR production OR motor OR "shop floor" OR "blue-collar" OR "engineer*" OR automo* OR auto OR car OR construction

Search Strategy

A systematic literature search was conducted between September and November 2019 (and later updated in December 2020) using Scopus, Ovid (includes PsychInfo and Embase), ProQuest, Cochrane library, EBSCOhost and OpenGrey. As each search engine works slightly differently, the search strategy, including search terms and Boolean operators, was adapted accordingly.

Further, the inclusion and exclusion criteria outlined in Table 13 were adapted.

Table 13: Search Criteria

Category	**Criteria**	**Comment/details**
Search engine	Ovid (i.e. PsychInfo and Embase), PubMed, ProQuest, Scopus, Cochrane Library, Open Grey	Scopus, as it is the largest database for peer-reviewed literature, Ovid, as it included PsychInfo and Embase, as well as ProQuest and PubMed, as it covers further social science databases, were used to searching for the relevant literature. Further, also the Cochrane Library was searched.
Search timeframe	No restriction	
Language	English and German	As the researcher is fluent in both languages, research in both languages can be taken into account. Other languages were excluded.
Accessibility	Online or via interlibrary loan	Publications had to be accessible for the researcher online. If there was no access initially, an interlibrary loan was ordered, and the respective researchers were contacted once. If there was no reply within 30 days, the publication was excluded.
Type of study	Peer-reviewed	It was assumed from an academic point, that peer-reviewed publications ensure a certain scientific quality that practitioner's or non-peer-reviewed accounts may lack.
Focus 'engagement'	Kahn, Maslach, Harter, Saks, Schaufeli, Macey	As there is no agreement towards the definition of engagement, it is often used as a synonym for involvement or other terms and to reduce the risk of missing any publications, the researcher used the surname of the most influential engagement authors (based on the lit. review) to appear in the list of references as one criterion.
Focus 'BC'	manufac* OR engine OR production OR motor OR "shop floor" OR "blue-collar" OR "engineer*" OR automo* OR auto OR car OR construction	As the focus of this project is on the automotive MF workers, this industry as well as similar working environments were taken into account. Consequently, the focus was on 'BC workers' as opposed to 'white or grey collar workers'. Therefore, only articles that included manual workers, such as MF industry workers (or similar industries including shop floor' PL workers, construction), were explored to keep the literature as relevant as possible to the automotive industry. Research being set in other fields of employment (i.e. 'white or grey collar environment', such as teaching, health care) were excluded, since work requirements are of a

		different nature in those environments and therefore not relevant for this project's purpose.
Comparability of intervention effect	clear pre/post intervention comparisons	Only studies where clear pre/post intervention comparisons were considered and reported were included, as the researcher had to be able to analyse the effect of the intervention.
Engagement interventions	Aim: impacting WE	The aim of the implementation had to be an impact on the WE level of the participants.

All of the above criteria were taken into account under the premise that digital content could be accessed. Additionally, no exclusion was made based on methodology. Qualitative as well as quantitative approaches were included.

The initial search identified a total of 409 studies, the abstracts of which were then reviewed for inclusion or exclusion. In the first instance, all abstracts and respective studies were evaluated and selected by one researcher. A sub-group of the results was then checked and discussed by the research team. Disagreements were resolved by consensus.

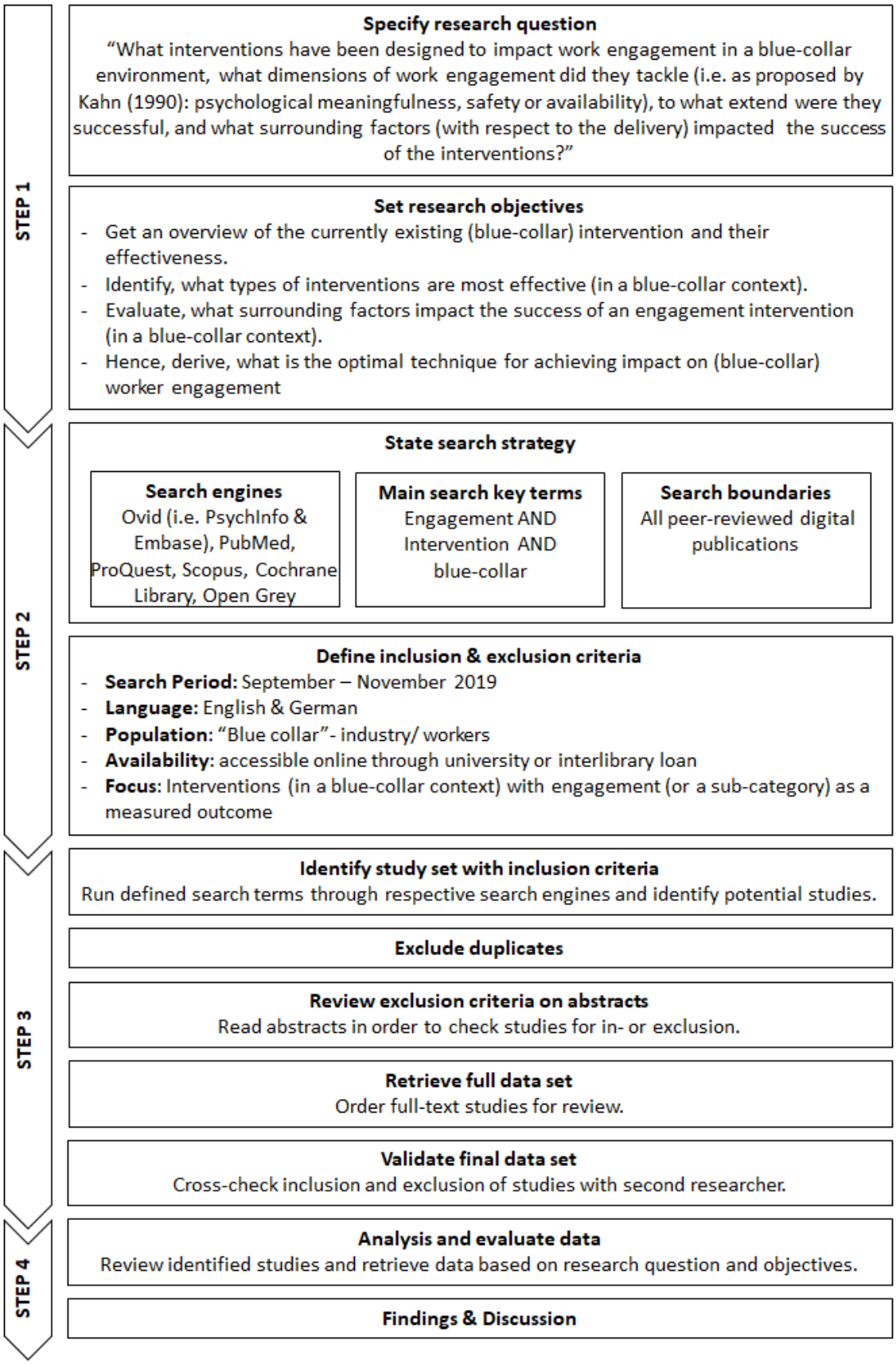


Figure 9: Systematic Review Process

Criteria for Inclusion and Exclusion

Based on recommendations by the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2008) and the defined inclusion and exclusion criteria a criteria catalogue that restricts the intake of studies into the primary analysis based on the bias, key areas and initial review eligibility criteria was designed. Those were integrated in the overall inclusion/exclusion checklist (see Table 14). In cases where the detailed set of steps or questions was not published, the authors were contacted and asked for more detail. If no information on the development of the process or intervention could be provided, the research was excluded (i.e. two publications were excluded on this basis; details see Figure 10).
If all of those questions were answered with "yes", the study was included. If one or more of the questions were answered with "no" or "not clear", the study was excluded. By this, the researcher wanted to make sure, on the one hand, that bias was reduced through the application of strict criteria, and, on the other hand, that only relevant, meaningful studies were being included.

Table 14: Inclusion Checklist

#	Category	Item	Description
1	Reporting	Does it provide clear understandable information that can be used to inform the review?	All studies have to provide clear and understandable information about the research which can be used to inform the review. Studies that display e.g. poor/not understandable language or where information were missing (even after contacting the authors) were excluded.
2	Focus	Is the focus of the intervention on WE?	As the focus of this project is on WE, the research examined have to focus on WE, i.e. one of the measured outcomes of the intervention had to be WE or a dimension/sub-components of WE (i.e. dedication, vigour, absorption).
3	Research population	Is the focus population of the study 'BC workers' (i.e. manual workers in the automotive MF industry or similar industries/working environments?	As the focus of this project is on the automotive MF industry, this industry as well as similar industries/working environments were considered.
4	Aim	Does the study examine the impact of the implementation of a WE intervention?	The study had to assess the impact of an intervention focusing on the effect on WE.

5	Effect evidence	Were clear pre/post intervention comparisons presented in the research?	Only studies where clear pre/post intervention comparisons were considered and reported were included. While this might have limited the cause-effect relationship that can be explained, there are still insights that can be drawn from uncontrolled studies. However, only one study was not controlled (i.e. Sakuraya *et al.*, 2016).

This led to the exclusion of 403 studies (see Figure 10).

Data Extraction

Data was collected in terms of: intervention characteristics (i.e. design, style, type, delivery mode, measurement, duration), participant characteristics (i.e. number per measure, role/hierarchical level), recruitment methods, results and engagement factors (i.e. antecedent type).

4.3.2 Systematic Literature Search: Search Results

Only six papers (Kmiec, 2010; Cifre, Salanova and Rodríguez, 2011; Hengel *et al.*, 2012; Gajdzik, 2013; Wiezer, Bakhuys Roozeboom and Oprins, 2013; Peláez, Coo and Salanova, 2019) were identified that fitted the criteria. One paper (Gajdzik, 2013) was excluded due to the poor report quality (e.g. no information how WE was measured, no detailed information on intervention, etc.). Another paper (Wiezer, Bakhuys Roozeboom and Oprins, 2013) was found that referred to an upcoming longitudinal study on a gaming intervention, but unfortunately, after correspondence with the authors, it turned out that the following complete research was not published. Hence, in the end, four papers were retained.

4.3.3 Adaption of Method

Since four papers were considered too limited to draw conclusions from, the search criteria were opened: The inclusion of only papers considering BC workers was broadened to research that was conducted in a BC context/industry. This means, that papers in which non-BC workers that work in a BC environment (e.g. managers of BC workers) were taken into account. While this may not mirror exactly the population of this research project (i.e. PL/BC workers), it might still give insights into interventions that may work in the broader environment. Hereby, another two papers (i.e. Aikens *et al.*, 2014; Sakuraya *et al.*, 2016) were added. An overview of the identified papers can be found in Table 15.

Considering an elimination of the industry-dimension altogether, a recent, thorough systematic literature review and meta-analysis by Knight, Patterson and Dawson (2019) was found that covered exactly the search criteria and research focus of this study. The study contained four of the papers that were also found in the extended BC literature search (Cifre, Salanova and Rodríguez, 2011; Hengel *et al.*, 2012; Aikens *et al.*, 2014; Sakuraya *et al.*, 2016). The finding of the existing review confirmed that no more BC context intervention studies, that report WE as an outcome, were published to this date. Limitations within the meta analyses by Knight and colleagues (2017a, 2019) should be considered as they were not explaining the variation of efficacy of interventions and not taking a comparison between control and intervention groups into account (Vîrgă, Maricuţoiu and Iancu, 2019).

As mentioned before, the discovery of the Knight et al. review (2019) was discussed within the research team and it was decided, that as a result the research questions will be discussed considering the six extended BC-search papers as well as the findings of the papers by Knight and colleagues (2017a, 2019) and therefore, conducting a systematic literature search and applying a narrative analysis.

4.3.4 Update of Literature Search

The search was updated in December 2020 and another two papers were added (Peláez Zuberbuhler et al., 2020; Thomas, du Plessis and Thomas, 2020). Hence, eight papers were found to be relevant.

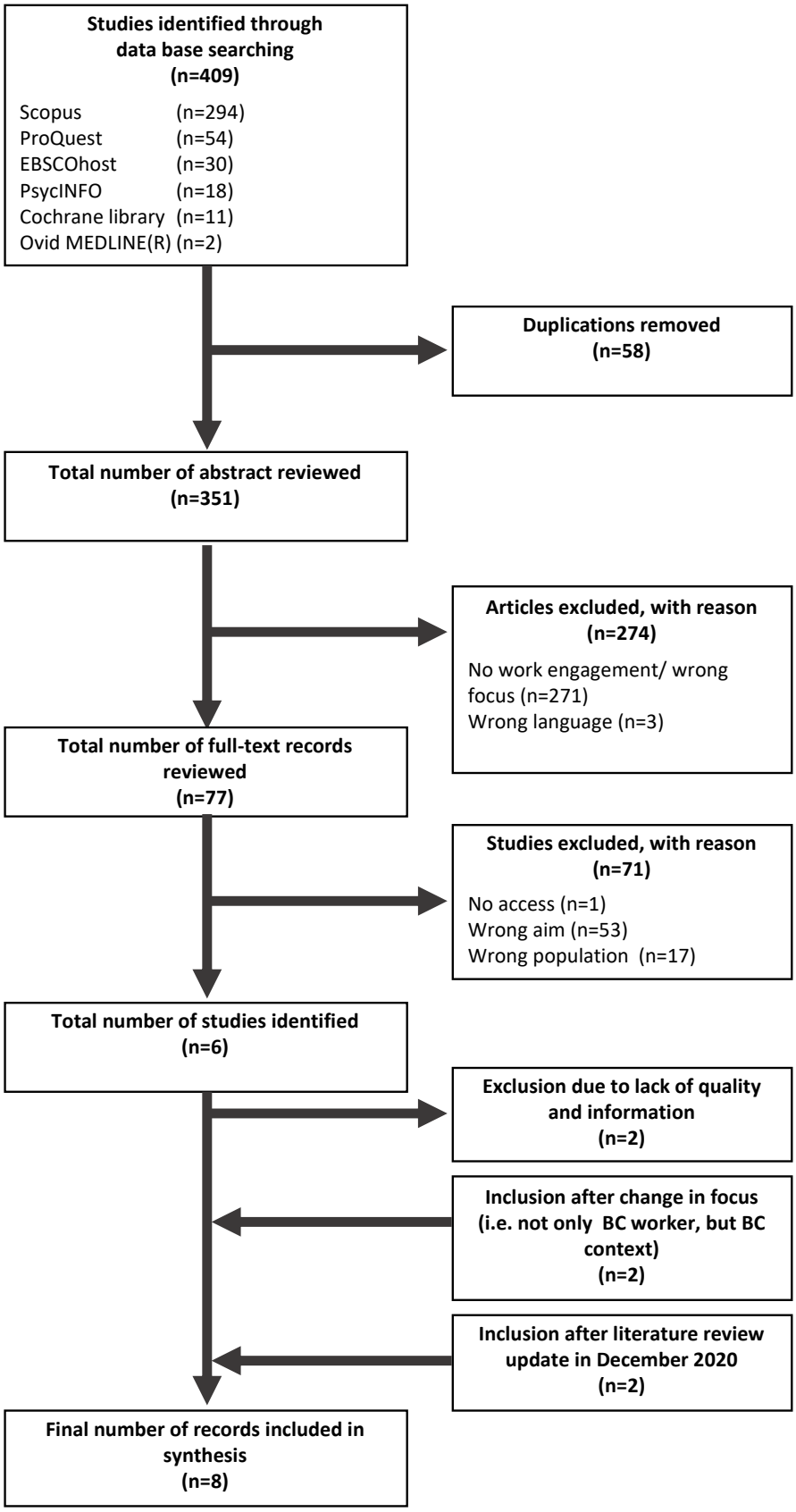


Figure 10: PRISMA Flow Diagram Displaying the Results of the Systematic Literature Screening Process (incl. Record Exclusion Reasons)

Table 15: Overview Included Publications in the BC WE Intervention Literature Review

Name	BC worker?	Number of participants	Industry, Country	Study design	Aim of intervention	Outcome measures
Cifre, Salanova and Rodríguez (2011)*	BC	T1= 108 (Ni=9; Nc=99) T2= 72 (Ni=9; Nc=63)	Manufacturing enamel company, Spain	controlled 2 (intervention, control) x 2 (baseline, 6 months after intervention phase)	Increase personal resources (i.e. professional self-efficacy and perceived competence) and job resources (i.e. innovation climate) and reduce stress and psychological strain	- Demands (i.e. quantitative overload, low role clarity, role conflict) - Job resources (i.e. autonomy, organizational support climate, organizational innovation climate, organizational training) - Personal resources (i.e. professional self-efficacy, perceived competence) - Psychosocial wellbeing indicators (i.e. work satisfaction, flow at work (i.e. happiness, absorption, intrinsic work motivation), engagement (i.e. vigour & dedication), burnout (i.e. emotional exhaustion, cynicism), job-related anxiety and depression (i.e. Relax-Anxiety, Enthusiasm-Depression))
Kmiec (2010)	BC	T1= 54 (Ni=32; Nc=22) T2= 48 (Ni=32; Nc=16) T3= 51 (Ni=30; Nc=21)	Manufacturing company, USA	controlled 2 (intervention, control) x 3 (before (by day-0), during (day-45) and at the end (day-90) of the intervention)	Increase the skills of front line, immediate managers to enhance the level of WE at the business unit level	- WE (i.e. vigour, dedication, absorption)
Oude Hengel, Blatter, Joling and van der Beek (2012)*	BC	T1= 293 (Ni=171; c=122) T2= 232 (Ni=137;	Construction company, Dutch	randomized controlled 2 (intervention, control) x 2 (individual, department) x 4	Increase construction workers' workability, recovery and health-related quality of life	- Social support (i.e. co-worker support, supervisory support) - WE (i.e. vigour, dedication, absorption)

Name	BC worker?	Number of participants	Industry, Country	Study design	Aim of intervention	Outcome measures
		Nc=95) T3= 221 (Ni=132; Nc=89) T4= 213 (Ni=120; Nc=93)		(baseline, 3 months, 6 months, 12 months post-baseline)		- Physical workload (i.e. using force, working in awkward postures, repetitive movements) - Need for recovery
Aikens, Astin, Pelletier, Levanovich, Baase, Park and Bognar (2014)*	only BC-context (i.e. no hourly paid employees included)	T1= 89 (Ni=44; Nc=45) T2= 78 (Ni=36; Nc=42) T3= 63 (Ni=31; Nc=32)	Chemical company, USA	not-controlled (i.e. intervention for control group started before T2) or randomized 1 (participants) x 3 (baseline, 6 weeks, 12 weeks)	Increase mindfulness, resilience, vigour and WE and decrease of stress. Resulting in an increase in positive organisational behaviour and worker wellbeing as well as positive effect on lifestyle choices.	- Mindfulness (i.e. act with awareness, refrain from judgement, non-react) Stress (i.e. psychological stress) - Resilience (i.e. personal competence, tolerance of negative emotions, positive acceptance of change, trust in one's instincts, sense of social support, spiritual faith, action-oriented approach to problem-solving) - Vigour (i.e. physical strength, emotional energy, cognitive liveliness) - Lifestyle factors (i.e. fruit & vegetable intake, fast food consumption, exercise, high stress episodes, feeling of too burned out to work)

Name	BC worker?	Number of participants	Industry, Country	Study design	Aim of intervention	Outcome measures
Peláez, Coo and Salanova (2019)	only BC-context (i.e. managers and middle managers, who got 180° feedback by supervisors and employees)	T1=60 (Ni=35; Nc=25) T2=56 T3= 52	Automotive industry, Spain	controlled 2 (intervention, control) x 3 (baseline, six weeks after baseline/2 weeks post-intervention (once for i-group, then for c-group), 4 months after intervention follow-up)	Increase engagement, job performance and optimal functioning in organizations as well as participants' goal achievement and personal resources.	- WE (i.e. vigour, dedication, absorption) - Job performance (i.e. in-role performance, extra-role performance - Positive outcomes of participation (open question)
Peláez Zuberbuhler, Salanova and Martínez (2020)	only BC-context (i.e. managers and middle managers, who got 180° feedback by supervisors and employees)	T1=41 (supervisors: N = 38; employees: N = 180) (Ni=25; Nc=16) T2=40 (supervisors: N= 38; employees: N= 117) $T3_C$=14 (supervisors: N = 14; employees: N = 53) T4=37	Automotive industry, Spain	controlled 2 (intervention, control) x 3 (baseline, six weeks after baseline/2 weeks post-intervention (once for i-group, then for c-group), 4 months after intervention follow-up)	Increasing leaders' coaching skills, PsyCap, WE, and in- and extra-role performance.	- Coaching-Based Leadership Skills Based (i.e. working alliance, open communication, learning and development, progress and results) - WE (i.e. vigour, dedication, absorption) - Psychological Capital (i.e. self-efficacy, resilience, hope, optimism) - Job performance (i.e. in-role performance, extra-role performance - Positive outcomes of participation (open question)

Name	BC worker?	Number of participants	Industry, Country	Study design	Aim of intervention	Outcome measures
		(supervisors: N = 33; employees: N = 90) (Ni=23; Nc=14)				
Sakuraya, Shimazu, Imamura, Namba and Kawakami (2016)*	only BC-context (i.e. managers)	T1=50 T2=44 T3=42	Manufacturing company & psychiatric hospital, Japan	not controlled over time: 3 (baseline, post-intervention: 2 weeks past baseline, 6-months follow-up)	Increase job crafting and WE and decrease psychological distress.	- WE (i.e. vigour, dedication, absorption) - Psychological distress (i.e. irritation, fatigue, anxiety, depression) - Job crafting (i.e. task crafting, relational crafting, cognitive crafting)
Thomas, du Plessis and Thomas (2020)	only BC-context (i.e. random sample of administrative (e.g. H&S clerk), managerial (e.g. contracts manager), operational (e.g. foreman) or technical (e.g. engineer))	Ni=33 Nc=22	Construction cooperation, South Africa	Controlled 2 (intervention, control) x 3 (pre-intervention, post-intervention: 6-8 weeks past baseline)	Increase of WE through higher resources	- WE (i.e. vigour, dedication, absorption) - Job Demands-Resources (i.e. social job resources, structural job resources, challenging job demands, hindering job demands) - Job crafting (i.e. growth opportunities, organisational support, advancement, overload, job insecurity)

Note: The following key applies:
*An asterisk (i.e. *) means that the study is included in Knight et al. (2019)*
BC=blue-collar worker; only BC-context=within blue-collar industry, but not manual worker
Key: Ni=Number of participants in intervention group; Nc= Number of participants in control group

4.4 Results and Discussion

The following section is organised into three parts according to the aims of the review. The results were analysed through a narrative lens.

4.4.1 General Findings

From the eight identified relevant papers, that report of engagement intervention testing within a BC context, only three focused on manual workers in particular, the others had either mixed samples or focused on white-collar workers in a BC context, such as MF or construction.

The publications were from various countries (Spain n=3, USA n=2, Dutch n=1, South Africa n=1, Japan n=1), reflecting the global interest in the field.

Moreover, the samples were from different industries with five studies using employees of MF companies, not surprisingly considering the PL context. One of the studies had a mixed sample not only of MF workers but also hospital staff. Two papers were from a construction background and one from a chemical company (see Table 16).

In addition, it should be taken into account that most studies had rather small sample sizes, thus quantitative methods may not have been appropriate for assessing engagement level impact. Indeed, none of the studies assessed WE level or relevant factors qualitatively in a mixed-method approach. Furthermore, most interventions can be considered ‘short term’, single-point interventions that did not take continuous integration into account, e.g. changes through job crafting only once and not making it a routine activity, or training sessions without ensuring long-term use of the skills transferred. This might explain the general decrease of intervention effect on engagement levels over time after the intervention, since most interventions could not find long term WE increasement, only temporary after the intervention. Hence, emphasising the need for continuous change through sustainability of interventions implementation.

4.4.2 Intervention Type and Impact

The aim of this section was to derive, based on the identified papers and the systematic literature review (Knight, Patterson and Dawson, 2017a, 2019), what kind of interventions were shown to be effective in increasing WE amongst BC workers.

The existing research found, that out of the eight intervention papers, only one did not have any effect on WE, while all other interventions showed an impact on WE (see Table 16). As can be seen, most studies focused on availability dimensions through personal resources, such as workload, stress and self-efficacy, as well as meaningfulness through job resources by interventions focusing on enhancing autonomy or job crafting and feedback.

In Knight and colleagues' systematic review (2019) it was found that health promotion interventions (e.g. mindfulness) as well as job (e.g. job crafting, empowerment) and personal resource (e.g. self-efficacy, personal competency) interventions were shown to be the most effective on WE. While the results were ambiguous, job crafting interventions and health programmes, appeared to be most effective individually. It was hypothesised that job crafting interventions derived their high impact from the combined effects on personal and job resources (Knight, Patterson and Dawson, 2019). Sakuraya and colleagues (2016) confirmed this by stating, based on finding by Schaufeli and Bakker (2004) as well as on the intervention studies they analysed within their literature research, that for successful overall WE improvement, personal and job resources need to be tackled. This has further been supported by the study by Thomas et al. (2020) whose personal job crafting intervention showed positive effects on the participants' WE levels. Hereby, participants identified their individual resources and demands and created and followed personal action plans to work on these resources and demands in discussion with their peers (Thomas, du Plessis and Thomas, 2020). However, in an intervention focusing on reducing workload through autonomy and empowerment, no significant effect on WE could be found (Oude Hengel *et al.*, 2012), which might be due to programme failures such as moderate compliance in training participation.

Furthermore, leadership training and coaching appeared to increase participants' WE levels (Kmiec, 2010; Peláez, Coo and Salanova, 2019; Peláez Zuberbuhler et al., 2020). Unfortunately, only one study explored the impact on subordinates' WE levels when their leaders were provided with empowering coaching and communication skills (Kmiec, 2010). It would have been interesting from a practitioner's perspective to see, what impact other interventions aimed at managers or supervisors had on their workers.

In addition, in terms of the type of intervention, a mix of group and individual components was found to be most effective (Knight, Patterson and Dawson, 2019). This might be due to the individual components allowing the participant to tailor the intervention to the individual

and allow individual reflection on the intervention in the participant's day-to-day business, while the group intervention encourages a feeling of belonging and allowing discussions with others.

Table 16: Overview BC Intervention Details and Results

Name	Intervention type*	Intervention type details	Engagement measure	WE outcomes	Other outcomes
Cifre, Salanova and Rodríguez (2011)	Work-stress-intervention: Team redesign (unclear; 2 months)	Based on data analysis and feedback survey in the selected intervention area, 'team redesign' intervention programme was carried out in two actions (personally in groups): 1. role redesign (i.e. after interview and negotiation, supervisor was relocated, team was split based on competencies into two areas) 2. information action through job trainings (i.e. presentation about on-the-job-training-possibilities by managers).	Engagement Scale (UWES-17; only vigour and dedication) (Schaufeli *et al.*, 2002)	Significant positive effect on engagement over time. Levels of vigour and dedication in the control group declined over time, whereas they increased in the intervention group.	Reliable, positive and incremental effects of interventions and time on job resources (i.e. innovation climate: innovation climate and personal resources (i.e. professional self-efficacy and perceived competences.
Kmiec (2010)	Leadership skill training (7, 90 days)	Blended-learning programme for managers based on The 5 Skills of Savvy Managers (Flagello & Dugas, 2009) with the aim to improve workers' WE. Results were measured on worker's WE.	UWES-17 (Schaufeli, Bakker and Salanova, 2006)	Significant effect on group-level. Between-group effects for the production and maintenance line employees, using both the UWES dedication subscale) and the entire WE construct, were statistically and practically significant and powerful. The individual, within-subjects tests for WE was not statistically significant.	Between day 30 and 90 many work-related issues appeared (e.g. fire) and engagement levels of workers in the test group were less affected by the issues.

Name	Intervention type*	Intervention type details	Engagement measure	WE outcomes	Other outcomes
Oude Hengel, Blatter, Joling and van der Beek (2012)	2 training sessions each on workload and empowerment (2 sessions per topic, 4 months apart)	Two personal group training sessions on physical workload, work style working method and rest-work-balance with development and evaluation of interventions and "Rest-tool" to help with rests. Additionally, 2 empowerment group trainings to develop skills for more autonomy and develop action plan.	UWES-9 (Schaufeli, Bakker and Salanova, 2006)	No significant effect on engagement. No significant effect was found between the intervention and the control group over time on WE in general or the relevant sub-scales.	- No significant effects on social support over time. - Slightly higher perceived workload after 6 months follow-up in the intervention group.
Aikens, Astin, Pelletier, Levanovich, Baase, Park and Bognar (2014)	(Online) mindfulness programme (consisting of mental fitness, focussing techniques and performance-oriented skills) (weekly sessions, 7 weeks)	7-week web-based workplace mindfulness programme (with weekly live (and recorded) virtual (besides first and fifth meeting) hourly long classes), workbook, opt-in text service	Shirom's (2003) vigour scale	Positive significant effect on vigour. Follow-up showed increases in vigour ranged between 11% for emotional energy to 19.6% for physical strength	- Increase in mindfulness and resilience increased and burnout decreased - Reduction in perceived stress (but not long-term)
Peláez, Coo and Salanova (2019)	Positive psychology intervention/coaching (4, 6 weeks)	Strength-based micro coaching programme: 1. 6 2h groups workshop sessions: Based on the REGROW model (Grant, 2003, 2011) specific individual strengths-related goals were set and an action-plan for implementation and development of the strengths developed in group sessions.	UWES-9 (Schaufeli, Bakker and Salanova, 2006)	Significant positive effect on WE over time, however not long-term. - Significant time (T1, T2) x group interaction effect (control, intervention) for the WE. - Paired-sample t test results for the whole intervened group (after both groups had the intervention) indicated significant increases on all the dependent variables at post compared to pre-intervention	- Significant short-term improvement in self-reported and observed job performance and long-term significant self-observed performance increase as well as wellbeing.

Name	Intervention type*	Intervention type details	Engagement measure	WE outcomes	Other outcomes
		2. In the three individual 1.5h coaching sessions, the goal and experiences with the action plan were reflected upon and, if necessary, redefined.		times, showing an intermediate effect size for WE. - However, no significant long-term change in WE (T1 to T4).	
Peláez Zuberbuhler, Salanova and Martínez (2020)	Positive psychology intervention/coaching (4, 6 weeks)	Coaching-based leadership intervention programme 1. Six 3h weekly group workshop sessions on GROW model (Grant, 2003, 2011), strength-based coaching skills as well as additional skills (e.g. working alliances, open communication). 2. three biweekly 1.5h individual micro-coaching sessions to support with their coaching goals and progress.	UWES-9 (Schaufeli, Bakker and Salanova, 2006)	Significant positive effect on WE over time (large effect size in t-test and ANOVA), however not long-term. - Significant time (T1, T2) x group interaction effect (control, intervention) for the WE. - Paired-sample t test results for the whole intervened group (after both groups had the intervention) indicated significantly between T1 and T2\T3. - No significant long-term effect between T1 and T4.	- Significant short and long-term improvement of coaching skills, and in-and extra-role behaviour, as well as short term effects on PsyCap.

Name	Intervention type*	Intervention type details	Engagement measure	WE outcomes	Other outcomes
Sakuraya, Shimazu, Imamura, Namba and Kawakami (2016)	Job crafting (2 sessions - 2 weeks between sessions)	Job crafting programme consisting of two group sessions (9-13 people) and accompanying booklet. Session 1: Learn about job crafting and design own plan. 2 weeks' time to implement own plan. Session 2: Reflection, evaluation and adaption of plan.	UWES-9	(Small) significant increase between T1 to T2, but no long-term effect on T3.	- Improvement of job crafting (significant for cognitive crafting, but not for task or relational crafting) - Reduction of psychological distress (significant at T3, but not T2)
Thomas, du Plessis and Thomas (2020)	Job crafting training (incl. training workshop, an individual crafting plan and a reflection exercise over 4 weeks)	Job crafting programme 1. Training workshop: presentation and focus group discussion on their demands and resources and how they can be influenced. Then, individual goals were set. 2. 3 weeks later: Reflection exercise within focus group sessions to explore challenges and success factors and discuss ways forward.	UWES-17	Significant increase between pre- and post-intervention engagement levels in intervened group.	- Social and structural job resources on average significantly higher, challenging and hindering job demands not significantly lower (though a trend is perceivable). - Growth opportunity and organisational support were found sig. higher, but not advancement, overload or job insecurity.

Note: The following key applies:

**In brackets: "number of sessions, duration of intervention phase)"*

4.4.3 Delivery Success Factors

In order to determine what factors promote the acceptance of interventions among the sample population and increase the likelihood of a successful implementation of an intervention, the findings from the six BC intervention papers were synthesised and supplemented by the findings of Knight and colleagues (2017a, 2019).

Throughout the BC papers, supervisor and management support of the intervention was highlighted. Oude Hengel et al. (2012) found in their long-term intervention study in a construction setting, that supervisors need to be involved in sessions, since otherwise they later dilute the effects by hindering organisational changes in the context of workers' autonomy and proactive decision-making. If individual tasks within their jobs or on an organisational level are being discussed with workers, supervisors and management need to be involved and supportive of the changes that may derive from such discussions. Further, especially with respect on organisational conceptual changes, such as more autonomy for workers, both parties, workers and supervisors as well as management, needed to be appropriately prepared for shared responsibilities.

Sakuraya and colleagues (2016) found that while their job crafting intervention (consisting of two training sessions of 120 minutes each, two weeks apart) had (small effect-sized) significant positive effect on WE, the long-term effect (after one month) was not supported. This might be down to participants only focusing on cognitive factors, but not the task of relational job crafting, as this is more complicated and therefore may require more training and organisational support, but also potentially other prerequisites, such as control over work and personal resources. Hence, the importance of proper and thorough training and preparation of needed skills and comprehensive support and assistance in individual implementation of change was highlighted.

Similar observations were made by Peláez et al. (2019; 2020). They confirmed short-term effects on workers' WE with their strength-based micro coaching interventions, but could not find a long-term WE influence, neither in their first (Peláez, Coo and Salanova, 2019), nor in their second study using the same intervention (Peláez Zuberbuhler et al., 2020). It was presumed that the lack of follow-up sessions may have hampered long-term impact (Peláez, Coo and Salanova, 2019; Peláez *et al.*, 2020).

In addition, Oude Hengel and colleagues (2012) recommend that compliance needs to be assured as well as proper and constant conduction of training and intervention quality in order to ensure the likelihood of long-term effects. Thus, the need for thorough and consistent, long-term interventions was demonstrated.

Looking at the broader context of intervention research, similarly, Knight and colleagues (2017a, 2019) found in their reviews, that interventions that derived from the bottom-up showed a higher likelihood for success. Compliance and satisfaction with the intervention were found to have a moderating effect on the success of the interventions and their impact (Knight, Patterson and Dawson, 2019). They hypothesised that this is because the employees are involved in the intervention design and therefore their work-related needs are being met, which fits with the premise of Self-Determination Theory (SDT) (Deci and Ryan, 2000; Ryan and Deci, 2000b). At the same time the benefits are understood and individual ownership, through job crafting, can be taken. Hence, employees are building their own resources in their working environment. This may not only enhance their job resources in terms of autonomy and support, but may also relate to social exchange theory, considering the improved rich resource environment may increase workers' willingness to invest themselves and make an extra effort in their work (Knight, Patterson and Dawson, 2019).

Furthermore, they claimed that management support was one of the most critical success factors for WE implementation (Knight, Patterson and Dawson, 2019). This was not only needed in order to get the general permission to implement changes, but also to make sure that prerequisites, such as enough time and resources for employees to take part in interventions and implement individual changes, were given (Knight, Patterson and Dawson, 2019). Additionally, management and superiors themselves need the necessary resources to first encourage and later maintain the changes. Hence, they need to be prepared, in order to support the changes/changed behaviour.

On a contextual note, Oude Hengel and colleagues (2012) experienced that factors within the work environment, such as laying off workers during the intervention conduction, influence intervention success negatively. In accordance with that, Hodgins et al. (2010) similarly claimed that workers who fear to lose their jobs may not be as involved and committed to (prevention) interventions. However, Aikens and colleagues (2014) found that their mindfulness intervention had a protective effect on layoff fears and their consequences.

In conclusion, the importance of a holistic approach, in terms of intervention design and implementation, had been demonstrated. The findings and reported experiences showed that long-term success was more likely if interventions were designed from the bottom-up but in agreement with and supported by management and superiors. Additionally, the interventions need to be implemented in a way that supports the recipient in making the new behaviour a habit and implementing it in their day-to-day routines. For this purpose, interventions need designated times to be reflected upon and revised to tailor them to the environment. In accordance with that, Cifre et al. (2011) used an Action Research approach in which, after the data collection and analysis phases, the findings were discussed and evaluated with the respective workforce area and together intervention ideas were developed and collected. By doing this, the intervention came from 'within', i.e. bottom-up, which increased compliance. They recommend use of the Action Research method in an organisational context to design organisation-tailored interventions that meet individual requirements and that hold the support of those affected by it.

4.5 Future Research Directions, Practical Recommendations and Implications for This Research

The aim of the narrative literature review was to explore the body of engagement intervention in a BC context and derive what interventions are effective and what success factors to consider.

The review has shown that not much research has been done yet in BC environments, hence there is a need for more peer-reviewed empirical research on evidence-based interventions and their impact on WE in general, but particularly with a context of MF workers. This call for more precise research is supported by publications showing differences between job types in WE experience (Hu, Schaufeli and Taris, 2013; Chambel, Castanheira and Sobral, 2014). Furthermore, most studies relied on qualitative measures, which may not have been appropriate for the used sample size and thus, to assess changes in WE levels. Hence, drawing meaningful conclusions from the review is challenging, yet valuable trends can be identified.

In summary, the following engagement intervention fundamentals were discovered from the review:

- Increasing engagement antecedents:
  The body of research seems to agree, that increasing availability by means of personal resources showed promise as well as enhancing meaningfulness (as well as safety) through enhanced job resources, such as improved LMX, recognition/feedback and empowerment/autonomy/job redesign. However, the findings also indicate that interventions that empower the workers towards increasing their own personal or job resources appear most promising (e.g. through job crafting or coaching) (Sakuraya *et al.*, 2016; Peláez, Coo and Salanova, 2019; Peláez Zuberbuhler et al., 2020; Thomas, du Plessis and Thomas, 2020).

  Recommendation for Practice: Interventions should encompass elements that increase personal as well as job resources, e.g. through positive psychology interventions or increasing soft skills as well as job crafting.

- Holistic implementation of interventions:
  Furthermore, several studies suggested that the intervention design should be thought through holistically to increase intervention success – making the workers architects of their own intervention (bottom-up) and preparing managers and supervisors to encourage and support.

  Recommendation for Practice: Intervention should be based on meaningful participatory settings within hierarchical mixed groups to foster joint creative solution design.

- Style mix (i.e. team and individual level):
  More so, the intervention should focus on team-level as well as personal-level resource increase (Thomas et al., 2020). Knight and colleagues (2017a, 2019) also mentioned in their practical implications, that it is important to assess the "drivers of work engagement" (p.362) on an individual level to evaluate the need for intervention and, as a result, to develop tailored strategies. Within the research conducted as part of this research project, this could be seen as the interviews reported in Chapter 5, exploring the individual promoting and hindering factors of WE in BEP workers.

Recommendation for Practice: Interventions should encompass elements of group as well as individual elements (e.g. group discussions as well as personal reflection).

- Consistency and long-term interventions:
  Last but not least, all studies struggled to evidence of significant long-term effects of their intervention and consequently highlighted the importance of follow-up sessions and a continuous process. Hence, the consistency in the delivery of the intervention has to be ensured: workers need the time to build habits and supervisors need to support/promote continuously. This is in agreement with research that shows that WE, while confirmed to be a fluent concept from day to day (Bakker, 2014; Breevaart, Bakker and Demerouti, 2014), was also found to be difficult to change within certain work contexts (Xanthopoulou *et al.*, 2009; Victor and Hoole, 2017).

  Recommendations for Practice: When designing and implementing an intervention, considering long-term and consistent input instead of single-point approaches is important. Thus, it should be considered how interventions and follow-ups can be integrated into day-to-day business or repeated regularly to ensure regular fostering of job and personal resources. This also means that full commitment from top-management and confirmation that resources are being secured to implement the consequential changes needs to be ensured. Therefore, there needs to be an allowance of time for workers, as well as leaders, to test new interventions and get used to the change in practice over a certain period, even if this may have a negative impact on the performance

In summary, based on this narrative literature review, the intervention to enhance WE levels in BEP workers should be designed in a way that supports the long-term and consistent increase of job and personal resources within an environment that promotes personal and structural changes.

Chapter 5 - Understanding the Driving Factors of H&S Engagement in BEP: A Semi-Structured Interview Study

5.1 Aim and Research Question

Chapter 2 presented literature showing evidence that fostering an environment that supports workers' engagement with H&S shows promise of improving their subsequent H&S performance. Emerging empirical research suggests, to understand and improve workers' safety behaviour, mindset and performance, the workers' H&S engagement levels need to be understood and their promoting and hindering factors (Bell, 2018). While it is clear that several antecedents promote WE in individuals, the impact of these varies (Crawford *et al.*, 2014) and the narrative literature review in Chapter 3 provided evidence that BC workers may experience WE differently to other work types.

Hence, while the literature indicates the impact of general behavioural characteristics on engagement in a broad context, the study reported in this chapter of this research project aimed to explore H&S engagement as a phenomenon in BEP, focusing on perceived internal affective as well as behavioural aspects. Hence, the drivers and barriers of BEP workers' engagement and the reasons for workers' compliant or non-compliant behaviour with H&S were identified and analysed from interviews with employees and their managers within BEP. To date, evidence has largely been drawn from quantitative research, but this novel qualitative study aimed to give the BEP workers a direct voice to communicate their perceptions of proactivity, compliance and engagement in the context of H&S leading to practical guidance for the design of tailored interventions.

Consequently, the research aim of this study reads as follows:

- To identify the promoting and hindering factors of workers' engagement with H&S using interviews to identify the components to consider for improving the H&S engagement in the plant through tailored interventions.

Thus, the proposed research question was:

> *"What factors impact workers' behaviour and mindset with respect to H&S engagement which can be utilised to inform interventions?"*

5.2 Study Design

5.2.1 Participant Sampling and Demographics

For this phase, data was gathered over 3 months between November 2018 and January 2019. The purposive sample for interview consisted entirely of employees directly involved with H&S on the shop floor (e.g. shop floor employees, managers of production areas, H&S professionals). Cell sampling was then applied according to hierarchy level, department and role to gather perceptions from different points of view at the plant as it was assumed that different departments and staff levels may have differing interpretations of H&S behaviour.

With regards to sample size, there is no clear recommendation regarding the number of samples needed for a Template Analysis. General guidelines recommend n=3-16 participants for a single idiographic study, with thematic analysis sample size focusing on data saturation and case studies or hermeneutic insight reached with a sample size of n=1 (Robinson, 2014). Hence, a combined approach was used with the number of interviews determined by saturation of themes, with at least one individual recruited per relevant research area. Despite the plan, occasionally multiple individuals wished to participate. In these cases, due to the willingness of their participation and building of trust, the interviews were conducted. However, it is important to consider selection or sampling bias which may arise from participants' personal or underlying reasons for participation which may impact on the findings. Nevertheless, voluntary qualitative research cannot be considered representative of the whole organisation as it only offers isolated views (Costigan and Cox, 2002). In total, thirty-eight interviews were completed involving forty-three participants. Due to circumstances beyond the researcher's control (i.e. participants were only released for the interviews by the manager in groups, containing volunteers of a team whose PL was briefly stopped due to maintenance actions), two group interviews were necessary: one group consisting of three participants and the other a group of four. Among all interviews, only one of the participants was female while all others were male. This appears to reflect the plant population as there are

no female members on the management team and very few within the general workforce population. While the specific focus was workers' perceptions of their individual engagement, managers were also interviewed to ensure a balanced opinion was captured.

Participants consisted of managers (n=9), machine workers (n=8), assembly-line workers (n=15), specialist department workers (n=9) and H&S professionals (n=2) across different PL and departments.

Table 17: Overview Participants

Code	Role Category detail[5]	Area of work	Length of service in years
OA1	H&S professional	Safety Dep.	10-19
OA2	H&S professional	Safety Dep.	1-9
MB3	Management	PLB	30+
WB4a	Assembly worker - Team leader*	PLB	30+
WB4b	Assembly worker - Team leader*	PLB	1-9
WB4c	Assembly worker*	PLB	10-19
WA5a	Material Planning and Logistics worker*	PLA	1-9
WB5b	Assembly worker*	PLB	10-19
WB5c	Assembly worker*	PLB	1-9
WB5d	Assembly worker*	PLB	20-29
MB6	Management	PLB	20-29
MA7	Management	General	30+
MA8	Management	PLA	30+
MA9	Management	PLA	20-29
MA10	Management	General	20-29
MA11	Management	General	1-9
MB12	Management	PLB	20-29
WA13	Machining worker*	PLA	20-29
WA14	Machining worker*	PLA	30+
WA15	Machining worker*	PLA	20-29
MA16	Management	PLA	20-29
WA17	Machining worker*	PLA	30+
WA18	Machining worker*	PLA	20-29
WA19	Estates maintenance worker*	Estates	30+
WA20	Estates maintenance worker*	Estates	30+

[5] An Asterix (*) means that these participants can be considered shop floor workers

WA21	Store worker*	Store	1-9
WA22	Store worker*	Store	30+
WA23	Store worker*	Store	30+
OA24	Trade Union Convenor*	PLA	10-19
OA25	Engineer	PLA	1-9
OA26	Engineer	PLA	20-29
WA27	Assembly worker*	PLA	10-19
WA28	Assembly worker*	PLA	10-19
WA29	Machining worker*	PLA	30+
WA30	Machining worker*	PLA	10-19
WA31	Machining worker*	PLA	10-19
WA32	Assembly worker*	PLA	10-19
WA33	Assembly worker*	PLA	10-19
WA34	Assembly worker*	PLA	10-19
WA35	Assembly worker*	PLA	10-19
WA36	Assembly worker*	PLA	1-9
WA37	Assembly worker*	PLA	1-9
WA38	Assembly worker*	PLA	30+

To recruit participants, the study information was presented in a management meeting. The manager cascaded this information to the shop floor. However, this approach, by turning the managers into ‘research champions’ to communicate the study to the shop floor, may have led to undue or perceived pressure for workers to participate. Therefore, managers were briefed to be conscious of this influence and emphasise the voluntary element of the request. Posters and personal contacts were also used to reach the shop floor. More information on the recruitment process can be found in Appendix X.III.

Taking part in the interviews was voluntary, therefore only employees who wanted to speak to the researcher were interviewed. Possible limitations that may have arose from this were discussed in Section 5.7.

Table 18: Interviews - Participants Across the Areas

Area	Count
PLA	20
PLB	9
General	14
Total	**43**

Interviews were conducted across all PLs in the plant (see Table 18). The category 'general' summarises all participants that do not specifically work for one PL (e.g. H&S professionals, specialist roles).

Table 19: Interviews - Participants Across the Levels

Role level	Count
Shop floor	30
Management	9
H&S professionals	2
Engineer	2
Total	**43**

Additionally, a representative sample of all hierarchical levels involved in production work was aimed for. As can be seen in Table 19, nine out of nineteen managers participated in the interviews and two out of the four H&S professionals were interviewed.

Table 20: Interviews - Participants Across the Shop Floor

Shop floor role	Count
Assembly	15
Machining	8
Store	3
Estates	2
Trade Union Convenor	1
Material Planning and Logistics	1
Total	**30**

With regards to the shop floor workers, from the thirty participants, at least one of each relevant major department/role was interviewed (see

Table 20).

Table 21: Interviews – Participants Across Tenure

Tenure (in years)	Count
1-9	9

10-19	12
20-29	10
30+	12
Total	**43**

In addition, a balance was reached across participants in terms of their length of employment at Ford (see Table 21). However, it must be acknowledged that workers in the plant were all within their jobs for a minimum of seven years.

5.2.2 Procedure and Analysis

The research aim was to explore and identify PL workers' perceptions and opinions regarding H&S engagement as well as driving factors. Considering the study's research aim, this study focused on the experience of the individual worker using qualitative methods. Unlike quantitative methods, deeper insight and meaning can be attributed to the drivers and influencing factors using qualitative approaches (Braun and Clarke, 2013; Hughes *et al.*, 2016; Sullivan and Forrester, 2019).

Considering the above, it was important to build trust and rapport with employees to address the aims and research question. As such, the interviews had an informal, 'relaxed' atmosphere to them to prevent the participants from feeling inhibited, inquisitive or dull. Thus, each participant was given the freedom to steer the conversation to a certain degree and 'branch out' to identify what they felt were significant factors and examples to explain the H&S climate, their behaviour, mindset or meaning-making. This resulted in both gathering relevant information to the research question and informing the next research stage (Gusterson, 2008), through use of semi-structured interviewing. Furthermore, by enabling participants to tell their story with the use of follow-up prompting questions and gently steering the conversation this also facilitated reducing researcher bias. However, this will be addressed further in the limitations section.

Concerning semi-structured interviews, Turner (2010) argued the researcher is able to be flexible in their line of questioning; adapting to the conversation flow and meeting the participant's needs whilst tackling the areas of investigation. This approach further develops the interview guide with new, yet relevant themes worth exploring which emerge during interviews (Smith, 1995; Hesse-Biber and Leavy, 2010). While other styles of interviewing

were considered, they did not fit the research requirements as closely as semi-structured interviews did. While structured interviews provide precision and a predefined interview schedule to keep on target, it inhibits the flexibility to engage participants in a 'natural' and relaxed manner to enable maximum insights and cater to participants' needs. In contrast, an unstructured interview design, while offering significant flexibility, increases the risk of not addressing the research question and aims, in addition to reducing replicability of the interviews. This may then increase the variation in the interviews and findings obtained.

On considering additional methods, while focus groups offered a similar flexibility as semi-structured interviews with enriched results, they may have prevented workers from opening up about their thought processes due to the potentially sensitive subject being studied. Consequently, the semi-structured interview offered the combination of both a systemic style from structured interviews and flexibility from unstructured styles, through the use of an interview guide with predefined questions and discussion topics to guide the interviews. While one-to-one interviews were the original aim, two interviews could only be conducted in groups due to circumstances beyond the researcher's control. While there were concerns of potential limitations of group interviews which the researcher did attempt to anticipate, there appeared to be honest and open discourse between the participants, with no sign of restraint or reluctance in voicing opinions or experiences probably due to them having worked together in a team for years. Finally, in these group interviews, attempts were made to address each participant equally and ensure all had the chance to add to the conversation. Therefore, it was unlikely that the mixed-method had a damaging or distorting impact on the theme development.

For the purposes of the study analysis, the terms 'barriers' 'promoters' and 'driving factors' were defined as follows:

- Driving factors: relates to all aspects thought to (positively and negatively) influence the H&S engagement of the workers;
- Promoter: refers to any levers that increase and support engaging behaviour; and
- Barriers: describe antecedents that may harm and hinder engagement.

Interviews were scheduled for 30 minutes, with flexibility where necessary.

5.2.3 Ethics

The research was in accordance with ethical standards with ethical approval obtained in advance through Cardiff Metropolitan University Ethics Committee (reference number: # PGR-57).

In accordance with ethical standards, a consent form and participant information sheet were provided to participants in advance of the interviews (further details in Appendix X.I). Signed informed consent was obtained from all participants prior to individual interviews.

5.2.4 Question Development

Identified through the initial literature review and further developed through conversation with specialists and practitioners, the questions for the interview guide were developed. The main questions as well as their respective rational derived from the literature reviews (see Chapter 2 and 3) previously conducted are presented in Table 22.

Table 22: Rational Interview Questions

Topic and Example question	Main rationale
Overall perception about working at the plant (e.g. annoyances, benefits): What is your least favourite/favourite thing about working at BEP? Why? If you could change anything in the plant with no restrictions to time, money or any other resources, what would it be? **General perception of H&S practice, climate, attitudes and compliance behaviour:** What factors encourage you to engage in H&S practice? Tell me about Health and Safety (H&S) here at BEP. What do you need to make you work more safely and take better care of yours and your co-worker's health?	Exploring factors that make work enjoyable (or not) may give an indication of job resources that influence engagement (Bakker and Demerouti, 2007, 2017). In his qualitative study on camp councillors, that first coined the concept of engagement, Kahn (1990) used general questions about the participants' attitudes towards their jobs and what encouraged them to be more involved to explore their engagement levels and the factors that drove it. Hence, asking on a high level what the participants think about H&S at the plant and factors that they feel contribute to H&S behaviour or are currently lacking made sense to get a general overview of the engagement level in the plant as well as to identify motivational drivers.
Management in general and in regard to H&S: To managers: What is your main focus when walking around or inspecting a site?	One of the key difference between Safety-I and Safety-II is the focus of safety i.e. only on the negative events and behaviour or mainly on the positives and the involvement of workers in the development of safety (Hollnagel,

To workers: What do you need from management to make you work more safely and take better care of yours and your co-worker's health? To both: If you had the power, what would you like to change with respect to how H&S is being managed? How are H&S documents and procedures developed?	2014b; Hollnagel, Wears and Braithwaite, 2015), hence the questions aim to investigate the level of 'resilience mindset' in the plant. Further, the leadership style was found to be an antecedent of engagement as well as safety climate including Safety-II (Conchie, Moon and Duncan, 2013; Salanova and Llorens, 2014; Van Loggerenberg and Nienaber, 2017).
Communication in general and in regard to H&S: When you first started at BEP, how did you learn about all H&S related topics? In what way are you being informed about H&S policies, etc.? How does communication at BEP work? What works very well regarding H&S communication?	Again, for engagement as well as safety climate including Safety-II, communication in the sense of informing and skill development and feedback were found to be antecedents to H&S related behaviour (Hollnagel, Wears and Braithwaite, 2015; Huang *et al.*, 2016; Dekker, 2018b; Nasima and Shalini, 2018).

Since the term 'H&S engagement' is complex and difficult to define, the questions explored participants' perceptions indirectly, through influencing factors and scenario descriptions.

The questions were primarily open, while closed questions were followed with a follow-up or probing question. The question order followed a natural golden thread, i.e. starting with lighter questions regarding general job satisfaction and then delving deeper into H&S topics and underlying factors. It has to be noted, that not all questions had to be asked in each interview, as they were utilised as guides to probe insights and opinions regarding the overall topics. For example, where participants provided information in a discussion, but it was also relevant to a later question, the researcher then either a) took up this thread of conversation, independently of the set chronology in the guide, or b) if the researcher felt that sufficient information was already given, she did not address the questions regarding the topic again.

Following drafting the interview guide, this was discussed with the research supervisor, a H&S professional, and further developed. The initial few interviews were used to pilot the guide allowing for it to evolve throughout the research. Thus, throughout the research course,

the questions and their chronology were often modified to keep the interview situation comfortable and natural for participants, while retaining focus around the core themes being studied. The final version of the interview guide can be seen in the Appendix X.

5.2.5 Contextual Information

During the time of the research, the plant faced major economic difficulties that led to forecasted redundancies. Thus, many workers feared for their jobs and the plant's future which may have influenced responses at times.

With respect to the scope of the analysis it should be noted that one of the three PL was in the process of being established and particular attention by line managers was paid to empowering and involving workers in the process and decisions. Also, workers at this PL felt that their jobs were secure. To distinguish between these two distinct management styles, workers at the new PL will be referred to as 'WB' while workers at the other two PL will be referred to as 'WA' (the same applies to references to Managers, i.e. 'MA', 'MB'), workers in other jobs will be referred to with 'OA' (see Table 17).

5.3 Analysis

A particular type of Thematic Analysis (TA) called Template Analysis (TemA) (King and Brooks, 2018) was applied to the interview content as it was best suited to the nature of the data as well as the aim of the study. NVivo Version 12 (NVivo, QSR International, Melbourne, Australia) was used to support the coding process.

TemA was chosen for multiple reasons: Firstly, coding a number of data items before interpretive themes are structured avoids the premature shaping or directing of research interpretation, complementing the inductive nature of the study (Brooks and King, 2012; King and Brooks, 2018; Saunders, Thornhill and Lewis, 2019). Secondly, TemA offers a practical and strategic approach to analysing a large data-set (thirty-eight interviews each between twenty and sixty minutes duration) which would otherwise pose a challenge to complete within the given timeframe (Stead *et al.*, 2001; Galpin *et al.*, 2017; King, 2017; Shilling *et al.*, 2018; Saunders, Thornhill and Lewis, 2019).

The common six-step approach (King and Brooks, 2018) was adapted to meet the project's needs (see Figure 15). In TemA the data was transcribed and coded analogue TA (information on the transcription process can be found in Appendix X.V), but in contrast to TA, first only a proportion of the data is coded; based on these derived codes and themes, a so-called initial 'coding template' was developed (King, 2017). This template was then used to analyse the other interview data and was adapted or rearranged according to the data (Saunders, Thornhill and Lewis, 2019). It is recommended to derive the initial template from an appropriate cross-section of the data, with no clear indication of numbers given (King, Brooks and Tabari, 2017). After screening all thirty-eight audio records, interviews were picked for transcription and initial analysis that seemed to offer deepest detail on themes and, at to a peripheral degree, give a cross-selection of the overall sample, thus a balanced number of each H&S dimension (i.e. areas and departments as well as hierarchy levels and length of employment to BEP) (see Appendix X.III). As some roles are further from the activity and distraction of the PL, e.g. specialty departments (e.g. engineers, store) in comparison to assembly and machine workers, the focus was set on the roles closer to production to maintain the research findings lined up with the aims. However, their views were considered and added to the template, which evolved throughout the analysis of the transcribed interviews. Furthermore, where multiple interviews were available from one area or hierarchy, a choice was made to represent the group with the interview that offered most relevant information in answer to the research question and thus, to the themes, for example, discussing more detailed the factors relevant to engagement, or offering new insights. While this was a subjective evaluation of the content by the researcher based on the researcher's reflective case notes as well as listening to the whole body of data first. However, insights from other interviews were not neglected, rather, they were acknowledged and added later through the template process; The remaining twenty-eight interviews were analysed audibly from the recordings (i.e. listening and taking notes of accounts relevant to themes and transcribing relevant parts), as direct audio coding was found to be as reliable as transcript coding (Farley, Duppong Hurley and Aitken, 2020).

In terms of coding, across the whole selected data set, the data was systematically labelled, i.e. coded to a theme on either a semantic or latent level (as the authors were interested in the surface meaning but the study also aimed to identify the underlying conceptualisations

and assumptions to inform the semantic content). This process was appropriate as it aimed to create meaning throughout the data set. It was recommended that particularly in the beginning, the more thorough the data is coded the more meaningful and inclusive is the template later, thus allowing iterative development of the template and the included themes by assessing further data but also critically questioning the coded data's relevance to the research question (King, Brooks and Tabari, 2017). In general, the TemA was meant to be inductive, exploratory and naive, as the data was meant to be explored bottom up. In order to make sure that all possible labels or codes were identified, the transcripts were read repeatedly. Some content was labelled from different perspectives and thus, the same text may have been coded to more than one theme.

For example, a sentence along the lines of "My manager doesn't listen to me anyway, why would I even bother." was coded with several different labels. First of all, the general label 'Engagement – voice/feeling heard' was used as the phrase shows how the feeling of not being heard ("My manager doesn't listen to me anyway") leads to disengagement ("why would I even bother"). It also demonstrates that the perception of management (or at least of some managers) from this worker is that they do not listen, therefore it was also labelled as 'Leadership – doesn't listen'. By implication, this also shows that for this worker, being heard is necessary to engage, which led to the label 'Antecedents of pos. safety culture/engagement – voice/feeling heard'. Finally, the sentence could also be construed as a general barrier within the H&S culture that exists for workers in order to engage with H&S. Thus, the label 'safety culture – barrier – not being heard' was created. The researchers acknowledge that some labels might be overlapping, however, this method of labelling allows different perceptions to be taken into account in later analysis. All labels were systematically and logically clustered and translated into codes, sub-themes and themes.

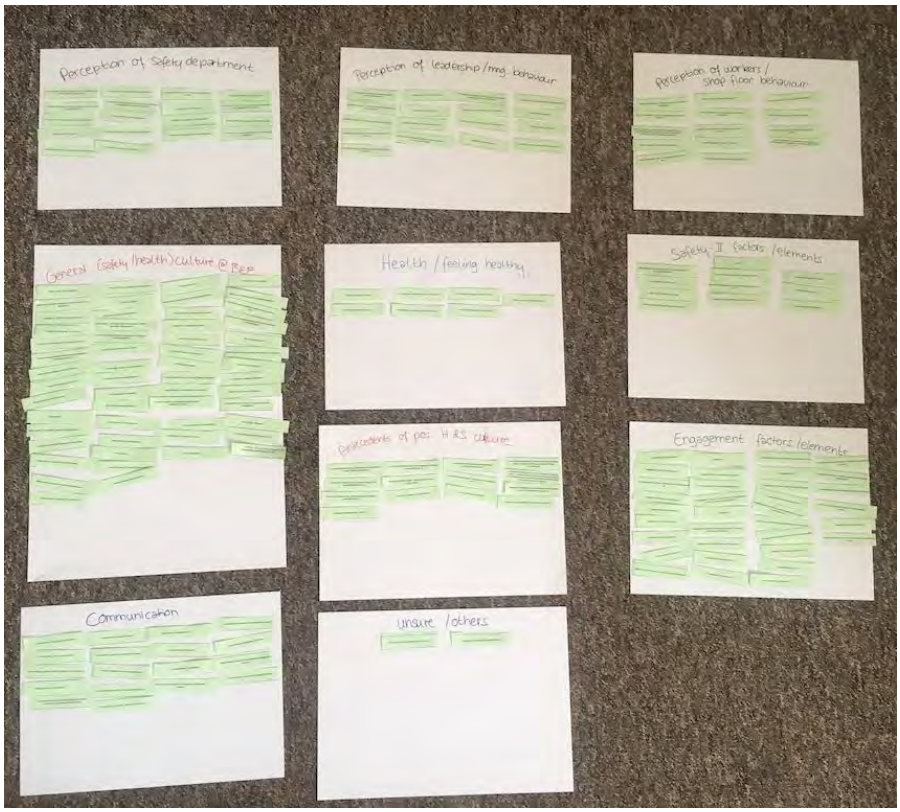


Figure 11: Interviews - Sorting Labels and Codes Into Themes

Some code names were chosen based on the individual's language concept, while others were based on the researcher's concepts. The codes worked as a label for the researcher as they are descriptive or interpretive, and as such, thus the coding template developed and expanded throughout the process. Furthermore, the initial notes, comments and ideas from the familiarisation and coding phase evolved dynamically so that connections and interactions could be noted and mapped in memos and drawings (see Figure 11). Once each transcript was coded, the complete body of transcribed data was read once more and compared to the code/label set in order to make sure that no relevant coded section was missing. The codes were then clustered, and an initial template was created (see Figure 13) and discussed with the research team to ensuring the clarity of the template as well as how it comprehends the data. There were no disagreements regarding the data representation. Concerns regarding names of themes or duplicity of content was discussed and adjusted after agreement.

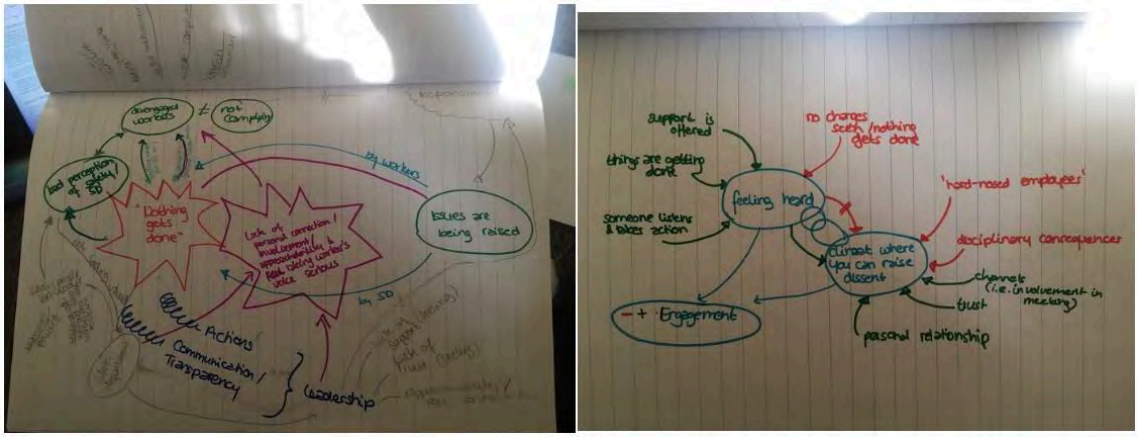


Figure 12: Interviews - First Drafts of Drawings Noting Potential Relationships

Throughout the further analysis, the template and themes and their relationships evolved iteratively through input of the subsequent recordings. Before finally ending up with a template that was a rich and inclusive depiction of the data, the themes and codes were rearranged and renamed several times, merging themes that related to the same aspects and deleting elements that, after critical evaluation that did not answer the research question[6]. For example, a first construction of the template differentiated between 'barriers' and 'antecedents' as opposites (see Figure 14). That was later merged to general themes incorporating both dimensions. After all data was analysed, again, quality of the template was assessed within the research team using the same procedure as described for the initial template.

The final template is presented in Table 23.

[6] A detailed audit trail documenting all changes of codes and themes can be provided upon request.

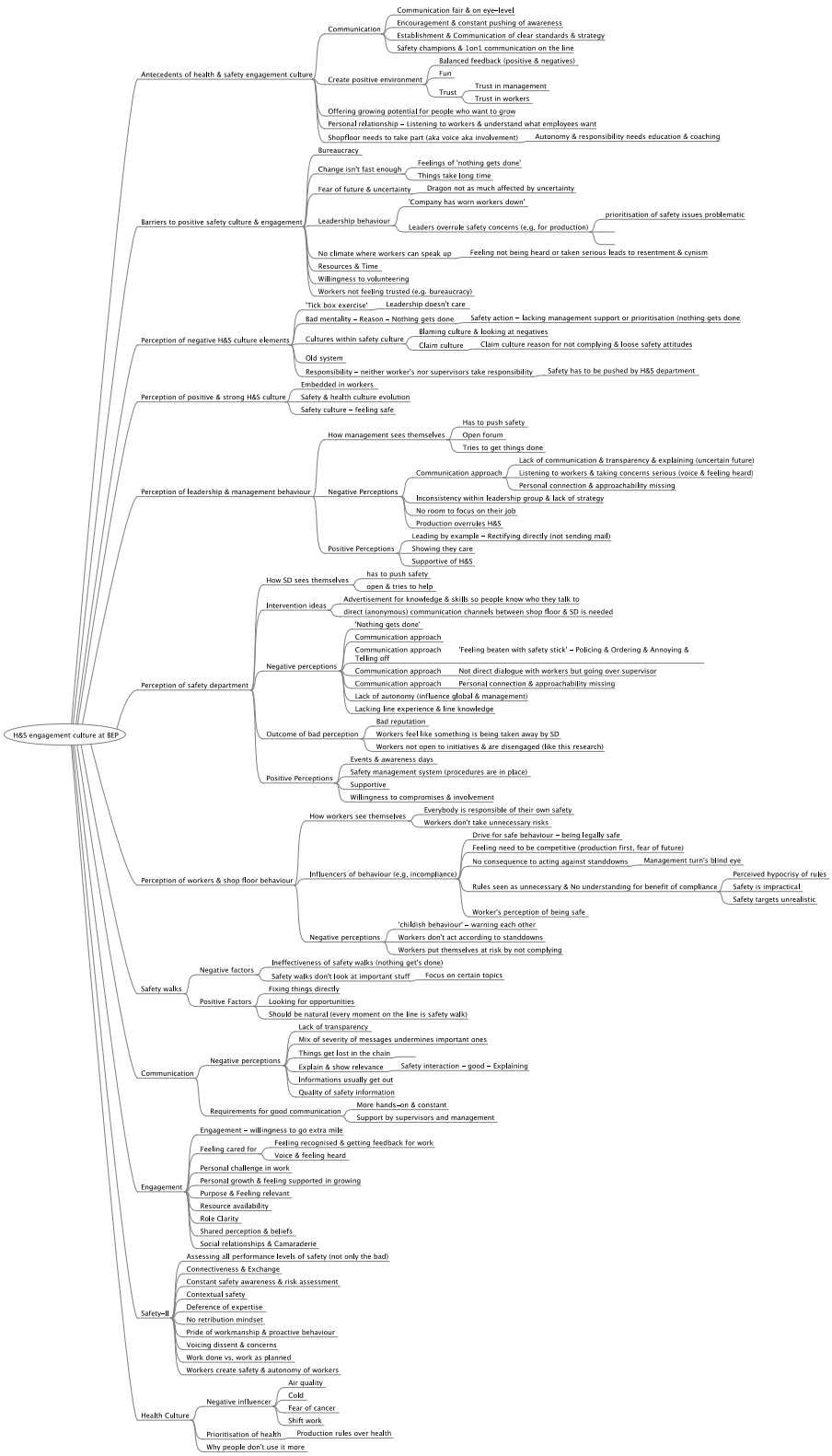


Figure 13: Initial Template - Overview of Initial Codes and Themes

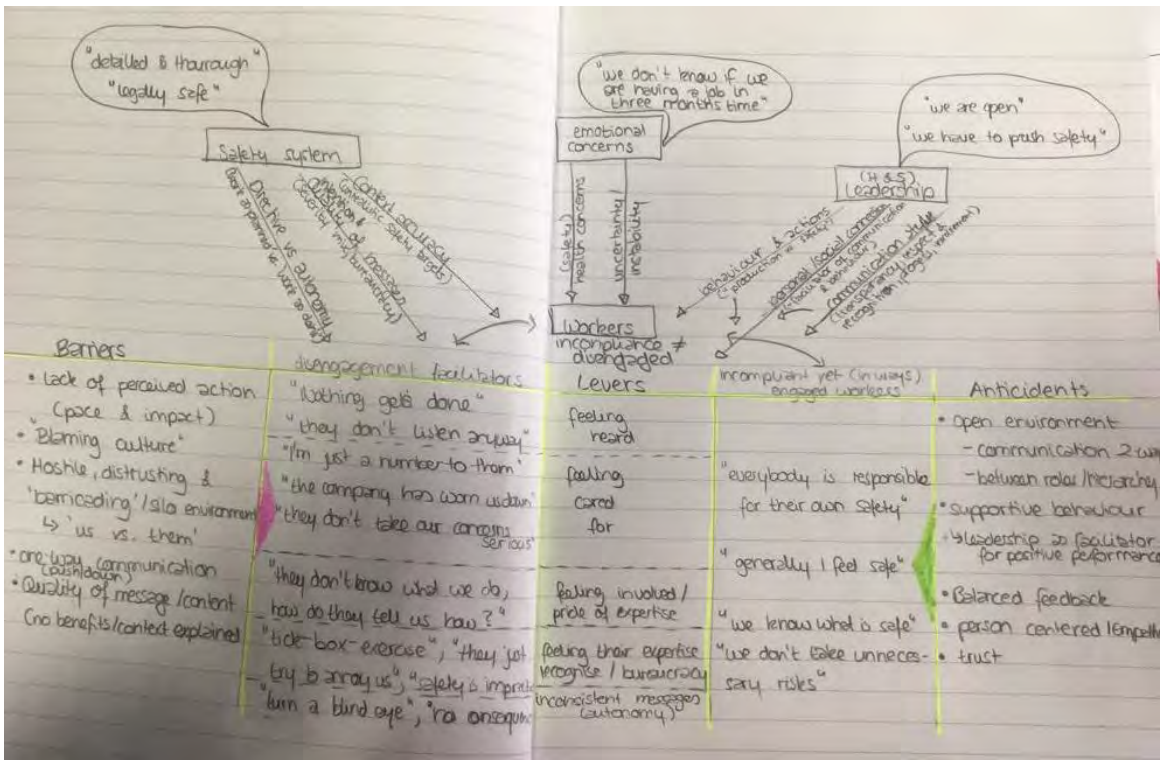


Figure 14: Initial Thematic Map and Base for Initial Template

In order to demonstrate and ensure the quality of the data collection and analysis, the criteria recommended by Sullivan and Forrester (2019) were followed which consider reflexivity, transparency, coherence, contribution and trustworthiness (details in Appendix X.VI).

Phase 1: Familiarising with data set
Initial audio check of records and first collection of themes

To enhance familiarity with the data, the transcribed data was read alongside listening to the audio file twice. Through this critical and analytical process, the first notes, comments and ideas regarding the content were collated.

Phase 2: Generating initial codes/labels of the transcriptions
Systematically and thoroughly labelling of relevant data extracts

Coding was conducted on a semantic or latent level; as the focus was on the explicit and surface meanings and aimed to identify underlying conceptualisations and assumptions to inform the semantic content. In addition, hierarchical (i.e. identifying overarching and more specific themes), as well as parallel coding (i.e. coding the same segment with different codes), were applied.

Once all transcripts were labelled, a total of 192 codes were created. However, due to the detailed and mixed coding approach, it was possible for some labels to be redundant or consider the same topic from different views.

Phase 3: Clustering of codes
Identification of relationships and themes between labels/codes into thematic map

Identified codes and themes were organised in clusters, to identify meaningful coherent patterns and relationships across the whole data set. Thus, not only was the quality and coherence of the themes checked, but also if they suited the collated data. Secondly, to secure quality, the themes were reviewed across the transcribed sub-set of the data set using 'thematic mapping' in order to create a thematic map with differentiated themes, forming clear and coherent patterns that captured the dimensions of data most relevant to the research question.

Phase 4: Development of template
Transformation of thematic map into template showing the connections between themes

Based on the thematic map, the coding template was developed. For this, the thematic list was transformed into a 'big picture' format, which represented the connections and relationships between the themes. This provided a visual answer to the research question.

Phase 5: Modifying and finalising of template
Check of remaining audio records of interviews for codes and additions to the template & revision of template

The development of the final coding template is an iterative process. The remaining twenty-eight interviews were acoustically analysed. After every three interviews the notes and codes were revisited, leading to refining, reorganising and adapting the coding template according to new insights. It was important when adding new codes or themes, that the whole body of data was revisited to ascertain any potential consequences on other themes or codes. Within this iterative process, some of the themes were renamed .

Phase 6: Interpreting the data and writing up
The themes, their connections and interactions were presented and interpreted both systematically and critically in a written report

Finally, the themes, their connections and interactions were presented and interpreted both, systematically and critically in a written report which uses data extracts to support them. A theme-by-theme approach was applied; presenting first an overview of the main theme and then each sub-themes with supporting quotes. The differences between context groups were also highlighted where present. Afterwards, the complete theme was interpreted and discussed with respect to existing empirical research.

Figure 15: Template Analysis Process (Adapted from King and Brooks (2018))

Table 23: Final Template

Theme	**Sub-theme**	**Codes**
Workers' perception of their H&S engagement	Autonomy of safety/being safe	'Everybody is responsible for their own safety'
	Taking (un)necessary risks	Taking (un)necessary risks
Safety focus	Organisational safety focus	Contextual safety/Context (ir-)relevant rules Flexibility level/Autonomy Autonomy of managers Intention 'Tick-box exercise' Hypocrisy and bureaucracy of rules Collision between production and safety goals Safety as number one value Safety system evolution Safety department staff proficiency
	'Lived' safety focus	Complacency 'Work-as-planned' vs. 'work-as-done' Blame culture Feedback and education Recognition of positives Managers' safety focus Managers' focus on safety/production H&S policing No consequence to in-and noncompliance Perception of 'Nothing gets done' Management under pressure Leading by example/rectifying directly
Communication	Communication quality and consistency	Permeability Consistency Encouragement H&S leadership as H&S consultants Positive perceptions Events and awareness days
	Communication direction	Level of information sharing and transparency Level of explaining Directive quality Two-way communication Communication fair and on equal terms Listening and involvement
Environment	Psychological environment	Uncertainty and instability Fear of job loss Perception of need to be competitive due to plant's financial situation Health perception and concerns Shift work

		Temperature Air quality
	Social environment	Trust Relationship between management and shop floor Camaraderie

5.4 Results

With respect to the factors affecting H&S engagement at the plant, after careful consideration of all codes, comments fell into three main themes and one supplementary theme, which were identified as overall categories:

- "Safety focus" (Section 5.4.2),
- "Communication" (Section 5.4.3), and
- "Environment" (Section 5.4.4) , as well as
- the supplementary theme "Workers' perception of their H&S engagement" (Section 5.4.1).

Within the identified main themes, several drivers and barriers were identified as sub-themes.

These three broad themes have been identified to aid further analysis of key concepts, but it is recognised that categorisation in this way is problematic due to the overlapping nature of these themes and their interdependencies. The categorisation was based on the primary and dominant feature of the respective data as well as on relevance to the research question as recommended by King and Brooks (2018).

In addition, commentary displaying the workers' individual engagement level was collected (Section 5.4.1). This was considered a supplementary theme, as it does not directly address the research question but was considered important contextual information to understand the main themes.

5.4.1 Workers' Perception of their H&S Engagement

This theme contains commentary relating to the workers' perception of themselves and the reasoning for their behaviour. Overall, workers indicated that they (1) take responsibility for their own safety and (2) would not take unnecessary risks as they know their jobs (Table 23).

Autonomy of Safety/Being Safe

Most workers agreed that they are *"in charge of [their] own safety"(WA36)* and that they *"don't come into work to get hurt"(WA31),* voicing their constant intention of taking care of themselves and others.

Indeed, one worker highlighted that avoiding unnecessary risks and taking care of himself and others comes naturally to him:

> *"I take personal responsibility for myself, and I take collective responsibility. I would never leave a machine be unprotected for my colleagues."(WA20)*

This quote emphasised the relationship and care-element between workers as well as this worker's intrinsic drive for safety as he takes *"personal responsibility"(WA20)* for himself and his peers.

Taking (Un)Necessary Risks

For various reasons, such as practicality or contextual relevance, workers' safe working was perceived to not necessarily mean compliance with rules, but rather to knowing their jobs *"inside out"(WA36)* and *"the best way to do it"(WA36).* Workers perceived that their skill and experience and common sense prevented them from taking unnecessary risks. One worker suggested that a strong H&S mindset was ingrained in his thinking as a consequence of working at the plant:

> *"I find [safety[...]] is embedded [...] into me, I take it outside, I notice the stupidest things, that people won't noticed [...], I'm doing a risk assessment while walking past things without realising it [...]."(WB4a)*

He acknowledged that risk assessments and safety calculations are part of his every day thinking and impacted his decision-making inside and outside the plant. While the worker

considered this *"H&S standard"(WA4a)* as a result of the safety trainings and constant communication, it may also indicate that risk assessments that he may have conducted subliminally raised his conscious awareness of risks and potential unsafe situations (e.g. how likely is it that this car will hit me if I cross the street now?).

Overall, workers reported viewing themselves as safety conscious and responsible and displayed a considerate level of H&S engagement, and yet, in their eyes, this did not necessarily equal compliant behaviour.

5.4.2 Safety Focus

The safety focus theme contains commentary reflecting the assessment and management of all safety performance. This was impacted by two properties: (1) on an organisational note, the plant's procedures and their perceived quality, and (2) on a social, 'lived' note (i.e. how management behaved regarding H&S aspects and thus how H&S was 'lived' at the plant). Both dimensions were perceived by workers as a demonstration of the company's focus and priorities. An overview of the underlying codes is provided in Table 23.

Organisational Safety Focus

In general, workers reported satisfaction with the provided H&S standard structures and the *"very good systems […] to keep everybody safe"(WA32)* as well as the personal protective equipment (PPE) provided. While the plant's culture was described as *"evolving"(MB3) "in the desire to make it a safer place"(MA8),* managers as well as workers agreed that the safety system and culture were still in many ways *"old school" (WA29)* and the same *"for over thirty-five plus years" (WB4b).*

Several workers criticised the contextual relevance of certain regulations. Often, rules were implemented top-down from the global parent company into all plants without consideration of local requirements. In addition, the safety department was perceived by some workers as *"unqualified"(WA17)* since they *"have worked on the line for a minimal point"(WA36)* and have *"just read a book"(WA18)* and therefore *"don't understand what it's like"(WA36)* to work on a PL. Consequently, these workers doubted the safety department members' ability to define relevant and practical safety items. One rule, often mentioned in this context, was the use of headphones on the PL with the explanation that workers wearing them *"can't hear*

it if people are calling you, you wouldn't know if something has happened"(WA36). In addition, this worker also mentioned that they *"don't feel it's an issue wearing headphones on the line, because nothing should be going into you, you shouldn't having a fork truck coming into you"(WA36).* While the aforementioned forklift trucks *"are electric anyway, so you would never hear it"(WA36),* he and his peers perceived the PL environment as protected since they *"have boxes behind [them], you have racks behind you, you have everything on the line, I think it's safe"(WA36).* Nonetheless, the same worker admitted that *"while walking, I would say, headphones out"(WA36).* The worker displayed a general understanding of the necessity and benefits of the policy in a certain environment (e.g. when walking or close to vehicles), however, in other circumstances (e.g. on his workplace) he does not see the relevance in that specific (by him perceived as 'safe') context. Thus, while not questioning the complete policy, the worker identified difficulties and displayed frustration with a 'one-size-fits-all' approach in relation to certain regulations that applied plant-wide. He proceeds by explaining that by *"putting a bit of music in your ears […] time goes quicker"(WA36)* and it *"brighten[s] your day up"(WA36)* because the work on the PL is otherwise *"monotonous"(WA34)* and *"boring"(WA34).* This attitude was shared by many of his peers (e.g. WA20, WA30, WA31). Consequently, certain rules were perceived as *"taking something away from"(WA36)* the workers in order to *"mollycoddle"(WA20)* them with overprotective rules. This led to workers doubting the genuineness of management's intention and only considering safety as a *"tick-box exercise"(OA24)* for the company to appear "*legally safe*"*(MB6)* and *"cover it all [legally]"(WA29)*:

> *"I think they [management] are more worried about the insurance side of things than the actual person themselves being injured." (WA20)*

Within the interviews many participants used the term 'tick-box exercise' to refer to certain aspects of the safety system (e.g. W4a, WB5a, WB5c, WA35, WA17, WA18, OA24). For example, one worker questioned the company's trust in his ability and sense of responsibility based on the safety items provided:

> *"It's a checklist, making sure that everything is safe for me to work. You know, if I have to observe a machine if it's actually working [slightly ironic tone]...I understand it, it's to cover it all. But I like to think that I'm a responsible enough person to do all that. Maybe not…[…]We should be trusted to do [our jobs] without the paperwork*

> *((...)) as it comes back to responsibility. [The company] should give us back a bit more responsibility. Let us do our job."(WA29)*

While the worker acknowledged the awareness-factor of checklists, he also indicated annoyance and disappointment and slight offence by the controlling, 'parent-child' connotations of them. In his perception, checklists not only reflected management's doubts in his personal responsibility but also questioned his experience and intellect. This was perceived as evidence of H&S leaders' distrust in him as well as an insult and discreditation of his skills, and consequently, his pride in his work. Thus, this worker's need for autonomy, feeling valued and competency recognition may have been unfulfilled. This led to frustration and disregard of the H&S leadership team as well as certain H&S topics. However, the statement also indicates that for this worker, feeling trusted was linked to actively taking responsibility. Hence to increase workers' trust, a distinct transfer of responsibility from management to the workers together with an increase in workers' autonomy must occur regarding safety decisions.

'Lived' Safety Focus

In the same way that safety was defined in the official standards and procedure, the way that it was 'lived' and presented through actions was shown to impact workers' H&S engagement.

The perceived focus of the H&S leadership team throughout the organisation was primarily on negative events, displaying a punitive and retribution mindset, appearing to promote a disengaging environment, confirmed by management admitting that they *"look for the failures rather than the successes"(MA7*). This resulted in workers' attempts to hide mistakes and enhanced the divide between leadership and workers, with a lack of perceived trust and fair feedback.

In one instance, a worker clearly highlighted his positive intentions and the inner drive to remain safe at work by saying *"[n]o one has accidents on purpose"(WB5b)* and yet he admitted that *"[...] if you drop something you may not come forward because it's a black mark on your record"(WA5a),* identifying that the retribution mindset at the plant led him to be careful to disclaim negative events. This also implies that this worker feels he cannot speak up about potential safety issues or improvement opportunities in fear of punishment. The

commentary also suggests a certain level of frustration with how the worker feels he is treated, despite the first part of the comment indicating that he takes pride in - and aims to do - a good and safe job. Hence, the comment demonstrates how the *"blaming culture"(WA23),* as mentioned by several workers at the plant (e.g. WA5a, WA23, WA28), suppressed workers' involvement and voice in H&S, as well as reducing the meaning they get from their work. Most workers agreed that a constructive approach was needed in order to learn from incidents. Consequently, providing balanced feedback which acknowledged both positive and negative events, *"to educate rather than dictate"(WB4a)* would provide workers with an opportunity to learn from mistakes without the fear of discipline. This was linked positively to an open and positive safety climate, supporting worker engagement and enabling workers to *"develop together"(WB5c).*

This notion was particularly evident at PL-B, with workers reporting feeling empowered as a result of additional training and a stronger integration into decision-making processes. Here, workers *"have been educated"* and when they are *"making a decision on something", "[management] listen to what [they] gotta say and they go along with what [the workers] suggesting"(WB5b).* The worker who described the approach at PL-B continued by saying that *"[i]t's nice to have an opinion that people actually appreciate and use"(WB5b) and "[t]hat's been a massive positive for [him] in this launch [of the new PL], the biggest thing to be honest"(WB5b).* This demonstrates how increased levels of involvement and recognition of his positive effort is valued by him, giving meaning and pride to his job and driving his engagement.

On another note, workers' commentary suggested that their interpretation of management's behaviour in relation to H&S was directly translated into how management prioritised H&S. When *"people got concerns"(OA1)* and *"they report it to [the managers]"(OA1)* they had the feeling that *"[management does] nothing"(OA1*). Despite actions possibly taking place in the background, but often with no feedback to the issue-raising person (e.g. something was being done, but it was not directly perceivable), this led to frustration about the lack of recognition of their voices and concerns. The lack of action was also often interpreted as management's lack of commitment to H&S and care towards the workforce, since *"[management doesn't] listen until an accident happens"(WA15).*

While most workers agreed that the PL would be stopped in the case of a profoundly serious issue, aspects which management identify as 'minor' (e.g. lighting situation or roof leaks) would be ignored or unresolved for 'production sake'. Workers consequently perceived that *"production is king"(WA15)* with one worker emphasising the perceived collusion between safety and production as the number one value, noting that *"[the workers] tend to have that safety culture mindset anyway, but I think probably the hierarchy they are probably more concerned about money first"(WA4a).* This insinuates that management are prioritising production over safety and stating that *"if [the workers] do it the way, [the safety department] want [them] to do it, [the workers] not gonna have any chance on hitting that [production] target"(WA31).* Also, the same worker (and some of his peers) explained that *"[they are] working on 20-year-old machines that are basically falling apart"(WA31),* which leads to the workers' perceived need to *"firefight"(WA31)* constantly which in turn was reported to *"[have] an effect on how [the workers] conduct [themselves] cos [they] have to cut corners to keep the machines running"(WA31).* The perception of *"production is king"(WA15)* appears to derive from the perceived lack of consequences for noncompliance, which they interpreted as an encouragement to continue; *"Basically, they know that we know what we are doing, and they leave us alone to do it"(WA31).* While the workers seemed to agree they would never put themselves in what they would perceive as a dangerous situation, they admit that *"there is a disparity between what the safety department asks from us and what we actually do"(WA31).* Workers also perceived that H&S leadership was aware of the variations in procedures and thus the breach of protocol appeared as acceptable to them. Hence, the workers perceived they had autonomy through neglect of H&S leadership in enforcing the rules in favour of production and subsequently acknowledged policies as impractical. While the management may not have intended this, the perception as outlined resulted in the respective H&S behaviour.

5.4.3 Communication

In discussing engagement and H&S, the workers perceived (1) quality and consistency and (2) direction of communication efforts regarding H&S policies, procedures and behaviour as recurring themes (Table 23).

Quality and Consistency of Communication

In terms of quality, one key factor was identified: the subliminal messages perceived as being communicated (intentionally or not). By way of example, in discussing a task, one manager admitted that often, despite the supervisor highlighting that *"obviously"(MA8)* safety comes first, they were *"sending [the] wrong message by asking wrong questions like 'when will you be done?'"(MB6).* This was confirmed by workers reporting that *"the pressure is already there, cos you don't want [PL] to go on stop. You feel obligated to try and rush"(WA5a)* or that managers criticised the worker later for taking more time to complete a task safely and in compliance with the rules. As a result, this was identified as adding pressure to the workers and undermining the safety message, leading to workers feeling obliged to prioritise pace over safety. Also, it could be suggested that supervisors' behaviour and communication regarding the prioritisation of safety may influence subjective norms. Thus, behaviour in which safety was displayed as secondary in comparison to production (with or without respective intentions) might be perceived as favourable in the context of the perceived norms.

Regarding safety messages, management and workers described issues with the permeability of messages, since *"[…]the information is [not] passed on well enough to the […]shop floor […]"(OA2).* Generally, safety messages were cascaded from top-management to managers who were in charge of ensuring that the messages were communicated via the supervisors to the shop floor. Concerning regulations or rules, several workers reported that management would give none or limited explanations with managers admitting that some workers *"have never been told why"(OA2).* This led to workers not understanding and/or accepting these policies, as one worker reported that *"[s]ome foremen are on a power trip and don't explain tasks or things and just scream at you"(WA37).* This remark emphasises the importance of communication, as well as education and training for supervisors and managers, to ensure they are aware that they are considered as role models by the workforce and therefore must always lead positively in the topic of safety.

Most workers and managers agreed that *"taking the time to talk and explain to people" (MB6)* was paramount to getting support from the shop floor. Similarly, workers highlighted the importance of personal communication to the manager and safety department on a regular basis to explain safety issues and rules. For example, taking five minutes every day with

each shift team to raise and discuss (safety) issues would be beneficial. Otherwise, the commentary suggests that messages were diluted; they were perceived as *"tick-box exercises"(WA18)* resulting in a loss of significance and meaning, or they did not reach the workforce at all leaving workers feeling disrespected and ignored by management.

In addition, it was considered important that the safety focus was aligned between the different departments since it is currently perceived as *"[e]ach area manager pretty much runs his own area the way he wants"(MB3)* with no *"collective aligned strategy"(MB3)* leading to unequal handling of H&S in each area and a regarded lack of stability and justice. Hence, not only is the communication frequency and quality important, but also consistency in the safety messages in terms of workers' H&S engagement.

Communication Direction

As indicated above, workers often felt *"annoy[ed]"(WA30)* and as if *"[the company] is completely ignoring the feelings of the workforce"(WA34)* with management perceived as neither listening to them nor taking their thoughts into account (e.g. ignoring their input). As it was reported that *"[s]afety rules always come down"(MA16)* and *"never come from the shop floor"(MA16),* workers criticised their lack of involvement in decision-making or managers' attempts at taking their ideas on board. Also, the commentary suggested that the approach did not fit the workers' values or that they did not agree with it (e.g. WA13, WA17, WA21, WA36, WA38). This disengaged workers from H&S as they felt that they were made to take orders as opposed to being part of the process and supporting something they believed was right.

As an example, one worker illustrated this point by reporting that after he and his colleagues had completed a training course on rescuing, they proactively produced the idea to *"give a map to everybody in the plant so everybody knows where they are"(WA17)* and where the nearest defibrillator was, but he felt that he was *"not taken serious"(WA17).* He felt the manager did not listen to their suggestion and directly disregarded it since the plant already had an established approach. The worker clearly showed a feeling of disappointment in the lack of appreciation of his creativity and proactivity. His frustration at the disregard of his input was since demonstrated towards the manager by pointing out every time he sees him that he would probably be *"dead now"(WA17)*, since the company's *"way doesn't*

work"(WA17). While this may or may not be true, it depicts how the lack of involvement, and the perceived disregard of workers' proactive improvement ideas may lead to resentment and disrespect.

Similarly, many workers communicated frustration with the level of information flow, as feedback on certain processes, concerns or issues (e.g. roof leaks, status plant future) were not reported back to them and they felt like they *"were kept in the dark"(WA13)*. In light of the plant's uncertain future, many felt that *"if something happens to the plant [they] should be the first to hear about it"(OA24)* instead of receiving news through the media which was perceived as disrespectful.

In contrast, fair communication on equal terms as well as *"listen[ing] to the work-force"(WA17)* and *"hold[ing] meeting[s] with people from every area"(WA31)* to include them as part of the safety discussions and decision-making processes was thought to improve workers' H&S engagement by creating a feeling of trust and appreciation. A good example can be found in the commentary of a worker from empowered PL-B. Here, workers reported feeling trusted and valued as if *"[management] want you to succeed"(WB5b)*. At this PL, since they were *"all a team, so [they] share information"(WB5b)*, workers reported feeling *"part of the process"(WB4a)* and consequently respected by management. They felt PL-B had a cooperative environment since it was *"a two-way street over here"(WB5d)*, in which everyone could speak up and (positively) challenge as no one was left to their own devices.

5.4.4 Environment

This theme entails commentary regarding the environment of the workers; (1) from a psychological perspective, such as their concerns and fears regarding the economic climate as well as issues impacting their wellbeing and health (such as shift work), and (2) their social environments reflecting on interpersonal factors such as trust, camaraderie and the leader-member relationship (Table 23).

Psychological Environment

The biggest concern affecting workers' psychological availability, and therefore engagement, was the economic situation of the plant and the resulting job insecurity with workers' biggest wish being *"to have future work"(WA30)* and them being *"afraid to just*

live"(WB4a). One worker reported that this is now *"in the forefront"(WA31)* of their minds and continues by using the situation of a peer as a visualisation:

> *"I know one boy who has taken on a mortgage. He just bought a house. And he is one of the junior men in the plant. Within two years, he's gonna lose his job and he has a three hundred-thousand-pound mortgage. That's gonna be a distraction. He is gonna be thinking 'What the hell am I gonna do in two years' time?' rather than 'Am I working safely'."(WA31).*

This remark shows how fears and worries are taking up the younger workers' thoughts due to prior financial commitments, taking psychological availability away from concentrating on the task in hand, highlighting the importance of a secure working environment for (H&S) engagement. At the same time, the worker reporting this case also displays empathy for the colleague and therefore evidences a certain level of camaraderie and care for their peers at the plant.

In addition, the overall commentary suggested that even though the workers understand that shift work is *"part of the parcel"(WA36)* of working at the plant, it negatively influences workers' health and wellbeing (e.g. the changes in shift patterns). This especially affected workers who had longer commuting times, with reports of sleep deprivation and thus concentration issues both inside and outside the plant (e.g. while driving home). Hence, the commentary displaying psycho-social consequences of environmental factors impacted their willingness and availability to engage with H&S.

Social Environment

The relationship between the workforce and management was reported as impacting almost all interpretations and decisions regarding safety behaviour, even if not explicitly stated. Throughout many conversations, remarks made suggested a distrusting environment from both sides with a *"they [management] against us [workers]"(WA15)* attitude and *"zero trust from the workforce in the management team"(WA13)* indicating a distinct divide between the leadership team and shop floor preventing positive H&S engagement (OA1, MA7, WA13, WA15, WA29, WA38). As the relationship between workers influenced the individual worker's behaviour and mindset, the relationship (or its absence) between the H&S Leadership team and shop floor significantly influenced workers' perceptions of feeling cared for

and their engagement willingness. Demonstrating the full gravity of consequences that the sum of perceived negative events and behaviour by leadership had on the workers, one worker stated:

> *"I know that sounds a bit mercenary and when it comes to safety, our attitude should be different, but the company has worn us down from keeping us in the dark about things and our mentality towards [the plant] has altered.[…] I'm not saying I resent the company, but I'm resenting, the way the company is treating us at the moment. ((... ...)) Whereas before I would have gone the extra mile, but now if this is how the company is treating me then this is how I'm going to treat the company."(WA31)*

This quote displayed the strong impact the perceived leadership's lack of camaraderie had on engagement (i.e. 'going the extra mile') when workers felt poorly treated and uncared for. The relationship between workers and managers was often measured in their willingness to share information. Hence, this theme is closely linked to the prior theme 'Communication' (at Section 5.4.3). Workers reported that *'before'*, a former manager who had a better relationship with them had made a concerted effort to build relationships with each worker, e.g. by making an effort to get to know them and *"speak[ing] to you every day"(WA17).* Since his departure, several workers reported that they felt like they were *"just a number"(WA17, WA22, WA34, WA37)* to management. Thus, an open environment where people feel heard, respected, involved and recognised was mentioned in terms of feeling engaged with H&S since *"a happy worker is a safe worker"(WB5c)*. One manager, supervising PL-B, an area in which workers reported more positive engagement and contentment levels, mentioned introducing measures to promote workers' feelings of being cared for and valued (i.e. writing congratulations and sympathy cards and having personal chats with workers). He also highlighted the importance of *"fun"(MB3)* in work to create a positive environment and workforce. After all, since workers *"spent more time [in the plant] than you spent with your family"(WB5b)* a positive environment was crucial for someone's wellbeing. Additionally, the manager mentioned, in his experience, that people were more willing to listen when a relationship was established. Also, in assuming this as a sign of respect and interest in the person, it can be perceived as 'caring' for the other individuals. These observations and opinions by the manager were supported by his team who reported higher levels of engagement and a positive and proactive attitude towards H&S.

Similarly, the relationship between workers impacted the workers' H&S behaviour. One worker reported he would not challenge anyone else on the shop floor because he would get *"a nasty reply"(WA28).* Another worker described the culture in the plant as an "*'I'm alright, Jack'-culture"(WA23),* in which departments act against departments and individuals act *"selfishly"(WA23)*. In addition, a *"bad morale"(WA22)* with people not *"taking any responsibility and ownership"(WA23)* due to pressure from senior workers who feel *"entitled"(OA24, WA27)* was reported as a barrier to speaking up about H&S and in general, the fear of being mocked or bullied for being forward and proactive. Hence, this atmosphere may influence workers' willingness to participate in different initiatives or speak up and raise issues or ideas. Thus relationship-building initiatives, such as *"teambuilding between shifts"(MB12)* was thought to have the potential to positively increase the cooperation between workers.

5.5 Discussion

The commentary suggests that the workers' level of engagement cannot be determined by monitoring compliance with H&S rules and procedures alone. For example, while management indicated that some workers exhibit *"childish behaviour"(MA1)* putting *"themselves at risk"(MA7*), this does not necessarily mean that workers are disengaged with H&S. Indeed, Kahn in Daisley's (2019) podcast 'Eat Sleep Work Repeat' suggested that 'H&S engagement' – be it non-compliant or compliant – is still an outward reflection of levels of engagement. Voicing and displaying a negative perception of certain H&S aspects, such as the safety department staff or rules, did not equal disengagement either. Indicating and voicing anger and frustration may actually be considered as engagement, as workers are demonstrating that they care about the topic (Kahn in Daisley, 2019). In fact, these polar perceptions may reveal a general meaning-gap between shop floor and leaders. Therefore, these comments highlight the workers' intrinsic drive to keep themselves and their peers safe. Furthermore, the different standards the two groups use to measure 'engagement' and 'working safely' need to be addressed, so that a common understanding between management and workers can be created. Otherwise workers may experience irritation and feel attacked when micro-monitored by supervisors or not feel appreciated for their experience and proactiveness in regards to H&S engagement (Andersen *et al.*, 2015; Hollnagel, Wears and

Braithwaite, 2015). The strong link between workers expressing themselves in, and bonding emotionally with, one's role and work and engagement with H&S was shown (Kahn, 1990; Macey and Schneider, 2008). This was displayed during the interviews whenever the interviewee showed a dissonance between personal values and identity and the perceived company values or company representative behaviour. For example, this occurred when workers viewed themselves as specialists and with many skills but felt the company did not take them and their expertise seriously, or in having to comply with rules when workers considered themselves as already working safely. Consequently, when workers felt they had invested themselves in work, yet the outcome was not acknowledged as important, this may lead to disengagement (Kahn, 1990; Macey and Schneider, 2008). This, in turn, highlighted the relevance for companies to add meaningfulness to employees' work and role performance, e.g. through autonomy, feedback, task variety, input or recognition of expertise and outcome.

Furthermore, the commentary indicated the importance of workers' feeling heard, involved, appreciated and especially, cared for by the company in order to increase their sense of psychological meaningfulness, safety and availability regarding their work. As such, the organisational, as well as social factors, need to reflect this (Shuck and Rocco, 2013). Therefore, company-wide, the safety system as well as all individuals' behaviour have to encompass the safety culture that the company aspires to. This will facilitate a united, multi-faceted and consistent approach to H&S, which is established to encourage and support greater worker investment in their daily tasks, thereby creating a thriving H&S engagement culture (Kahn, 1992; May, Gilson and Harter, 2004). Thus, measures should be applied that support fair, accurate, respectful and balanced feedback in order to help workers find solutions to challenges, support their personal development as well as creating a trusting and honest relationship between workers and the leadership team. Similarly, an environment in which the contextual complexity of working is acknowledged and workers' insights are appreciated and encouraged has to be created (Catteeuw, Flynn and Vonderhorst, 2007). While some rules may not be open to discussion and non-compliant behaviour needs to be addressed accordingly, non-compliance should be approached as a learning opportunity for the person conducting the mishap and the company. Weaknesses or areas of improvement (e.g. training, communication or work instructions) may quickly become apparent and so contextually relevant rules can be created. For this, education of workers and supervisors is essential as they

will benefit both from learning how to make informed decisions and conduct relevant risk assessments.

Hence, focusing on employee growth instead of weaknesses can create accountability, prompting engagement in both workers and managers by making them responsible for not only the quality of work, but also the quality of work relations and their employees' development (Shuck and Rocco, 2013). Supporting this, research agrees that if teams learn together, engaging in authentic, respectful dialogue free from assumptions and blame, it not only strengthens their relationships and trust but also due to the increased sense of psychological safety are more likely to engage (Edmondson, 1999; Kahn, 2010).

The commentary on the safety focus demonstrates that the (perceived) intention of rules and procedures also needs to be considered as the workers' H&S engagement seems to be reduced when procedures are not perceived as relevant or discourage proactivity. Creating psychological safety was found to be key to engagement through establishing a blame-free, trusting environment (Kahn, 1990), whilst a 'blame culture' reduced trust between workers and supervisors and is detrimental for workers' self-image and consequently engagement (Rich, Lepine and Crawford, 2010; Dekker, 2012; Brandis, Rice and Schleimer, 2017). Hence, only approaching workers for negative events and to discipline them reduces the likelihood of workers contributing to the partnership between management and workers as well as to the improvement of the company (Dundon *et al.*, 2004). Pidgeon and O'Leary (2000) argued in their paper about their view on the 'Man-made Disasters model' that while blame had a long history in society and provided institutions with a dilemma of providing positive (e.g. legal security through accountability) as well as negative opportunities, a blaming culture kept organisations from learning from negative events. Based on Sagan's research on organisational learning, it led to faulty reports and reinterpretation of negative event (Sagan, 1993). Yet, Pidgeon and O'Leary (2000) retracted former claims of presenting a no-blame culture as the solution and rather advised companies to establish definitions of tolerable and culpable errors that preserve, for both categories, a level of responsibility and accountability. In terms of performance, workers who felt supported by their leaders demonstrated higher levels of engagement as it moderated psychological safety (May, Gilson and Harter, 2004; Saks, 2006).

Concerning communication, commentary suggested that one-way communication, where workers felt talked at and ordered to do things that did not fit their values or that they did not agree with, disengaged workers from H&S as they felt that they were made to do things instead of being included as part of the process to support something they believed was right (Shuck and Rocco, 2013). Similarly, workers' and managers' commentary highlighted the association between regulations where the benefits were not fully understood and a lack of consistency in safety messages, directions and the synchronisation between what was said and what was being done. Two-way communication, as well as helping workers to feel listened to and cared for promoted worker engagement, as those communication strategies prompted meaning in the individual's jobs and consequently enhanced engagement (Shuck and Rocco, 2013).

Regarding psychological safety, the current economic situation at the plant naturally took a toll on workers and their engagement level. However, the strongest influencers were the leadership style as well as the LMX, which directly impacted the perceived work climate and organisational justice in the plant. The perception of mixed messages as well as reported variability in H&S gravity formed workers' H&S mindset and sense of psychological safety. In this respect, the trust gap between workers and management also influenced workers' engagement, since an environment of trust and security were reported to be paramount. In order to create an environment that facilitated a dialogue and exchange between hierarchies and departments, communication channels must be employed, respective structures must be implemented and H&S leaders must adjust their behaviour and genuinely listen, discuss and take workers' opinions on board, thus, promoting psychological safety through non-threatening contexts where there is consistency, predictability, and respect (Kahn, 1990).

Moreover, a bilateral trusting relationship between workers and management was shown to be paramount for workers' engagement. Showing trust and appreciation in workers through autonomy and having open conversations where workers are part of the decision-making and solution-design processes allow workers to bring themselves into their work, take responsibility and have pride in their work. Similarly, workers' trust in management must be established (Purcell *et al.*, 2008), since research found that if an organisation and their leaders are perceived as trustworthy by the workers, they repay the organisation through higher engagement levels and involvement in H&S matters (Benedicto, 2017; Lawani, Hare and

Cameron, 2019). Rees and colleagues (2013) found that trust, as well as the LMX, had a mediating effect on workers' engagement, hence, those elements also constituted the organizational climate which determined if engagement could flourish or not (Purcell, 2014). Thus, the interpersonal dynamics not only between leaders and workers, but also across workers were reported to predict levels of engagement (Schneider *et al.*, 2010; Crawford *et al.*, 2014). LMX was also found to have an effect on the relationships between employees and leaders which were based on trust, mutual respect and liking, yet differed in quality from follower to follower (Soane, 2014). This could be explained through workers having a trusting relationship with their supervisors and feeling 'attached' to them, which would extend their meaning and purpose in work through deeper connection (Kahn and Heaphy, 2014). Additionally, this added to the psychological safety of workers since trusting relationships established through authenticity were found to be enablers of engagement (Stephens *et al.*, 2013). Again, receiving trust as well as perceiving an effort made to establish a connection may be perceived as an exchange relationship (based on SET) due to feeling empowered, making workers feel obliged to reciprocate the trust and repay the effort by caring for the organization and their work (Cropanzano and Mitchell, 2005; Saks, 2006, 2008). An increasing gap was identified in trust between the shop floor and higher levels of management, which Saks (2006) called the 'engagement gap'. This was reported to exist at the plant where workers' comments showed that every element concerning H&S and all the workers directly (e.g. communication, safety focus, environment incl. management behaviour, rule intentions, etc.) is interpreted through a relationship/trust barrier. The quality of this barrier determines how the input is being decoded (i.e. confirmation bias): insinuating good intentions if the quality of the barrier is positive and vice versa (Nickerson, 1998).

In addition, in a study across different cultures, researchers found that in times of job insecurity, maintaining trusting relationships between leaders, followers and between the leaders and unions increased in importance (Kelliher, Hailey and Farndale, 2014). Thus, the strong focus on the role of trust and the relationship quality between leaders and workers might derive from the fact, that at the time the plant was undergoing major economic turbulence which resulted in workers facing job losses.

The findings of this research study show similarities with the engagement maturity indicators that were specified for OSH in the construction industry (Lawani, Hare and Cameron,

2017a, 2017b): Meaningful Discussion; Empowerment; Trust; Motivation; and Commitment. While they do not define their understanding of the term 'worker engagement', rather describing the positive outcomes linked to different engagement concepts, the description suggests that a behavioural outcome-focused understanding of engagement was considered. Considering the similarities between themes, this may indicate that PL workers perception of engagement might be closely linked to construction workers' views, however the details might differ (e.g. 'Meaningful Discussion' is only a part of the overall 'Communication' aspect). However, it should be considered that in their model of engagement trust was an equal part of the model dimensions, while in this interview study trust was found to have a special moderating role. Plus, considering that this study also considered engagement as a motivational affective psychological state that may lead to certain behaviours, but not as a behaviour itself, the findings by Lawani et al. (2017a, 2017b) might support the wider impact of the findings of this interview study in a production plant.

Nevertheless, it is recommended to initially concentrate on fixing the identified trust gap before changes regarding the other dimensions can show improvement. Moreover, the individual perceptions reflected within the interviews also demonstrated that workers and managers could benefit from working together to come up with solutions and measures to address these issues in order to take into account the different perspectives and their requirements, for example, by using participatory measures (Dollard and Karasek, 2010; Nielsen, 2013; Punnett *et al.*, 2013; Knight *et al.*, 2017b).

5.6 Summary

Whereas much research has been conducted in other industries, this study is the first of its kind, to the authors' knowledge, that has analysed the factors influencing engagement of PL workers in particular in a H&S context from a qualitative angle.

By using template analysis, three main themes were identified as overall categories affecting the H&S engagement climate in the plant:

- Safety focus,
- Communication, and

- Environment.

All themes were found to be strongly linked to each other. Thus, they must be seen as a whole and not individual areas that stand alone from each other. An overview of all themes and the respective barriers and promoters they represent can be seen in Table 24.

Not surprisingly, the interviews displayed the importance of leadership's influence on workers' engagement and disengagement. Building on existing engagement antecedent research (Conchie, Moon and Duncan, 2013), this research found that supervisors' behaviour had a stronger influence on workers than co-workers' behaviour. Leadership's responsibility for fostering a safe and supportive environment in which workers felt that their needs and opinions were being taken seriously and developmental feedback was given for them to grow and develop were found to be the main promoters of worker engagement. However, for that to be achieved, an environment of trust between both groups must be established.

Generally, the interviews showed that the workers in the plant appeared to be fundamentally, intrinsically self-motivated to keep themselves and others safe and their comments indicated that personal protection (i.e. keeping themselves safe) and human empathy (i.e. keeping others safe) were general values that the workers followed, and which formed their identity ('we keep ourselves and others safe'). Yet, there were limitations to this protection need which appeared the moment that workers perceived disagreement between their own perceptions of what was safe and the company's proposed measures in order to keep a worker safe. Consequently, when workers felt that they invested themselves in work, yet the outcome was not acknowledged as important or when they felt these values were not reflected by the organisation, this led to disengagement (Macey and Schneider, 2008). This, in turn, highlighted the relevance for companies to first establish trust and secondly to add meaningfulness to the employees' work and role performance, e.g. through autonomy, task variety and recognition of expertise and outcome.

The identified relationship between the different themes and sub-themes was visually synthesised in Figure 16. The framework can be best read from the outside to the inside; The most-outer ring showing the main themes and the next ring the respective sub-themes. The analysis of the interviews, as mentioned before, showed that these themes represent the factors that impact workers' engagement levels. However, the commentary also emphasised,

that the individual evaluation of the impact was depending on the level of trust, based on the relationship each individual worker had with their leaders. Thus, the next ring depicts the 'trust boarder' which determines the perceived quality of each engagement driver (i.e. theme) impacting the workers H&S engagement (i.e. the core).

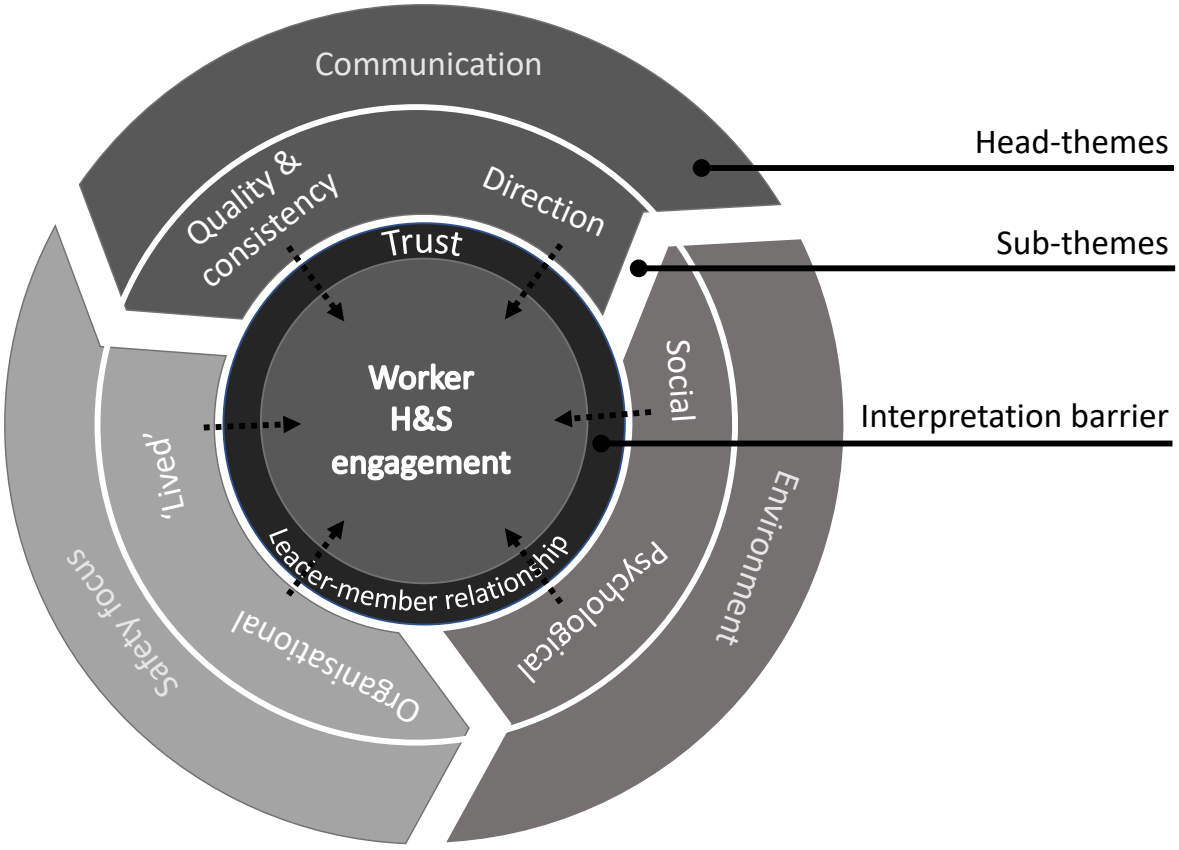


Figure 16: Derived H&S Engagement Factor Framework

Table 24: Overview of Engagement Themes and Sub-Themes

Theme: Workers' perception of their H&S engagement				
Description: Relating to the workers' reasoning about their H&S behaviour and safety perception, thus their engagement with H&S.				
Sub-themes	Barriers	Example Quotes	Promoters	Example Quotes
Autonomy of safety/being safe	▪ Colliding perception of what means 'safety' between management and workers	"But then again I'm skilled so I know what I'm doing it's always done right […] but the manager doesn't know what I do […] so how can they make it safe for me?"	▪ Intrinsic drive and personal ambition to keep themselves and peers safe	"You look after your own safety anyway you've just got to be sensible" "I'm in charge of my own safety."
Taking (un)necessary risks	▪ Personal convenience ▪ Not being aware of risks	"No one here does something deliberately wrong. [The workers] cut corners and by trying to do the right thing, they do the wrong thing."	▪ Confidence in skills and experience	"Safety-wise I would like to think that I don't cut corners because I would put myself at risk." "as an individual, you should know what line you shouldn't cross. So, yeah, we hold back on certain things.... we wouldn't put ourselves in danger if we know an area."

Theme: Safety focus				
Description: Reflecting on the negative (barriers) and positive (promoters) aspects of the safety focus and the behavioural and performance characteristics displayed during communication (including how feedback was given and received in order to effect a change in safety behaviour) as well as the organisation aspects that support and reflect that safety focus.				
Sub-themes	Barriers	Example Quotes	Promoters	Example Quotes
Organisational safety focus	▪ Contextual irrelevant rules ▪ Rules perceived to be a 'tick-box exercise' ▪ Production goals collide with safety goals	"Safety is just a tick box for [the] company, they put you on a training course, tick the box, done, forget about it." "[…] we have to cut corners to keep the machines running."	▪ Context relevant rules ▪ Involvement in decision-making ▪ Safety as number one value ▪ Autonomy and responsibility	"[…] because you have been educated, when you're making a decision on something, they accept it and go along with it rather than stopping it and saying, 'this is how it's gonna be done'. They listen to what you gotta say and they go along with what you're suggesting"
'Lived' safety focus	▪ Focusing on negatives (a 'blame culture') ▪ A perceived retributive or punitive mindset ▪ Feeling underappreciated for positive work efforts ▪ H&S leadership perceived as policing	"We look for the failures rather than the successes" "[The safety department and managers] will find everything that's wrong" "[…] the company's motto is 'noting is more important than our people, there can't be no compromise', but there always is, we say it, but we don't deliver it" "I think they take us for granted or maybe they don't trust what we're saying, I don't know."	▪ Receiving balanced feedback ▪ Recognition for a 'job well done' ▪ Educating and sharing knowledge ▪ Focusing on 'learning' from mistakes (constructively) ▪ Safety always comes first – managers walk the talk	"I say, rather educate first rather then, you know, discipline people, sometimes it's just down purely that they don't realise the danger that is involved you know they can't foresee it." "[…] being more positive when we're sharing information, you know, not just focusing on the negatives" "You develop together"

	▪ Management prioritizing production	" […] sending wrong message by asking wrong questions like 'when will you be done?'"	▪ Involvement in decision-making	
Theme: Communication				
Description: Reflecting on the perceived quality, direction and intention of communication in relation to H&S in relation to the workers.				
Sub-themes	Barriers	Example Quotes	Promoters	Example Quotes
Communication quality & consistency	▪ Lack of consistency in communication ▪ No consequences to non-compliance ▪ Hypocrisy and bureaucracy of rules ▪ Subliminal pressure ▪ Lack of explaining	"They [management] have let a few things go, but historically if you stepped out and don't follow the plant policy nothing is done about it... " "When someone takes something away from you it's not nice, is it. It doesn't matter what it is. […] Well, they are not trying to make your life more difficult, they're trying to make it safer. safeER! Are you safe or do you need to be safer?"	▪ Constant encouragement of safe working and a safety mindset ▪ Managers and safety professionals as H&S consultants	"I know there are the posters up about the lost time accident information that sort of stuff, but it's just more than hands-on, you know, more feedback often, I suppose." "They did […] like a safety day. Maybe they could do more of that because that was quite good" "It's all about encouragement and [communication], to do a bit further I guess."
Communication direction	▪ One-way communication ▪ Top-down approach ▪ Disregard of workers' insights and ideas	"Safety rules always come down, they never come from the shop floor"	▪ Two-way communication ▪ Fair and on equal terms ▪ Listening and involvement	"We are all a team, so we share information." "[H&S Leadership team] could possibly take people from the line and have a sit down then with them I guess and say: "Let's have a meeting. These are what we want to implement. What do you think?". "Listen to the people of the shop floor, who work in this environment, cos H&S people, they don't work daily in this environment, and managers, they don't work daily in this environment.[…] But I would like to have them listen to us a little more in regards what we are talking […]."

Theme: Environment				
Description: Reflecting discussions around psychological, i.e. concerns and fears that workers displayed with respect to the current economical and physical climate, and social, i.e. the relationship between workers and managers and between workers, factors perceived to have an impact or influence on the level of H&S engagement among workers.				
Sub-themes	Barriers	Example Quotes	Promoters	Example Quotes
Psychological environment	▪ Job insecurity ▪ Uncomfortable environment ▪ Health worries ▪ Negative impact on social life outside the plant	"we are on the precipice of the plant shutting. We ((...)) ...we have been in this situation for four years and it has affected our mindset, we gotta get the engines out and we gotta get the out, get them out. And it does affect our attitude towards safety […]" "I'm working shifts so I'm all over the place, ((...)) I don't wanna blame it on shift but it's half the time[…]. Most of the time you eat dinner on irregular times, nightshift is no good..."	▪ Clarity of future of jobs ▪ Trust in healthy environment	"I do enjoy coming here, certainly hope that I'm gonna be here for some time after as well. Obviously, there is a bit of uncertainty at the moment, but fingers crossed, that there is a future there for us." "[…]my only one wishes is to have future work. But that really is.... At the moment we're in uncertain times, but if there is anything, I can change it would be to know that the plant has got a future."
Social environment	▪ Perception that workers are "just numbers" to managers ▪ Negative management/shop floor relationship ▪ 'us vs. them' ▪ Lack of trust in management's intention ▪ Lack of camaraderie on certain PLs	"The company's motto is 'nothing is more important than our people, there can't be no compromise', but there always is, we say it, but we don't deliver it […]." "[…] I'm resenting, the way the company is treating us at the moment. […] Whereas before I would have gone the extra mile, but now if this is how the company is treating me then this is how I'm going to treat the company." "Managers do what they wanna do"	▪ An open environment where workers feel heard and valued ▪ Feeling supported by management ▪ Management perceived as prioritising workers' H&S ▪ Building trust ▪ Teamwork between shifts	"I think I have changed massively [since working at PL-B […] we have been told a lot of information […] you go to the lines, they [workers] are all happy, they are all energetic." "We are all a team, so we share information." "I felt they [management] were on my side. I could make a mistake and generally they were on my side." "I think I have changed massively […] we have been told a lot of information […] you go to the lines they are all happy they are all energetic they all wanna work" "We need more collaboration between safety department, managers and the shopfloor"

5.7 Limitations

Although this research offers meaningful findings and contributions to the H&S as well as engagement literature, due to the context and nature of the research some limitations may apply. During the time when the interviews took place, the plant went through a phase of negative media where potential job losses were revealed before management had talked to staff about them which may have introduced bias. Thus, this polarisation was acknowledged, and it was recognised that while the internal validity of the data was assured, the external validity might be compromised/limited. On a positive note, this may have motivated certain workers to take part or talk more freely than they would have under more stable circumstances. Furthermore, social desirability bias was acknowledged to be a general threat within this study, since the interviews may have tackled personally challenging topics (i.e. admitting rule-breaking or personal shortcomings) which might have influenced workers' responses.

Additionally, other limitations based on the study design and conduction might be possible. They were addressed in Table 25.

Table 25: Possible Limitations of the Interview Study

#	Bias	Reasoning	Consequence
Sampling			
1	**Measuring bias**	During the time when interview conduction took place, the plant went through a phase of negative media where the numbers of job losses were revealed before management talked to them. That news naturally had a considerable influence on the workers' mindset and was at the forefront of their minds when doing interviews and therefore influences what they said.	The researcher acknowledged that the sample may have been polarised and thus, that accounts may have been skewed. In consequence, it was recognised that while the internal validity of the data was given, the external validity might be compromised/limited. On a positive note, this might have motivated certain workers to take part or talk more freely than they would have under stable circumstance.
2	**Selection bias**	Taking part in the interviews was voluntary, therefore only employees who wanted to speak to the researcher were interviewed. However, this may have led to a loss of	While attempts were made to address this e.g. speaking to as many workers as possible to develop a rapport and motivate their participation and high-

#	Bias	Reasoning	Consequence
		valuable insights, with certain people not wishing to participate and other participants who may be more interested or confident in voicing their opinion being core participants. This may impact the results through for example; self-selection bias (Costigan and Cox, 2002). Further, due to the circumstances explained in #1, some people refused to take part in the study because they did not want to disclose their names on the consent form and their distrust towards management made them 'paranoid' of the research being shared with management without anonymization. In contrast, others were more than happy to take part now as it allowed them to 'vent' to a certain degree about all the things that are going wrong and thus let out their disappointment about how they perceived management treated them.	lighting the independence of the researcher as well as the anonymity of participants, naturally they could not be pressured into participating in order to follow good ethical practice. Therefore, self-selection bias could not be avoided, and this must be considered as a limitation of the findings.
Interview design/conduction			
1	**Researcher/Response bias**	The researcher herself might have inflicted bias by showing considerably distinctive characteristics than the population. While most workers in the plant were e.g. male, Welsh and without university education, the researcher was female, German and with academic education. This might have let to cultural misinterpretations between researcher and participant and may have influenced participants' responses due to possible perception of lack of e.g. trust, credibility.	While the researcher tried to build a trusting relationship with the participants through building rapport and creating a friendly and relaxed atmosphere, the possibility of biased data still had to be considered. However, this could also have seemed more approachable to some participants, since a young female may seem less threatening.
2	**Desirability-bias**	Since the interviews may have tackled personally challenging topics (i.e. admitting rule-breaking or personal shortcomings), this might have influenced workers' responses.	Social desirability bias was acknowledged to be a general threat within this study.

#	Bias	Reasoning	Consequence
3	**Measurement bias: Mixed-methods**	Whilst one-to-one interviews were the original aim, two interviews could only be conducted in groups due to circumstances beyond the researcher's control i.e. participants were only released for the interviews by the manager in groups.	While there were concerns of potential limitations of group interviews which the researcher did attempt to anticipate, there appeared to be honest and open discourse between the participants, with no sign of restraint or reluctance in voicing opinions or experiences. Finally, in these group interviews, attempts were made to address each participant equally and ensure all had the chance to add to the conversation. Therefore, it was unlikely for the mixed-method to have critical impact on the theme development. In fact, the group setting may have actually enhanced the results since the participants actively discussed their opinions and thus prompted new ideas and thought processes.
4	**Measurement bias: semi-structured interviewing**	The interview guide evolved through the interviews as one question (i.e. "Is there anything that you would have expected me to ask or that you feel important to share with me and that you could not say yet?") prompted participants to mention topics that they felt relevant to the research, e.g. the perception on the safety department in particular and their performance.	Slight changes to the data collection may lead to measurement bias, thus the respective limitations were acknowledged. Yet, it can be assumed, that the data richness benefitted from those changes since the researcher was made aware of relevant topics. Further, the researcher also personally developed throughout the course of the interviews, therefore, in the beginning, the researcher was more bound to the structure of the schedule and then became more fluent and natural in the interview style.
5	**Observer/analysis bias: Single researcher transcription and analysis**	Since the transcription and analysis was done only by the researcher, bias can be assumed.	With respect to the quality of transcription, coding and theme development, after each step in the process, the results were discussed in detail with the supervisory team in order to identify blind-spots or inconsistencies. To ensure quality, the researcher herself critically and repetitively sample checked the work results at each stage in a test-retest format (i.e. allowing one to two days between tests in order to overcome memory effect).

#	Bias	Reasoning	Consequence
			While this process may not have eliminated all errors and researcher bias may occur, on the positive side, internal consistency in error can be assumed as only one researcher was involved in the research.
6	**Observer/analysis bias: Selection of transcription interviews**	To design the initial template, interviews were selected for complete transcription. Since this selection was subjective, bias may have arisen.	While acknowledging the limitations that may arise through the subjective selection they might have been restricted through a systematic approach: Firstly, the researcher immersed herself in the data by listening through all audio files several times and collecting an initial overview of themes. Brooks and King (2014) recommended when using large data sets to only work with a subset of the data and focus initially on deriving codes and themes from multiple perceptions and from "where the richest data (in relation to the research question) are found" (p.7). Therefore, based on the initial theme collection, interviews for transcription where chosen based on their theme density and variation/diversion of perception on those pre-themes. Also, it was aimed to transcribe interviews from different roles, hierarchies and PLs, thus interviews were picked that were evaluated as rich in insight (with respect to the research question) and those who added diversity to the transcribed set of interviews. Saturation of codes and themes was reached after ten interviews. On a positive side, this approach allowed the researcher to efficiently but still in-depth analyse the data in the timeframe of this research project. More important than this, the template required for the template analysis forced the researcher to constantly think in a structural and systematic way.

5.8 Practical Applications and Future Research Directions

Based on the findings, exemplary recommendations for MF environments to enhance H&S engagement were derived (see Table 26). It also became clear that a one-size-fits-all-solution will not be possible and that companies must make individual efforts to understand their workers' drivers and barriers in terms of H&S engagement.

Table 26: Exemplary Practical Implications Drawn from Reported Behaviour and Consequences

Theme	Consequential Recommendation
Workers' perception of their H&S engagement	Uniform definition of 'safety': Open discussion and understanding between managers and workers of what 'safety' and 'safe work' means to them and why. Clarify and prepare shared definition and consequently, specific meaningful reporting measures and performance indicators, can then be developed (Dekker, 2018b).
Safety focus	Balanced feedback: Train for supervisors and managers on how to give positive constructive feedback and acknowledge work well done as well as making efforts to understand drivers and reasoning behind incompliant behaviour (e.g. to learn from 'work-as-done'). Also, train on transformative leadership style and the importance of 'leading by example'. Restorative justice: Move from punitive safety to restorative safety such as use of Dekker's (2018a) 'Restorative Just Culture Checklist' in case of incidents to acknowledge all victims of incidents (Dekker, 2012). Contextual safety: Implement of participatory measures to address 'global' rules to ensure local relevance and fit (Rasmussen et al., 2006; Nielsen, 2013; Punnett et al., 2013; Knight *et al.*, 2017b).
Communication	Integration of workers in decision-making: Promote cooperative design of H&S measures through participatory action design process, where workers are a valued inclusive part of the design and decision-making process of interventions (Rasmussen et al., 2006; Nielsen, 2013; Punnett et al., 2013; Knight *et al.*, 2017b). Shared information: Share of information through integration of (representative) workers in management and decision-making meetings.
Environment	Teambuilding: Build trusting relationships between shifts and between workers and management through designated training and events (e.g. (H&S) trainings between shifts with formulation of handover processes). LMX: Designate resources (especially time) for managers to be spend on the shop floor in dialogue with workers.

Whilst this study provides a meaningful insight into the drivers and barriers of engagement in one case-study plant, the findings are considered a snapshot of this particular organisation

and so generalisation to the whole industry should be considered with caution. Thus, it would be interesting to see how the factors identified match up with qualitative results from other MF environments and whether there are distinct differences between industries. So far, a previous literature review has indicated that there does not appear to be a great deal of academic research focusing on engagement in (automotive) BC industry settings. In comparison to the striking amount of research conducted in hospital settings, it may be beneficial to see how those particular industries differ in terms of individual H&S engagement. In addition, given the vastly different working environments, future research may benefit from taking a more specific look at the different aspects of H&S engagement within industries. The only other study with a similar approach in a different setting, was the study conducted by Lawani et al. (2017b, 2017a) proposing a WE maturity matrix for the construction industry.

In addition, in the accompanying literature review, it was found that engagement research was mainly dominated by quantitative findings. Hence, the body of knowledge might benefit from increased use of qualitative measures, taking a stronger account of individual and more in-depth insights (Bailey *et al.*, 2017).

Moreover, the research highlights the impact of management upon workers' engagement levels. While this is not a new point, the major influence of the trust level between management and workers on workers' engagement, as identified in this research, was a less explored factor that may deserve more consideration in future research.

Finally, the workers' commentary showed that the directive, distrusting and often nannying quality of H&S leadership and management was perceived to not only eliminate the feeling of responsibility for H&S but also the feeling of meaningfulness in, and appreciation of, one's work. Therefore, on a trusting base, a cooperative and balanced approach to H&S on equal terms is recommended. To conclude, interventions must ensure that workers feel they gain psychological meaning, safety and availability through their work and working environment in order to be engaged (with H&S) by being:

- heard and taken seriously (e.g. for their insights, concerns, ideas),
- involved and part of decision-making processes,
- recognised and appreciated (e.g. for their expertise and work), and
- cared for by the company and by management.

5.9 Implications for This Research

This qualitative study was the first of its kind in BEP identifying and analysing the factors influencing engagement and offered valuable insights into the drivers that motivate and hamper them.

Implications can be drawn towards implementing measures to: (1) design a shared H&S strategy involving all hierarchies and departments to create a common understanding of objectives, values and principles, (2) create a workspace in which workers and H&S leadership team members work together on deriving H&S measures, (3) H&S leadership members become more aware of their actions and their implications, and (4) a higher importance is set on building a respectful trusting relationship on equal terms with the workforce. Identifying interventions on how to adapt the respective (HR and H&S) practices, and respectively designing a WE intervention framework, in order to potentially improve the H&S climate and engagement level of workers is the focus of the following research stages.

All the known factors that contribute to or undermine engagement, and also engagement with H&S, were seen to be present at Bridgend. In that particular context, however, there were some unique contextual factors that brought some of those antecedents and barriers to the fore. These include:

- An aging building and aging plant, meaning that considerable resources were being invested in simply keeping the building and operations running. The building and facilities were, however, not always adequate to provide decent working conditions.
- Uncertainty over the future, with rumours of closure occurring. This undermined individual's sense of personal safety and may explain why some decisions were being made or delayed not to invest in the buildings.
- A mixed workforce of direct employees and contractors (which is one response to an uncertain future, as contractors can be disposed of more easily). Further, the workforce was also mixed in tenure with workers reporting that they feared that showing stronger H&S engagement or involvement might lead to bullying particularly by senior workers (see sub-theme 'Social Environment').
- Some managers who appear, according to the interviewees, to lack basic management skills, which may be the result of having no formal management training, or a

lack of awareness about the disjoint between word and action and how that is being interpreted by the workforce (see sub-theme ‘’Lived’ Safety Focus’).

- A large organisation with a strong emphasis on bureaucracy and a perceived lack of trust in workers.

The analysis explained how and why these factors can influence levels of engagement.

It is quite possible that some of these factors would be relevant to other elements of the automotive industry, or perhaps MF more widely.

The findings show that in order to change the current H&S engagement level of workers that interventions have to tackle:

- Leaders: they should adapt their behaviour and need time and resources to build meaningful, trusting relationships with their workforce and learn how to support their workers and create a psychological safe environment.
- Workers: Need the resources (e.g. skill, communication channels) and opportunities to take responsibility for their work, voice their concerns and insights and help shape their working environment.
- Generally: processes should be adopted in order to provide a structure and environment for WE.

Chapter 6 - Recommendations for the Design of Interventions to Enhance H&S Engagement: The Proposal for an Intervention Framework

6.1 Introduction

In line with Research Objective 4 of this research (see Section 1.4), this chapter describes the design of the proposal for an intervention framework. The aim for the intervention framework proposal was that, when implemented, it would promote and increase H&S engagement in the context of Safety-II in a PL environment, specifically in BEP. However, due to the plant's closure, this aim was expanded to ensure the transferability of the intervention proposal designed on the basis of BEP to other production environments.

The MRC within the element "Development" Step 1 and 2 (see Figure 17) recommends to first build a thorough evidence base before next modelling intervention ideas (MRC element "Development" Step 3). Hence, based on the MRC guideline the collated findings reported in the previous chapters were considered the evidence base. Thus, based on these findings, the first model of the intervention proposal was derived and is presented in this section.

Drawing from the findings of the initial literature review, the qualitative interviews and the narrative literature reviews, it was shown that generally job resources as well as personal resources need to be increased to enhance WE in order to increase psychological meaningfulness, safety and availability. Similarly, applying Safety-II principles led to recommendations for an intervention that should meet the following requirements:

- establish and promote a good relationship between workers and leaders on the basis of mutual trust and appreciation,
- establish (organisational and social) structures that promote and guide worker empowerment,

- establish (organisational and social) structures that promote contextually relevant procedures and behaviours by workers' active input in designing their work
- promote empowered, engaging leaders, who act as coaches and supporters to the workers and work and communicate with them on equal terms.

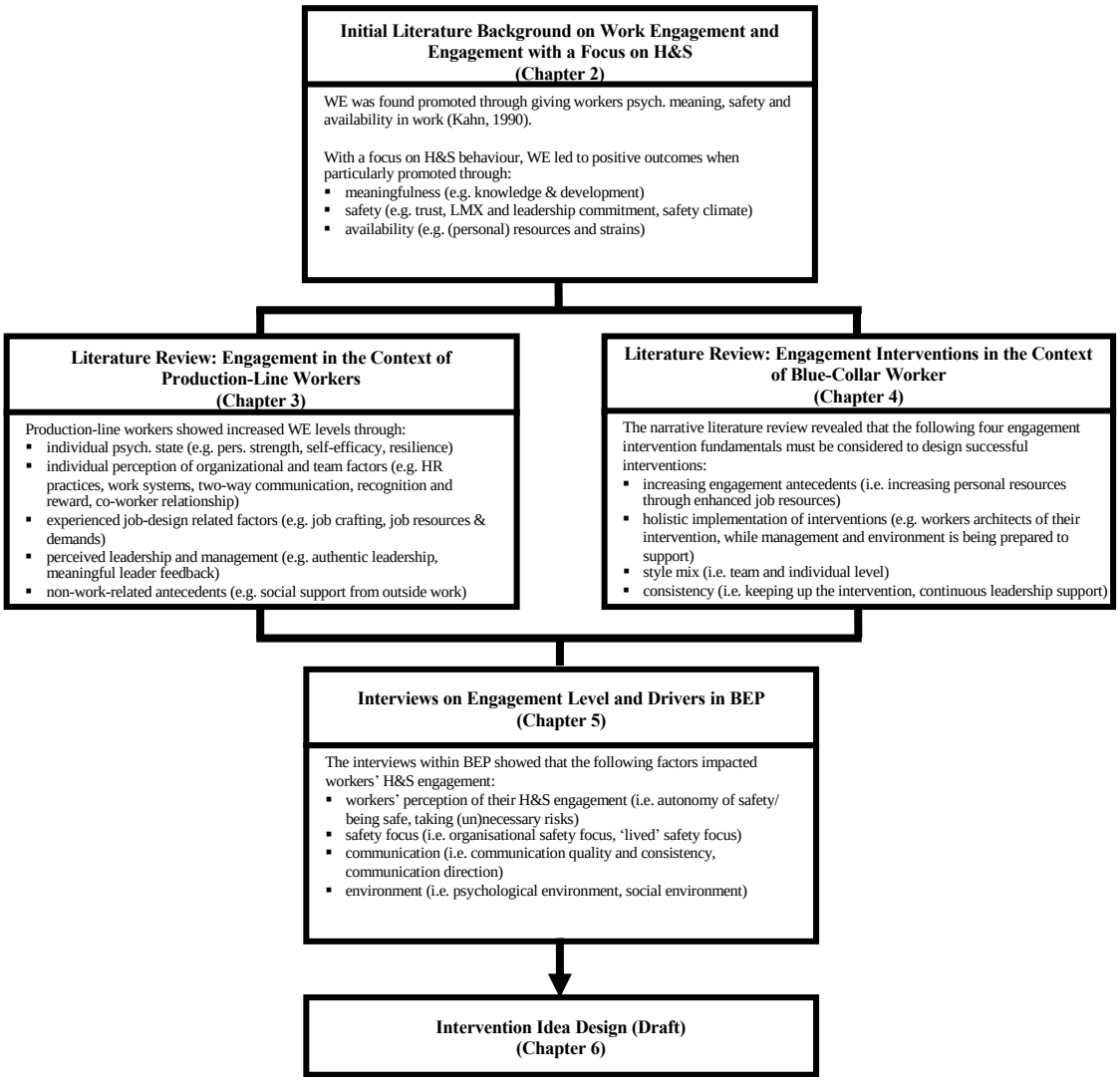


Figure 17: Workflow Design of Intervention Framework

6.2 Background of the Resulting Proposal for the Intervention Framework

The research on engagement interventions as well as on Safety-II emphasised the importance of giving workers meaning through voice and autonomy to design their work (Kahn, 1990;

Christian *et al.*, 2009; Crawford *et al.*, 2010, 2014), similarly, appreciating workers' as valuable resources and knowledgeable designers of resilience (Hollnagel, Wears and Braithwaite, 2015; Dekker, 2018b) as well as the importance to successful interventions of designing them from the bottom-up (Knight, Patterson and Dawson, 2019) demands not dictating fixed intervention framework proposals but providing an overarching structural concept that facilitates the design of tailored measures while promoting all the requirements mentioned before. A one-size-fits all solution will not be the answer here, neither will a single, one-point initiative. As Rasmussen et al. (2006) pointed out, in today's volatile world, top-down planned out interventions will meet the resistance of workers, which, considering the previous interview findings, was a likely reaction in BEP. Therefore, based on the research conducted and in order to create an environment in which all levels in the company talk on equal terms and find solutions together, the researcher proposes establishing a Participatory Action Research (PAR) design (Park et al., 2004; Rasmussen et al., 2006; Knight *et al.*, 2017b) – however not as a research approach (as it is usually used) but as long-term sustainable organisational intervention that provides a structure within the organisation to develop tailored solutions for their individual challenges in an inclusive way. The foundations of this approach build participation and action and seek to create change collaboratively through collective inquiry and experimental piloting, and following reflective practice (Baum *et al.*, 2006). Hence, in this respect, while being called participatory, it is more than just giving workers a voice and consulting them, but providing a structure to co-design interventions within the organisation. Thus, workers are part of decision-making. The individual experiences of the participants are hereby a valuable resource to design sustainable change which is in line with antecedents concerning Safety-II as well as WE. Therefore, this is also in line with the ethnographical understanding of this research, that every experience is different and multiple or that shared perceptions of reality exist (Macdonald, 2012).

Furthermore, considering the varying challenges and dynamics that exist in organisations, the importance of context-relevant, tailored interventions as well as the need for ownership by the workforce of the interventions is needed. Therefore, an approach that can become part of the company's routine, that adapts to and utilises the various resources in a company as well as works from the bottom-up was required. Hence, in the PAR an approach was found that shares the perception of organisations as self-regulating complex adaptive systems, with safety being created through social interaction and learning as well as experience exchange

and which develops continuously (Döös and Backström, 2003). Furthermore, PAR, through its inclusive design, provides the possibility to directly impact the social environment in the plant as it offers opportunities for workers to actively design their work and workplace (i.e. job redesign and job control) and voice their opinions and experience, which in turn was found to be a driver of engagement as well as Safety-II. In addition, in accordance with Safety-II (Dekker, 2018b), PAR can provide intervention design that provides solutions that consider the whole organisational context instead of perceiving them as isolated within the organisation, hence offers the potential to overcome the silo thinking in terms of departments as well as hierarchy levels (Rasmussen et al., 2006).

Moreover, Knight et al. (2017b) argued that PAR approaches were likely to enhance WE based on SDT and the JD-R, as PAR facilitates the underlying needs of SDT: autonomy, competence and relatedness. Hence, job resources were increased. Workers may feel more listened to and taken seriously through PAR, as it provides them with the opportunity to raise their opinion and share experiences to support themselves and others through the design of new solutions (Nielsen, 2013; Knight *et al.*, 2017b). Collaboratively designing solutions may increase the workers' perceptions of job control, while the feedback and support of the other workers on their solutions may increase competence and ability. Knight et al. (2017b) hypothesised that the positive support by co-workers, either within the work groups or outside when getting feedback for the designed solutions, may increase learning and self-development through the new responsibility and extra-role experience these workers are gaining. This in turn may also positively influence relatedness through positive co-worker support and feedback (Knight *et al.*, 2017b). However, Knight et al. (2017b) experienced an opposite effect in their study which may be due to a lack of sharing of knowledge and enthusiasm between intervention workshop participants and non-participant employees. Thus, this shows the importance of promoting social structures for sharing information and ideas. Indeed, participation in intervention design was found to be positively related to improvements in social climate and relationships between managers and co-workers as well as an increase in perceived organisational belonging and reduced resistance to change (Lines, 2004; Park et al., 2004). Another PAR study measuring WE was the study conducted by Cifre et al. (2011) that aimed to develop a stress intervention using PAR in a MF company. However, in this study, WE was considered a positive outcome of stress and it was not clarified if the people participating in the PAR were also the final recipients of the intervention. Hence, the

focus here was not on WE. While they found a positive incremental impact of the intervention on WE on the intervention group in comparison to the control group, this might be due to the measures developed and not the PAR structure.

Furthermore, personal resources (and psychological availability) may increase through an enhanced sense of self-esteem and optimism of workers as they are feeling heard and taken seriously (Knight *et al.*, 2017b). Moreover, the process of PAR may inherently create value since the focus is on solving issues within the community through community members being involved in the creative as well as decision-making processes (Macdonald, 2012). Bell (2018) found that the fulfilment of values is of paramount importance when it comes to promotion of engagement in the context of H&S.

In addition, PAR was used successfully in several related studies concerning work stress (overview through scoping review by McVicar, Munn-Giddings and Seebohm, 2013) as well as safety involvement and health and wellbeing (Park et al., 2004; Rasmussen et al., 2006). Furthermore, the potential impact of PAR structures on the participants' psychological meaningfulness (through e.g. job design possibilities), availability (through e.g. participants' direct impact on resource allocation) and safety (through clear guidelines and roles as well as potentially improved social structures) incorporate great potential to increase WE through the implementation of PAR structures (Knight *et al.*, 2017b). However, to the author's knowledge, only one study was conducted using PAR in the context of WE so far and that study found no significant change in WE , which from a methodological point might be related to a lack of statistical power resulting from a small sample size, and from a contextual perspective might be due to the respective PAR setup and support in the organisation (Knight *et al.*, 2017b), emphasising the importance of a systematic preparation of the organisation as well as the value of qualitative approaches.

In conclusion, while the use of PAR as a tool for research in several environments is not new, designing and providing a proposal for an intervention framework on the base of PAR structures to provide organisations with means to develop tailored intervention in co-design and simultaneously to enhance WE levels in PL workers and Safety-II is deemed a novel approach and advancement in knowledge.

Table 27: Overview Relevant PAR Studies

	Rasmussen et al. (2006)	**Knight et al. (2017)**	**Park et al. (2004)**
Focus of study	Development of intervention improving safety in a wind turbine plant	Development of intervention increase WE in nursing staff	Development of intervention on organizational climate and worker's health and well-being
PAR base	Schurman & Israel, 1995	Lewin, 1946; McTaggart, 1991	Not defined
Organisation/Process	**Organisation**: Company manager Responsibility: overall **Steering committee** Consisting of: 4 managers, 4 employee reps, 2 researchers Responsibility: determines overall frame (i.e. priorities, finances) **Project coordination group** Consisting of: 4 managers, 4 employee reps, 2 researchers Responsibility: determines topics and working groups **Several working groups** Consisting of: 2 workers, 2 supervisors and 1-2 researchers each Responsibility: for own theme or sub-project discussing issues and developing intervention ideas Unfortunately, no information was giving on the PAR process within the working groups or in general.	**Process/Organisation:** **Launch event** (half-day) with representatives of all hierarchical levels and wards. Focus: Rational and theory was presented & baseline measure via questionnaire. **5x Core-workshops** Consisting of 3 representatives (different hierarchical levels) of each ward Consist of: 1x 3-day workshop Consisting of 3 representatives (different hierarchical levels) of each ward Focus: Introduction and background of project, appreciation of current situation, sharing of positive experiences and identify common themes, discussion of values and beliefs **4x 2-day workshops** Consisting of 3 representatives (different hierarchical levels) of each ward 1. Workshop; Focus: Feedback and reflection of baseline questionnaire results, discussion and planning of possible changes. 2. Workshop; Focus: Sharing and reflecting on progress,	Process/Organisation: **"ACTion Teams"** one team within each intervention store Consists of 8-12 employees of the store from all hierarchical levels and departments Aim: developing, implementing, and evaluating a interventions for the issues or problems identified within the store. Process: five-step problem-solving process: familiarization, skill building, prioritization, action, and reaction (p. 625-626). **1. Familiarisation:** Focus: clarity of roles and responsibilities, introduction of project frame & plan, definition of team's goals, familiarisation and discussion of situation in the store based on information (i.e. feedback reports, meeting minutes) and clarification of researcher support. **2. Skill building;** Focus: Definition of roles (e.g. team captain, recorder, etc.), setup of regular meeting time, establishing of ground rules (e.g. decision-making process, confidentiality, respect of opinions). Method: Structured activities were used by the facilitators, directed at enhancing skills in

	Rasmussen et al. (2006)	Knight et al. (2017)	Park et al. (2004)
		discussion of available and necessary resources and develop plan. 3. Workshop; Focus: Sharing experiences, reflection and feedback, revisiting previous topics while considering strengths, planning cycle and change evaluation and enactment. 4. Workshop; Focus: Reflection on project, knowledge transfer and development, possible improvements and successes, future implications on proactiveness and sustainable change. **Celebration** event to mark end of project. In between core-workshops: 'Communities of Practice workshops' One for each hierarchical level across wards Aim: Discussion of progress & success factors or barriers; keep momentum of change; make participants to change agents.	team communication and cohesiveness (team mapping, mirroring), problem-solving (e.g. weighing pros and cons), time management (e.g. prioritizing tasks), and conflict resolution (e.g. anger control, negotiation). **3. Prioritization;** Focus: Identification and prioritisation of issues. Method: (1) brainstorming sessions to identify salient issues, (2) issue clarification exercises to determine and understand the mediating factors impacting those issues, (3) priority matrices (i.e. importance versus changeability) to prioritize identified issues, (4) strategy matrices (i.e. feasibility versus impact) to design solutions, and (5) the construction of an initial work plan for the team's efforts. **4. Action;** Focus: definition of work plan including strategies to be used, tasks, responsibilities, timeline, follow-up steps and evaluation measures. Method: action plan worksheets supported documentation and were discussed in the store meetings and communicated to everyone. **5. Reaction;** Focus: Review of action plan monitor progress, exchange of experiences and adjustment of steps/action plan.

	Rasmussen et al. (2006)	**Knight et al. (2017)**	**Park et al. (2004)**
Details	Testing of ideas for feasibility in pilots before they are implemented in full-scale. The researchers' role: - surveying the work environment and health, and - coach managers and workers during the change process. Participants were selected based on high results in a baseline questionnaire on safety climate	Workshops were led by a researcher and a nurse practitioner. Time between workshops to share knowledge and collect feedback.	Reduction of researcher involvement overtime to support teams' independence and self-sustainability Interesting findings: - PAR also beneficial to improve diversity - Positive spill-over effect on people outside the project teams - Increased organizational climate
Limitations of study	Focus more on intervention results than on method. Hence, little information was shared about project setup and process.	Based on the approach description, it is hard to tell if the work groups systematically designed change or if the focus was rather on experience sharing. Very small attendance numbers in the workshops. WE was not enhanced through PAR in this study, possibly due to lack of management support and knowledge sharing outside the workshops. Also, the sample size may have been inappropriate to evidence a significant change in WE levels.	Focus of the study overall more on ethnic group differences than on generally evaluation of approach. Unclear, if there were pilots of intervention or how the implementation was decided on.
Inspiration for intervention recommendation	- 'experimental' pilot testing - Setup of organization	- Participant setup in core-workshops - Some of the content of the core-workshops	- Setup of action groups - Methods used during group meetings

Table 28: General Recommendation for General PAR Research

Studies	Recommendations
McVicar et al. (2013)/ Scoping review on stress management interventions using PAR and identification of success factors.	▪ Ideally, 12+ months involvement of ‘action groups’ or ‘change agents’. ▪ PAR provides opportunity to establish long-term change and innovation implemented in organization. ▪ Managers should be part of the ‘action groups’. ▪ The project aim should not be too ambitious to allow workers to be fully involved. ▪ Focus should be on specific and ‘local problems that have been identified, not presumptuous issues. ▪ Considerable number of resources (i.e. time and effort) are to be invested by the researcher and the organization. ▪ Managers, union and key-workers need to be committed and involved over the complete duration of the project. ▪ The following should be considered and planned accordingly: turnover, management change, policy changes.
Nielsen (2013)/ Theoretical discussion on the importance of participatory approaches and job crafting in occupations complex intervention design	▪ Focus on intervention should be on how and why make interventions work not on why old ones failed. ▪ Workers and line managers should be seen as crafters of the interventions, and it has to be analysed how the interventions change their job instead of seeing them as 'passive recipients' of the intervention. ▪ (Line) managers need to commit to and also need to be drivers of the intervention including being trained in this role as 'change driver' and being part of the change. ▪ The relationship between managers and workers (including perception of shared values, beliefs and attitudes) has an active influence on intervention success (i.e. joint responsibility and job crafting). ▪ Before starting any interventions, workers and managers need to be equipped and discuss shared values, attitudes in the work group.
Kelly (2005)/ General review that provides overview about PAR and its processes and recommendations for initial steps for nurses	▪ An assessment should be the first step and builds the basis of action. ▪ Ethical approval needs to be given by the relevant committees (note by FH: in an organizational context this might mean union and HR). ▪ Finances need to be secured (incl. time of participants and researcher, materials, maybe food during meetings, meeting space, etc.). ▪ Meeting minutes and all input should be recoded in a field notebook. ▪ Each meeting and stage within the PAR cycle should have a clear goal to address criticism regarding the time-consuming nature of PAR. ▪ There are three steps within PAR: Planning, Action and Reflection: ▪ Planning cycle is about understanding the challenges in-depth and presenting ideas for solutions. ▪ Action cycle aims to create “create consciousness and social change” (p.70) through delivering actions (i.e. solutions). ▪ Review cycle contains shared assessment of solutions, their effectiveness and evaluate process. ▪ Consider how general attendance and commitment can be kept up (e.g. serving food/snacks, providing childcare, making sure that the objectives and goals are being kept in mind, having the timeline visible). ▪ PAR showed potential to create group-feeling/feeling of belonging, meaningfulness to work and shared vison. ▪ Meeting minutes and outputs should be made available for everyone to discuss and scrutinize.
Dollard et al. (1997)/ Information on how to prepare a PAR proposal	▪ It is important to keep communication up between stakeholders and financiers, since them feeling not involved or consulted might lead to dismissal of the project. ▪ Calling participants 'experts' might make them feel overwhelmed, hence the project should be framed as a participatory process for solution development with feedback from all angles. ▪ A thorough research proposal should be prepared for grant application and presentation to the company.

6.3 Structure and Components

Drawing from PAR designs published in the literature that were either in a PL or H&S context or focused on WE (overview provided in Table 27) and general recommendations from the literature focusing on PAR (overview provided in Table 28), the initial template of the intervention framework structure was developed.

6.3.1 General Structure

The proposed intervention framework aims to not act as a single-point intervention, but provide a structure that will be weaved into the fabric of the organisation and its culture. It therefore should become the common modus operandi when analysing and designing solution ideas for challenges or to improve the workers' work experience. Hereby, making workers the creators of their own solution ideas and decision-makers on how to improve their working environment is on the core of the intervention framework. Hence, this is how it a) differs from usual PAR, as this is not a research project with an expiration date, and b) differs from the HSE understanding of to manage H&S and workers' participation or consultation (Health and Safety Executive, 2013). To ensure the longevity of the intervention framework within the organisation, the progress and success of the working group (WG) need to be constantly communicated to the workforce (Dollard et al., 1997; Kelly, 2005). Each WG therefore needs to set clear goals for the process as well as for each meeting and communicate their progress through a medium that is visible for all employees and allows feedback (Kelly, 2005).

Based on the used PAR structures as well as lessons learned in published PAR literature (see Table 27 and Table 28), it is proposed that the overall intervention framework consists of a coordination group and several WG (see Figure 18).

6.3.2 Coordination Team

The overall responsibility in terms of coordination and economic decisions should be handed over to the coordination team once it had been set up (Schurman, 1996). This would oversee the coordinating of the working groups (WG). Within the coordination team every area of the plant should be represented by a manager, a supervisor, and a worker (Park et al., 2004). Furthermore, a safety professional and a union representative should complete the group. However, within the coordination group there should not be any hierarchies and all team

members should be treated on equal terms, with no single person being able to 'pull rank' – every member and their respective experience, opinion and insights are equally valuable (Macdonald, 2012; Haarmans, Perkins and Jellicoe-Jones, 2020)

Within this coordination team the topics and issues within the plant that need to be addressed within the WGs should be defined. Hence, the coordination team will be in charge of organising the WGs according to the identified issues. That means that for each issue, a WG would be established (Rasmussen et al., 2006). To identify issues that need working on, the recurring topics from safety audits, topics identified from safety climate assessments or simply topics that the participants feel strongly about could be addressed. However, it should be ensured that the focus should be on specific and 'local problems' that have been identified, not presumptuous issues (McVicar, Munn-Giddings and Seebohm, 2013). Within the coordination team these identified issues would then be prioritised and WGs would be established, to take the work from there (Rasmussen et al., 2006).

Besides the establishment of WGs, the coordination team would also act as the overarching group that brings all WGs together. That means, that after establishing the WGs, representatives of those WGs would come together in the coordination group meetings and report their progress (Dollard et al., 1997). They can then get feedback from the other members of the coordination group and bring those insights back to their WGs. By this, the members of the coordination group can also act as so-called 'Change Agents' (Armenakis, Harris and Mossholder, 1993). That means they would be responsible for communicating the progress of the coordination group but also the individual WGs into their own working areas and to their peers and thereby impacting their attitudes towards the change being driven by the WGs. The aim would be to include as many employees of the company as possible, and even if they were not directly involved in any of the groups, they still get regular updates about the progress from their peers (Kelly, 2005).

6.3.3 Working Groups

As already mentioned, it is recommended that the WGs are developed based on a particular topic (McVicar, Munn-Giddings and Seebohm, 2013). Here, everyone in the organisation, who is interested, should be welcome to work on the topic within the group. Initially, just certain representatives from the coordination team that took over the respective topic would set up the respective WG. However, it would be their responsibility to recruit the right people

for the WG in order to work on the topic and come up with solutions ideas (Bond and Bunce, 2001; McVicar, Munn-Giddings and Seebohm, 2013). In the best-case scenario, a mixed group consisting of manager, workers, and supervisors from the relevant areas (depending on the size of the area) should be included in the WG (see Figure 18) (Knight *et al.*, 2017b). Firstly, the aim of the WG would be to understand the topic in depth. By this it is meant that they would need to gather information about what factors impact this topic. For example, what laws are linked to the topic, what do different workers with different roles from different areas think about the topic – the members of the WG have to become 'detectives' or 'researchers' of this particular topic in order to become crafters of their own solution ideas (Nielsen, 2013). Only when they understand the different factors that impact the topic, should they come up with solution ideas which they could then pilot test as little 'experiments' in one area to gather feedback on their solution ideas (Rasmussen et al., 2006). When they have enough feedback and have 'polished' their solution ideas according to the feedback, their detailed plan for action could be taken to the coordination team or the management team for final implementation approval (Kelly, 2005). Therefore, the working team should also prepare a business case to justify their solution idea and show responsibility and holistic consideration of the stakeholders (Rasmussen et al., 2006).

Hence, each WG should be in charge of its own topic (McVicar, Munn-Giddings and Seebohm, 2013) with one or two representatives of the WG regularly reporting at the coordination team meetings about their current progress or challenges they may face. Meanwhile, the members of the co-ordination team could also support or give feedback on the WGs' work.

Furthermore, it is important for the WG members to stay in constant contact with their peers outside the WGs (Dollard et al., 1997). This means, WG members will be encouraged to talk to their co-workers about the progress and ideas from the WGs and so gather feedback and new insights as well as bounce ideas off each other that they can then bring back to the WGs. This will not only improve the solution ideas designed in the WGs, but also may attract other workers to take part in the WGs or at least keep them up-to-date on what is being planned (Park et al., 2004; Knight *et al.*, 2017b).

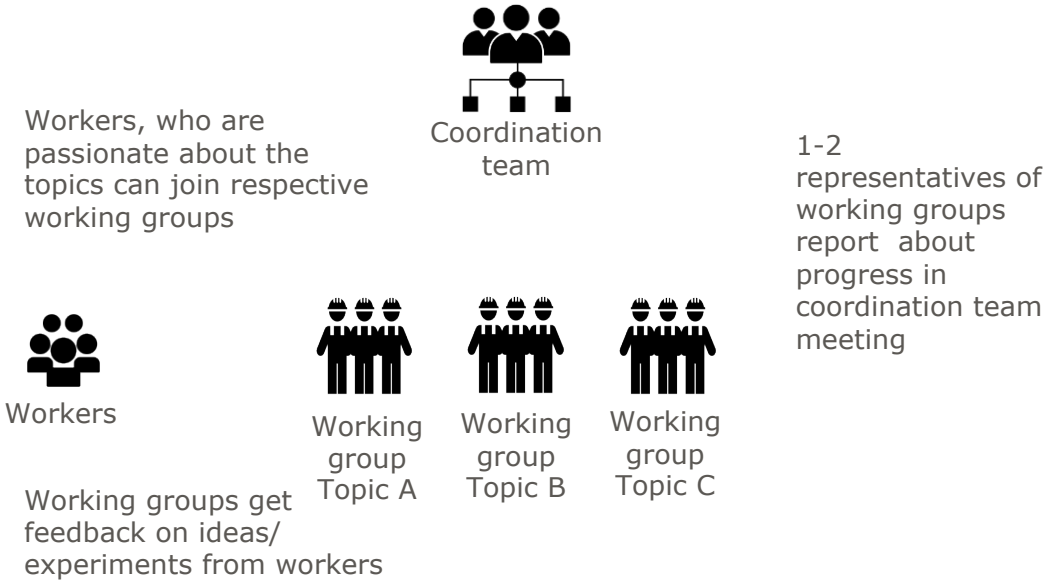


Figure 18: Intervention Framework: Process - Overall

6.3.4 (Top-)Management Commitment

Intervention research agreed that one of the most crucial factors for the success of the implementation of interventions is the support and commitment of the top-management team (Knight, Patterson and Dawson, 2019). Hence, the top-management's and managements' commitment must be ensured to be able to establish a sustainable environment to implement the intervention in the long-term (McVicar, Munn-Giddings and Seebohm, 2013).

Therefore, before implementing the PAR structure intervention framework, as a first step to ensure the necessary commitment and resources, it would be essential to conduct a meeting with top-management to meet the following requirements, which are paramount for success:

- A clear commitment from top-management to support the project – this was shown to be paramount for intervention success by various studies (Rasmussen et al., 2006; Nielsen, 2013; Knight *et al.*, 2017b; Knight, Patterson and Dawson, 2019). Managers, as well as supervisors and the trade union need to consistently emphasise the importance of the project and support the experiments within their work area. Similarly, managers must understand the interdependence between workers and managers and the consequential barriers that may arise and need to be addressed (e.g. fear of speaking up, fear of challenging managers, distrust of managers' motives) (McVicar, Munn-Giddings and Seebohm, 2013).

- Access to mixed groups to have a joint discussion with input from different perspectives and hierarchical levels. Hence, the relevant workers need to get the time to participate. Further, key representatives should be recommended through managers and workers. Also, access to experts needs to be granted (e.g. H&S professionals, legal experts, technical experts) planned (Park et al., 2004; Knight *et al.*, 2017b).
- A clear agreement from top-management concerning resources: It has to be kept in mind that the proposed intervention would not consist solely of single isolated events but the setup of a participatory change and innovation project which will take up regular time from the employees (Rasmussen et al., 2006; Knight *et al.*, 2017b) for a sustained period of time (McVicar, Munn-Giddings and Seebohm, 2013). For this reason, the respective employees must be granted designated work time to attend the workshops. Similarly, a financial framework must be set up regarding costs for the process (Kelly, 2005; Rasmussen et al., 2006).
- A clear agreement from top-management concerning the scope of the intervention (i.e. setting a frame within which things can be changed and outlining factors that cannot be touched, e.g. legal documents, salaries) (Park et al., 2004).
- Acceptance of 'experiments' (i.e. planned trials of interventions) and room for failure as overlying principles: Learning from mistakes within a small learning sample (i.e. pilot groups) (Park et al., 2004).

Furthermore, the following elements are recommended:

- A competent, experienced facilitator (Schurman, 1996; Punnett et al., 2013)
- Workshop material
- A workshop room

Through management approval, the overall responsibility in terms of coordination and economic decisions will be handed over to the coordination team.

6.4 Setup and Process

After gaining the full management commitment, the implementation structure and necessary requirements need to be implemented.

Kick-Off and Setup Coordination Team

After the management have agreed to implement PAR structures within the company, a coordination team would need to be set up.

As mentioned before, while there should be a representative of the management team, the union and H&S, also at least one supervisor and worker should be identified. For the participants from the shop floor, it would be important to not only identify knowledgeable individuals but also informal leaders within their peers to ensure acceptability of their colleagues.

Following, coordination group members would need to get to know each other and define their modus operandi, potentially identify and acquire individual skills, as well as the setup of the WG. For this, the similar procedure concerning phases 1-3 as is recommended for the WGs (in the next section 'Kick-Off and Setup Working Groups') should be applied, with the exception, that within the 'prioritisation phase' within the coordination team, the team would identify the most urgent topics/issues to be discussed and set up WGs accordingly (analogue (Rasmussen et al., 2006).

After implementation and setup of the coordination teams, their first task would be to set up and coordinate a communication to the whole plant to inform about the possibility of participation and enable workers to understand the process and aim. Overall communication from top management, line manager and supervisor must carry the message down the hierarchy to make sure that everyone knows about the programme and all questions are answered. Furthermore, all line managers and supervisors should be briefed in-depth preferably via face-to-face meetings and one member of the coordination group needs to be present to answer questions.

Kick-Off and Setup Working Groups

In this section, the different phases of the WGs will be explained (see Figure 19). The phases are largely as adopted by the process presented in Park et al. (Park et al., 2004). As a disclaimer, it should be kept in mind, that one phase does not necessarily equal one meeting. For some phases, several meetings will be required to achieve all necessary steps.

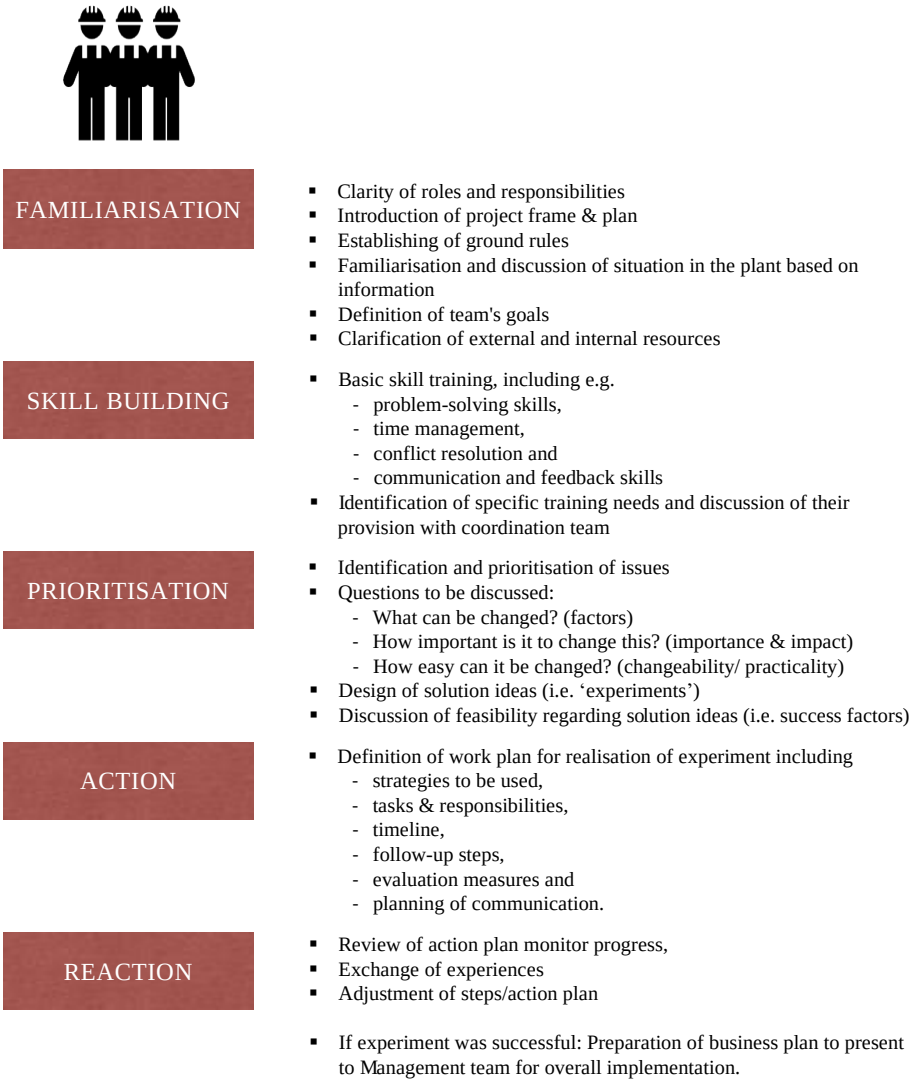


Figure 19: Intervention Framework: Process - Working Groups

Starting with the 'familiarisation phase', this would be the first meeting of the WG. In this phase all members will be enabled to get to know each other and the organisation of the WG would be established. That means that the different roles within the team should be discussed and defined (e.g. who will be the facilitator of the meetings, who will record the meetings etc.), as well as relevant ground rules (e.g. how decisions will be made, how disputes will be resolved). Similarly, a shared set of values and goals should be developed (Nielsen, 2013) and it should be defined how much time each participant can invest into working for the WGs and how often the WG should meet and when. In addition, all necessary information about the WG's topic should be shared and viewed by all members. Based on that discussion, the goal for the team should be determined by the team members. If necessary, it should be

decided if further members for the group are needed and how to approach them. Finally, it should be discussed what kind of support is needed by external and internal resources (e.g. the researcher, management, the co-ordination team, a consultant).

In the second phase, the so-called 'Skill Building Phase', enabling the participants of the WG to do their jobs would be the focus. This means that necessary skills would be identified and respective input provided (e.g. in problem-solving skills, time management, and conflict resolution, as well as communication and feedback skills) (Nielsen, 2013). Further required skills, for example speciality knowledge with respect to risk assessments or other H&S topics, should be identified and their provision discussed and ensured with the coordination team. Therefore, participants of all the WGs get a thorough basic skill set that will not only support their personal development, but also enhance their CVs.

In addition, Jeschke et al. (2017) found that the following factors were mostly hindering the application of knowledge:

- constricted production schedules,
- turnover and lack of interest among workers, and
- personal attitudes towards the initiative.

Hence, these factors need to be addressed in the training session and feasibility of solution ideas and workarounds or alternative strategies need to be designed together to proactively face these potential barriers. Potentially, if the group members are able to predict other challenges they may face or skills they will need, these training needs should be addressed on an individual basis. In general, training should be provided by a professional body, to enhance quality, but be tailored to the plant's context and group members' situations in order to ensure relevance and effectiveness.

After setting up the group and giving members the necessary skills in the first two phases of the process, the third step would be the 'Prioritisation Phase', with the focus on the issue at hand. As mentioned before, each WG will be in charge of one specific topic. This topic could be a general problem or issue in the plant or in a specific area, or simply an overall theme that needs attention.

In the first instance, it would be important for all members of the WG to get a good understanding of the topic. That means to investigate, for example by reading the relevant documents (e.g. reports, meeting minutes), through talks to specialists and/or by talking to co-workers that are affected by the topic (to learn what might be related to success, or to see what needs to be changed). This phase might take some time, as the participants of the WGs will have to conduct in-depth research into the topic to avoided them jumping to conclusions without having identified the relevant underlying factors. Bringing all this information together, the team members will then discuss the topic and the underlying issues as well as the changeability and importance of the underlying factors. Based on that discussion, in a brainstorming session, solution ideas would be collected and prioritised based on their impact and feasibility.

In the 'Action Phase', the group members will aim to come up with a detailed plan to achieve the WG targets and to address the recognised priority challenges (Park et al., 2004).

Therefore, they will need to specify

- what strategies they would employ for refining each issue,
- the planned tasks and the individuals responsible for completion of the required work,
- the timeline for completion of the tasks,
- the follow-up actions required, and
- the necessary assessment procedure.

In order to test their prioritised solution ideas, so called 'mini-experiments' should be set up. A mini-experiment is meant as a pilot on a smaller scale whereby, for example, only the participants of the team test the action experiment idea (or parts of it, as a 'light' version) for a few days in their daily work routine and then get back together to share experiences and re-evaluate their action experiment idea before presenting it to the coordination team or top- management (Rasmussen et al., 2006).

In order to set up an 'experiment' the following questions should be considered (as an example):

- What is being changed?
- For whom?
- How can success be measured?
- When should the success of the experiment be re-evaluated?
- What are the expenditures and benefits related with the experiment/with the whole change?

Furthermore, the relevant success factors would need to be identified and considered in the experiment as well as the later solution ideas based on the findings summarised in Table 27 and Table 28:

- Stakeholder involvement – Who needs to be informed/involved? How are the different stakeholders impacted by the developed solution idea?
- Changes in responsibilities – What changes, if any need to be made to the role description and who loses/gains which responsibility?
- Necessary resources – How much time is needed to implement the change? What investment must be made? Are new tools/materials etc. needed?
- Changes in procedures – What documentations and procedures are impacted by the change?
- Supporting tools – What will help the stakeholders to stick to the proposed changes?

The experiments will provide the WG with real-live feedback on their solution ideas on a small scale. Through their own experience, but also the feedback of their colleagues being affected by the experiment, the WG could gather valuable experiences and insights on the effectiveness and practicability of their solution ideas (Rasmussen et al., 2006).

Afterwards, in the ‘Reaction Phase’, this feedback should be used to improve the solution idea and review the action plan monitoring steps. This process can be repeated until the WG members were happy with their solution idea. Then, they should prepare to present their solution idea to the coordination team and potentially the management group.

Before final implementation, a business case must be prepared for the solution idea implementation and presented to the coordination team and potentially the management team, who will then confirm the implementation. The business case as well as the presentation should be conducted by members of the WG. Rasmussen et al. (Rasmussen et al., 2006) used a similar approach in their design of safety involvement interventions and found that workers felt more empowered and stronger ownership for the action experiments, if they also took responsibility over the presentation to management.

After successful solution idea design, it is recommended that all members of the WG get a certificate that acknowledges their active participation in the group and their solution idea development skills. Again, this can be a valuable enhancement for the individual's curriculum vitae (CV) as well as work as an incentive for workers to join the WGs in the first place.

6.5 Summary and Implications for This Research Project

Based on the findings reported in the previous chapters (for an overview see Figure 17), implementing PAR structures was recommended – not as a research tool, but as a team-based intervention for cooperative analysis of workplace challenges and tailored solution idea design. Knight et al. (2017b) proposed that the increased perception of social support, influence in decision-making and reduction of job demands through PAR will lead to a rise in perceived autonomy, competence and relatedness (the key needs by SET) and in turn increase WE.

Therefore, a proposal for an intervention framework was designed and presented as a template based on relevant PAR research findings. It must be considered that implementing a framework as proposed would mean a certain investment of resources (i.e. time and money) as well as some organisation in terms of working and decision-making structures and leadership style. It proposes therefore not a single-point intervention but a structural change that will be woven into the fabric of the organisations. Also, the intervention framework proposed differs from the current HSG65 recommendations (Health and Safety Executive, 2013) by not only recommending consultation and participation of workers but workers' involvement in re-design and decision-making. Therefore, in the next step of this research, the designed intervention framework proposal needs to be evaluated regarding feasibility

and practicability in the plant context and improved based on the feedback of the relevant BEP employees as well as its transferability based on the perception of external practitioners.

Chapter 7 - Feasibility and Evaluation of the Proposal for an Intervention Framework: A Preliminary Exploratory Study

7.1 Introduction and Research Aim

Exploratory studies are defined as studies that evaluate whether and how to optimise or assess the feasibility of an intervention, with feasibility being defined as the assessment of whether the intervention would work, should be implemented and how the intervention as well as the implementation could be conducted (Hallingberg *et al.*, 2018).

In the previous chapter the first template for the proposal of an intervention framework was described. To reduce the risk of the intervention framework proposal not being practical or acceptable within the target environment, as well as to evaluate the feasibility of the intervention framework to achieve the desired output, a preliminary exploratory study was conducted to evaluate the internal validity within BEP on the basis of the written proposal for the intervention framework. This study aimed to optimise the intervention framework proposal through identifying possible needs for improvement and potential problems as well as solutions (O'Cathain *et al.*, 2019). The study also aimed to address and explore what Hallingberg et al. (2018) called "key uncertainties related to the intervention implementation", meaning factors such as the acceptability, practicality and feasibility of the intervention. A further aim was to gain insights about possible shortcomings or barriers that affect the target group's acceptance of the intervention implementation as well as its setup's practicability (i.e. to what extent an intervention can be delivered under constrained resources (Bowen *et al.*, 2009)). In addition, through interviews with external practitioners, external validity and transferability of the intervention framework proposal was aimed to be assessed. Generalisability is a concept often used in qualitative research that is deemed by many qualitative researcher not to be a meaningful goal in qualitative research which aims for a deeper understanding of a particular sample and the context-bound knowledge generated (Johnson, 1997). However, it was argued, that if the context of the research is described in great enough detail, readers can make an educated decision regarding how far the presented research could

be transferred to their context (Lincoln and Guba, 1985), hence a flexible generalisability can be assumed (Braun and Clarke, 2013).

Feedback and insights were collected through semi-structured interviews via video conferencing calls or in person. This process is supported by several intervention researchers who have reported the importance of sufficient feasibility testing in a pilot before implementation of any intervention in order to tailor it to the target group and ensuring appropriateness (Moore *et al.*, 2015; Hallingberg *et al.*, 2018; Craig *et al.*, 2019; O'Cathain *et al.*, 2019). Most often, feasibility and acceptability have been studied in pilot studies where the intervention was rolled out to a small pilot sample and their interaction with, as well as attitudes towards the intervention were measured qualitatively or quantitatively through questions or behavioural measures (Saracutu *et al.*, 2018). This level of realism was not possible under the prevailing circumstances as during the time of the study, the plant was in the process of closing and several employees had already left the company and decommissioning was in progress. Hence this exploratory study focused on the hypothetical scenario of implementing the intervention framework proposal in the participants' company at a point in time when the plant was still on full capacity. With respect to the interviews, questions were framed so that participants should imagine it was two or three years in the past and whether they think that the intervention framework proposal would have worked as things were then.

Therefore, while this study is just evaluating a hypothetical scenario, researchers recommend conducting an exploratory evaluation of the intervention prior to actual piloting or even implementation to identify whether the intervention framework proposal is deemed appropriate, as well as to explore components and elements that need to be adjusted for success (O'Cathain *et al.*, 2015, 2019; Sekhon, Cartwright and Francis, 2017; Hallingberg *et al.*, 2018). Thus, this process of exploratory examination of 'key uncertainties' as well as gathering information on process and implementation practice is encouraged in guidance for the design of complex interventions (O'Cathain *et al.*, 2015, 2019; Hallingberg *et al.*, 2018).

7.2 Study Design

The study was conducted in two parts in order to allow triangulation between a) BEP employees (i.e. the potential target group) and b) practitioners while bringing those findings in context with c) empirical literature (Figure 20).

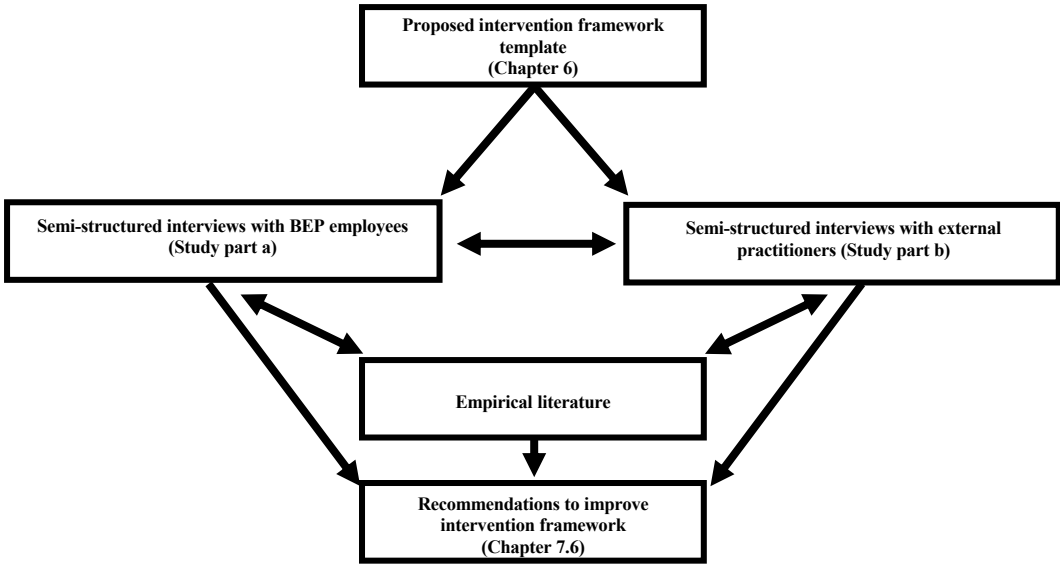


Figure 20: Exploratory Study Process

7.2.1 Participant Sampling and Demographics

For this study, data was collected between August 2020 and March 2021.

Study Part A: Semi-Structured Interviews with BEP Employees

The purposive sample for the interviews consisted of BEP employees directly involved with H&S on the shop floor (e.g. shop floor employees, managers of production areas, H&S professionals). However, since only a limited number of employees were still available, a certain level of convenience sampling was also applied. Furthermore, cell sampling was conducted according to hierarchy level and roles, as they may hold different perceptions and focus points with regard to the intervention framework proposal. Hence, it was aimed for a good representation of all the plants' safety-involved roles.

In total 14 interviews were conducted, which can be considered a sufficient sample in qualitative idiographic studies (Robinson, 2014). However, it needs to be considered that it may not be representative of the whole organisation (Costigan and Cox, 2002), especially not since limitations occurred due to the plant having been in the process of closure and no assembly line workers were employed anymore and therefore the researcher had to rely on machining workers, Estate workers, engineers and managers. However, besides the lack of assembly line workers, the sample can be considered balanced in terms of roles. There was a mix of managers and shop floor roles as well as H&S professionals. Further, in terms of the shop floor workers, different areas of the plant were covered (e.g. PLA, PLB, specialty

jobs, such as Estates and trade union convenor). Similarly, representatives of different hierarchical levels were provided (i.e. worker, supervisor, team leader and manager). Hence, there was one representative at least from the relevant areas and levels (except assembly line).Table 29 provides an overview of the sample's demographics. As can be seen within the Table 29, two individuals agreed to take part in the interview, but ended up not showing for the agreed time, due to time restrictions.

Table 29: Intervention Interviews - Participants BEP Employees

Participant	What is your role? - Selected Choice	For what department/PL do your work? - Selected Choice	For how long have you worked for Ford?
H&S1	H&S professional	Safety Department	1-9 years
MW2	Machining worker	PLA	20-29 years
H&S3	H&S professional	Safety Department	20-29 years
UWV04	Trade Union Convenor	Material Planning and Logistics	10-19 years
Mng5	Manager	overall	30-39 years
Mng6	Manager	Engineering	30-39 years
SWM07	Plant Senior Maintenance Supervisor	Engineering	20-29 years
WE08	Estates fitter	Estates	20-29 years
WE09	Electrician	Estates	30-39 years
WE10	Estates maintenance	Estates	10-19 years
Mng11	Manager	Engineering	20-29 years
Eng12	Senior Manufacturing Engineer	Engineering	20-29 years
WM13	Team Leader - Machining	PLB	10-19 years
WM14	Team Leader - Machining	PLB	10-19 years
n/a*	Manager	PLA	20-29 years
n/a*	Machining worker	PLB	30-39 years

*n/a = signed up, but did not show up

In terms of recruitment, safety professionals within the plant were used as 'study champions' in order to approach and recruit participants, since, due to the COVID-pandemic, personal

attendance of the researcher in the plant was aimed to be kept to a minimum. These 'study champions' were briefed in-depth via a video call meeting before conducting the interviews, so they knew all details about the study and were able to answer potential questions. However, this approach, by turning the managers and H&S professionals into 'research champions' to communicate the study to the shop floor, may have led to undue or perceived pressure for workers to participate. Therefore, managers were briefed to be conscious of this influence and emphasise the voluntary element of the request (similar to the approach taken in the first interview study). In order to maintain anonymity of participants, the 'study champions' were provided with a flyer (see Appendix X.VIII), that included the most essential information about the study as well as the researcher's email address. The research champions then communicated to BEP employees in their team. Furthermore, during that time, many safety relevant trainings were conducted (e.g. National Examination Board in Occupational Safety and Health (NEBOSH) qualifications), thus, the study was also promoted by the H&S professionals during those trainings and the flyers were handed out to interested individuals. This way, the workers who were interested could contact the researcher directly. Interested workers therefore contacted the researcher who then explained the details of the study to them, answered all questions, and provided them with the participation information sheet, the link to the consent sheet as well as contact details in case of further questions. Furthermore, those flyers were also used as posters and hung up in public places throughout the plant to catch the workers' attention.

As an incentive, a token of their voluntary participation and a recognition of their time invested in the study (i.e. reading the approximately 3.500-word intervention framework proposal information handout (see Appendix X.IX) and taking part in the interviews), a £15 amazon voucher was given to each participant who completed the interview. After only a very limited number of people volunteered in the first few weeks, the plant agreed on offering an additional £25 voucher, that workers could spend on the company's reward catalogue, 3 hours off the line so they had paid time to prepare for and attend the interview, as well as a Reward and Recognition (R&R) certificate for participation in order to promote and encourage participation in the study.

Taking part in the interviews was voluntary, therefore only employees who wanted to speak to the researcher were interviewed. However, this may have led to a loss of valuable insights,

with certain people not wishing to participate and other participants who may be more interested or confident in voicing their opinion being core participants. This may impact the results through for example; self-selection bias (Costigan and Cox, 2002) (potential limitations will be discussed in Section 7.5).

Study Part B: Semi-Structured Interviews with External Practitioners

To gain a wider view on the intervention framework proposal and learn from other's experiences as well as assess external validity, 'external practitioners' were interviewed as well. In this context, 'external practitioners' were considered to be people who have successfully implemented interventions with PL workers or in a similar environment in the past and therefore know about the challenges involved in implementing change in a production context, or people who conducted PAR research before.

Participants were recruited via the researcher's direct and indirect network[7] as well as through relevant groups on LinkedIn. Furthermore, authors of relevant papers were directly contacted via mail and each individual contacted was asked to recommend further possible participants (i.e. snowballing).

Depending on the platform Individuals were addressed differently:

- Individuals identified through publications: They were contacted via mail (see Appendix 0), explaining the study and asking for participation or recommendation of others (i.e. snowballing).
- Relevant LinkedIn groups: A post was uploaded explaining the study and asking for participants or referral to relevant people (see Appendix 0).
- Direct professional network: A post was uploaded explaining the study and asking for participants or referral to relevant people (see Appendix 0) on LinkedIn and Xing (i.e. a German platform analogue LinkedIn).
- Indirect network: Direct network contacts with a potentially relevant network were asked to promote the research via their channels (i.e. mostly LinkedIn or sent via

[7] Direct = People the researcher directly knew; indirect = people that were contacted by the researcher's direct contacts

mail to personal direct contacts). They were provided with a specific text outlining the study and asking for participation (see Appendix 0).

In the end, seven external practitioners were recruited from various backgrounds and with different expertise (see Table 30). Recruiting external practitioners had proven difficult as they were a) hard to reach, and b) had strong time-restrains. Resonance of individuals contacted via e-mail provided in publications as well as feedback within LinkedIn groups was very limited. Luckily, due to the researcher's network, a mix of safety practitioners and production practitioners could be included in the study. Further, one PAR practitioner identified through his publications was willing to participate and share his insights with the researcher. The external practitioners were offered a summary of the findings after participation as a token of appreciation for their insights.

As can be seen from Table 30, one person signed up to be part of the research but in the end, did not find the time for the interview.

Table 30: Intervention Interview – External Practitioner Participation

#	What is your job title?	In what country do you (mostly) work?	In what sector do you (mostly) work?	Experience in years	Recruited via
Pra1	Specialist Health and Safety Advisor	UK	Manufacturing	4	Indirect network/LinkedIn
Pra2	retired MD, PhD	Denmark	Hospital	25	Publication
Pra3	Industrial Engineer	UK	Manufacturing	13	Indirect Network
Pra4	Industrial Engineer	UK	Manufacturing	30	Indirect Network
Pra5	(Most Recent) Leadership Coach (recently laid off)	Canada	Oil and Gas	15	LinkedIn Group
Pra6	HSE Consultant	Wales	Manufacturing	20	Direct Network
Pra7	Plant Manager	UK	Consumer Goods	28	Direct Network
n/a	Research and outreach director	USA	Higher Education, Healthcare	21	Publication

7.2.2 Method and Process

The following sections applies to both samples, BEP employees and external practitioners.

Semi-structured interviews via video call or face-to-face were chosen as it allowed the researcher to gather the participants' perceptions and opinions on the whole intervention framework proposal as well as particular parts of it. This is deemed appropriate since qualitative methods were encouraged to be used to evaluate the acceptability and appropriateness of intervention framework proposals in exploratory studies (O'Cathain *et al.*, 2015; Hallingberg *et al.*, 2018).

Furthermore, it allowed for the necessary flexibility to adapt to the challenging situation because of the restricted access to participants due to the closure of the plant, the COVID-19 pandemic as well as the timeframe of this research project. On top of that, the same benefits and limitations applied as discussed in Section 5.2.2.

On considering the method to be used for data collection, first, focus groups set up as workshops to discuss the intervention framework proposal were considered, but the COVID-19 pandemic prevented meeting in person, therefore they were deemed inappropriate. Similarly, face-to-face interviews were only considered in cases where online interviews were not possible and only under strict health security protocols. Hence, semi-structured interviews offered the researcher the flexibility in terms of questions, but also in terms of method as they can easily be switched between online and face-to-face.

The flexibility of a semi-structured interview allowed the researcher to go deeper into topics that seemed significant and also gave the participant an opportunity to share whatever they perceived relevant. The interviews took between 20 to 70 minutes.

At least a week before each interview, participants were provided with the following:

a. A participation sheet: this included all necessary information to enable participants to make an informed decision before starting the interview (see Appendix X.VIII).
b. A link to the online consent form: participants were asked to consent to taking part in the study by signing an online consent form (see Appendix X.VIII).

After the participant had consented to taking part in the research, a date for the interview was set and the 'Intervention framework proposal Handbook' was provided (either via mail or (for the BEP employees only) a physical copy could be picked-up in the BEP safety department). Participants were asked to read the intervention framework proposal handbook before the interview. This document provided the participants with a summary of how the study would be conducted as well as with the main questions that were to be asked during the interview. However, the main part of the document was the detailed description of the intervention framework proposal (see Appendix X.IX). The aim was to give the participants the chance to immerse themselves in the topic in their own time and therefore, potentially reduce the time spent during the interviews. The participants therefore had the chance to think about the feasibility and practicability of the intervention up front and note down questions and comments. In the end, it turned out that all participants had read the document in detail and most had noted down ideas and thoughts.

In the interview session, a brief introduction to the study, the ethical background and the intervention framework proposal were explained to the participant. The depth and length of the presentation of the intervention framework proposal before the actual question part, was dependent on the participant's understanding of the handbook (i.e. if they understood everything the overview was more concise than for someone who reports understanding problems). As an aid, a presentation was prepared (based on the handbook).

In the case of online interviews, these were recorded using the software within Teams and using an additional audio recorder as backup. In case of face-to-face interviews, recordings were conducted using an audio recorder. The purpose of the recording was to allow the researcher to capture all the information discussed during the interview, which was vital for analysis. The recordings were later transcribed by the researcher, with all personal information being coded and anonymised.

To ensure the effectiveness and efficiency of the interviews in meeting the research aims, two pilot interviews were conducted to test the understandability of the supporting documents as well as the question guide. The feedback from these initial interviews was used to improve the supporting materials as well as the question guide before further participants were recruited. Generally, the feedback from these were positive with the exception that it

showed that some wording had to be adjusted to fit with the target group (e.g. the term 'intervention' was confusing for the plant workers, so it was usually referred to the 'framework' or 'initiative').

7.2.3 Ethics

The research was conducted in accordance with ethical standards with ethical approval obtained in advance through Cardiff Metropolitan University Ethics Committee (reference number: # PGR-2855).

In accordance with ethical standards, before an interview was conducted, the participant was provided with a participation information sheet detailing all relevant information about the research. Participants had the option to contact the researcher in case of questions or when content had to be discussed further. When the information was understood and agreed upon, a digital consent sheet was filled out to officially consent to the research (as an example, the BEP interviews participant information sheet and consent form can be found in Appendix X.VIII). After discussion and assurance by the ethics as well as data protection department, the participant filling out the online form completely was considered confirmation of consent despite the missing signature. Participants were informed about their right to withdraw in the participant information sheet, the consent sheet as well as in the beginning of each interview. However, it should be noted that no one did.

In accordance with General Data Protection Regulation (GDPR) policies, all data were anonymised and stored using a cloud storage facility protected by a password.

7.2.4 Question Development

A semi-structured interview guide was developed to guide the discussion while allowing flexibility through expansion.

The interview guide aimed to open discussion by exploring the participants' opinions on the intervention framework proposal's 'key insecurities' (e.g. feasibility, acceptability, practicability, possible barriers, learnings from other interventions). Therefore, the questions were designed by the researcher according to the seven components of the theoretical framework of acceptability (TFA) by Sekhon et al. (2017) which was developed following an extensive literature review (n=43) of acceptability interventions in a healthcare setting, and adapted according to the relevance to intervention framework proposal. While some of the categories

reflect on concurrent and retrospective evaluation of intervention acceptability, these were adapted to fit the evaluation of the proposed intervention framework proposal instead of an implemented pilot. Furthermore, while this model claimed to focus on 'acceptability', it was ensured by the researcher that questions concerning feasibility and practicability were addressed as well by considering the dimensions of feasibility by Bowen et al. (2009). Considering, that these terms 'feasibility', 'practicability' and 'acceptability' are often used interchangeably and or that the concepts were found to often overlap in academic literature (Hallingberg *et al.*, 2018), adjusting the TFA accordingly did not prove challenging. Plus, areas that were already mentioned in the literature as challenging were addressed as well (e.g. time for WG sessions during challenging PL schedules as mentioned by Jeschke et al. (2017).

After the development of the first draft, upon reflection some of the wording was perceived as too technical or complicated and therefore was simplified (see Appendix X.X). Also, the first interview was used as a pilot for the guide and the participant was asked for further feedback but had no suggestions for change. The complete chronological order of the questions as well as additional questions concerning the intervention implementation can be found in the interview guide (see Appendix X.X and Appendix X.XI). The same interview guide was used for both participation groups, with small adjustments in wording (e.g. the question for BEP employees "What would make the participation more attractive to you/your peers?" was changed to "What would make the participation more attractive to workers?").

An example of a question related to 'Affective Attitudes' (Sekhon, Cartwright and Francis, 2017) included:

"What suggestions do you have, if any, that could help improve implementing this intervention framework proposal?"

As can be seen, the question also explored practicability and feasibility.

In contrast, a question relating to 'Self Efficacy' (Sekhon, Cartwright and Francis, 2017) included:

"Do you feel you could successfully take part in the WGs right now? If not, what would you need?"

Again, while the question asked participants what perceived skills they thought would be needed to be part of the WG, it also left room to expand on other requirements, hence exploring feasibility dimensions.

7.2.5 Analysis

Transcription was conducted in an analogous way as in the previous study reported in Chapter 5. Transcripts were uploaded to NVivo 12 (Mac), which was used for labelling the data. A thematic analysis approach was adopted to categorise participant responses into themes. Thematic analysis was chosen as the study aimed to understand the opinions and attitudes of participants with respect to feasibility, practicability and acceptability of the proposed intervention framework proposal, and thematic analysis was recommended for identifying themes in attitudes and perceptions across data sets (Braun and Clarke, 2013). The analysis was conducted according to the 6-step process recommended by Braun and Clarke (Braun and Clarke, 2006) (Figure 21).

To ensure the quality of the analysis, similar to the interview study described in Chapter 5, the quality criteria by Sullivan and Forrester (2019) were followed (see Appendix 0).

Phase 1: Immersion & Familiarisation
Initial audio check of records

The researcher immersed herself in the data by besides transcribing it from the audio file, listening to it twice after transcription. Throughout this process of analytical and critical reading, first notes, comments and ideas on the content were collected. By this, the researcher not only emerged with the data but also the memory of them was refreshed in the researcher's mind as is recommended by Maguire and Delahunt (2017).

Phase 2: Generating initial codes/labels of the transcriptions
Systematically and thoroughly labelling of relevant data extracts

Across the whole selected data set, the data was systematically and thoroughly labelled, i.e. coded, either on a semantic or latent level as the researcher is interested in the explicit and surface meanings but also aims to identify the underlying conceptualisations and assumptions to inform the semantic content. Once each transcript was coded, the complete body of transcribed data was read once more and compared to the code/label set in order to make sure, that no relevant code or to be coded section was missing.

Once all transcripts were labelled, a total of 319 codes were created. However, due to the detailed and mixed coding approach, redundant labels could be eliminated.

Phase 3: Searching for and identifying themes
Construction of initial themes

On a higher level, it was looked for themes across the codes and how those themes interact. Braun and Clarke (2006, p. 82) said a theme "captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set". Hence, after the initial labelling process, the researcher started by broadly categorising all identified labels

Phase 4: Reviewing Themes
Revision and definition of themes and construction of a thematic map

In this phase, firstly, the themes were reviewed and if necessary rearranged regarding their fit to the entire data set, respective codes and if they resolve into coherent patterns. Thus, it was checked, if the themes suited the collated data, but also the quality and coherence of the identified themes. Secondly, the themes were reviewed across the transcribed sub-set of the data set using 'thematic mapping' in order to create a thematic map with clearly differentiated themes, that formed clear and coherent patterns and captured the most relevant dimensions of the data in relation to the research question. Within the process, further refinement and adjustments were undertaken based on the quality dimensions proposed by Maguire and Delahunt (2017, p. 3358). The thematic map was then discussed with the research team in order to identify incoherencies and redundant themes and sub-themes.

Phase 5: Defining and Naming Themes
Final refinement of each theme and naming of the themes

In this phase, the essence of the themes was specified and it was described what each theme compiles. Further, sub-themes, as well as the fit into the overall 'story' of the research question, were explored and defined. Following, all themes and their sub-themes were given concise and informative names and their essence was defined.

Phase 6: Writing the Report
The themes were presented and interpreted both systematically and critically in a written report

Finally, the themes and their connections were presented and systematically as well as critically interpreted in the written report which uses vivid data extracts to tell the 'story' of the data, i.e. the interpretation of the data set and the respective themes. Further, the data was connected to the research question as well as the results of the literature review.

Figure 21: Thematic Analysis adapted by Brown and Clark (2006)

7.3 Results

Based on the interview content, and after careful consideration of all codes in both groups, five main themes were identified that are presented in the following Section:

- Potential of Intervention Framework Proposal (Section 7.3.1)
- Transferability of the Intervention Framework Proposal (Section 7.3.2)
- Requirements for Implementing the Intervention Framework Proposal (Section 7.3.3)
- Communication Aspects (Section 7.3.4)
- Characteristics of the WG (Section 7.3.5)

7.3.1 Potential of Intervention Framework Proposal

All BEP employees generally displayed positive attitudes towards the intervention framework proposal and, with some amendments and considerations (that will be discussed in the other themes) the intervention framework proposal was considered sensible and beneficial for the plant.

Particularly the psychological impact on workers that such an intervention would have was often discussed, as such a process was perceived to allow engagement.

One worker described the potential as follows:

> *"It's your responsibility, that is, isn't it? If it is your responsibility you feel involved and if you feel involved then you are more inclined to buy into whatever the idea is. […] You are part of the process. […] But from a shop floor point of view to be involved, to feel responsible for the process and if someone told me to create a process uhm would be fantastic. I think it would work."(UWV04)*

He therefore displayed optimism of the intervention having direct impact workers' motivation through involvement. Other workers supported that notion and suggested that the forming of groups would encourage learning and facilitate a better safety culture.

The external practitioners largely mentioned similar points. Solving primary H&S problems, such as current safety hazards, in co-design was perceived by one external practitioner, who

used PAR in a H&S context before, as an essential to improve the psychological work environment (Pra2). Correspondingly, a H&S practitioner suggested that, in his opinion, he expects this intervention to encourage

> *"a sort of psychologically safe work environment where people don't feel like there are the potential for repercussions if they speak up about issues within their […] environment [as well as] open and honest discussion from the shop floor with the workers at the sharp end"(Pra1).*

One particular topic brought up by the practitioners was the potential to reducing silo thinking within the plant and aligning organisational processes.

> *"[…L]ook at a team that's fully engaged isn't just a safe team, it's somebody that wants to get production over the line and better-quality product so you know it's important that not everything is just focused on safety, […] it should be the business as a whole."(Pra6)*

The external practitioners highlighted the importance of aligning the plant's processes conjointly and that an enhanced workforce will improve a plant's work situation overall, not just in respect to H&S, which is in line with a Safety-II mindset (Dekker, 2018b). Therefore, the participants shared the perception that this intervention framework proposal showed great potential for increasing PL workers' engagement as well as a Safety-II mindset within the plant by means of co-productive safety solution idea development.

7.3.2 Transferability of the Intervention Framework Proposal

In addition, the external practitioners agreed that the intervention framework proposal was

> *"something that would work across the board rather than just in an engine plant"(Pra6).*

One production plant manager pointing out:

> *"It's something I would really consider piloting here [in his plant] because you know, […][the plant] has been here since 1997, very low turnover of people. You know most people have been here many years. They're in a routine. This is the way of things are done. Uh, and [this intervention could] break that routine, I think the work*

> *group approach could be the change agent I need. Because […] the people [would work under their] own steam."(Pra7)*

He further added that in his opinion this intervention had potential to create an inclusive environment in which workers' opinions are being valued. Hence, the external practitioners' comments suggest that the transferability of this intervention to other production environments was possible.

7.3.3 Requirements for Implementing the Intervention Framework Proposal

In order to implement this kind of intervention, several barriers and requirements were identified that need to be addressed, defined or set-up before the start of the PAR WG.

Some workers mentioned worries about the sustainability of the intervention in the organisation based on former experiences. One worker recommended

> *"people can feel if you're just giving the lip service to them, especially people which have got a long history of [working in the plant]. They shouldn't feel that this is [the] flavour of the month"(Eng12),*

hence highlighting the importance of long-term consistency of running the intervention in the plant. Another worker described his expectations as follows:

> *"It would start […] as a buzzword and probably be a buzzword for a while, will start off amazing[…] everybody's really keen to get on board and everybody will give their 110%. The management will promise you the Earth: 'we do this every week, will do that every week'; and then […] frequency of things will get slowly, […] until the end then everyone will get pissed off – excuse my language – everybody got pissed off, because it's not happening whereas all the workers are really keen and the management or the supervisor will be like 'Oh no, hang on now, we need we can't do it today, because of this or this', is just phases off and in the end then everyone will get pissed and say 'well if they can't be bothered, we can't be bothered', and then that's the end of that and I've seen that lots and lots of times. I think that's just factory life I think."(WE09)*

The worker not only showed his frustration with previous initiatives in the plant and his worries that this may also happen to the PAR intervention, yet generally later voicing his

opinion of the intervention being worth implementing and keeping. The importance of continuance and sustainability was also confirmed of the practitioners and described as *"the hart part"(Pra5)* of intervention implementation.

Other workers put it even harder saying that *"Ford will never have [an intervention like this]"(WE08*), based on past experiences as well as a culture that a BEP manager described as:

> *"These are the rules follow the rules. And […] we have lots of rules. And also the corresponding side, I don't think the people, whether it's a product of the culture or not, but they're not in the right mindset to behave maturely. They […]want to be told the rule, that's the rule. They have no interest in my opinion, in being empowered, a lot of them."(Mng11)*

Thus, the initial implementation or sustainability of the intervention was doubted based on past experiences and cultural aspects in the plant. The manager described the BEP culture as strongly rule-driven, yet he also expressed distrust towards some workers' ability but also their lack of interest in being empowered and working on issues together across levels. Partly, workers expressed similar views and acknowledged the difficulty of changing working habits, attitudes and mindsets acknowledging people's resistance to change, though some also acknowledged the socio-cultural impact, as worries were expressed that socio-cultural components like social pressure (e.g. bullying) may hinder success of the intervention, since the culture on the line was by some described as *"cut throat"(UWV04)* and concerns were expressed that if you showed positive attitudes or ambitions to participate in safety interventions, that social pressure by peers might occur.

Similarly, concerns were raised regarding the management commitment. One of the most discussed barriers next to the workers' attitudes, were the pressure by production and the respective leadership priorities. Workers voiced concern of management not releasing workers off the line. Some workers expressed the perception that the leaders on all levels must

> *"show full commitment [and] not just lip service"(Eng12)*

to convince the other employees that this intervention had priority. At this, the costs of releasing workers off the line as well as the time management of substitution, especially when production runs high, were listed as main barriers. Reflections on past experiences by some

BEP employees emphasised the importance of aligning the production and safety goals, and depicting a clear direction on safety as a priority. One manager admitted that *"production comes first"(Mng05)* on all levels, indicating that this includes not only workers' behaviour of cutting corners but also leaders' behaviour of perhaps letting them. Another manager emphasised that for him it is essential to have full and honest commitment by management:

> *"The first thing you're always going to need is commitment because as soon as you don't have managers committed to the process, you end up with, you know, one of the managers for example, doesn't attend a meeting or one of the leaders doesn't attend a meeting because - I don't know he's got a problem, or he's got something else going on - all of a sudden everybody then thinks: 'he's not interested in safety'. […]So, what you've got to get is management commitment and […]process confirmation that regardless of the time of day, regardless of the situation they're in, if they are due to go and engage with the teams, they go and engage with the teams"(Mng05)*

The commentary by BEP employees thus ensuring prioritisation of the initiative and therefore WG attendance. Hence, the commentary highlights the importance of the alignment of all leaders in the first place, so that they support the intervention. Further, managers admitted that workers' coverage on the line could be ensured through early notice and proper planning. Hence, the resources should be provided not only in terms of costs and time off the line, but also regarding social support and recognition of effort.

Related to the longevity of intervention implementation, one practitioner added that in his experience in order to achieve sustainability of interventions, single point of accountability needed to be implemented, with someone taking ownership over further feedback and changes, such as an internal practitioner. Furthermore, it was acknowledged by most BEP employees that the implementation for an intervention framework like the one proposed would mean a strong change in culture for the plant. Moreover, while these reflections were made based on BEP, the employees often considered them to be true for other factory environments as well, through contextualisation such as *"in a factory environment"(UWV04)* or *"I think that's just factory life"(WE09).* In addition to the BEP employees concerns with regards to the social environment, while the transferability of the intervention framework proposal was confirmed by the external practitioners, they also mentioned their perception

on an implementation of this in a plant and the accompanying culture change would mean that details of the intervention framework need to be amended to the company's staffing structures (e.g. shift patterns) and social culture as it needs to be specific to the organisation and its structure and characteristics (e.g. shift patterns, socio-cultural circumstances).

In addition, the importance of implementing first a 'Just Culture' was expressed in which

> *"open and honest discussion with workers on the shop floor [was encouraged]"(Pra1).*

Similarly, one external practitioner highlighted his perception of it being important that there needs to be a shared mindset, purpose and leadership direction instead of a competition between safety and production:

> *"There's always been perceptions [of production being prioritized over safety initiatives] and it's a very old-fashioned sort of view where it's like production versus safety. But in reality the two should go hand in hand."(Pra1)*

In terms of resource allocation and allowing workers off the PL, one practitioner, who is a manager of a production plant, shared that in his opinion, it is a planning and therefore, leadership commitment (Pra7). In line with the previous commentary, the matter of management commitment, was expressed as the most essential precursor for PAR success for a practitioner that had conducted PAR intervention before (Pra2). However, there were also mentioning that that the workers' attitudes need to be understood, as

> *"at the bottom line the intervention has to be relevant and accepted [by] the people [on] the floor"(Pra2).*

Thus, measures to prepare the workforce were recommended to be considered as well.

Thus, the aforementioned commentary depicted a need for identification and amendment of individual requirements within the plant, based on the existing culture and structures, e.g. how the staffing while workers participate in the groups can be ensured. In this respect, one member of the safety department recommended setting up a pilot approach (H&S03).

7.3.4 Communication Aspects

This theme addressed the commentary regarding communication in terms of initial communication regarding the introduction of the intervention framework to the company and its workers as well as continuing communication throughout the WG proceed.

In terms of initial communication, the most noted factor mentioned in the interviews by the BEP employees was the importance of explaining to workers the benefits, the process and background of the intervention framework. One worker specifically emphasised the importance of making the workers to allies in the structure change instead of pushing the intervention framework on them:

> *"Explaining sort of the background and the reason behind it. And maybe people take it on board rather than it being thrusted down their throat and told to get on with it. People don't like that but if they can understand why, the reason behind it, which is obviously trying to improve on near misses, minor injuries and things like that and health and safety, then they might be willing to take it on board."(WM14)*

For accompanying the intervention framework, it was perceived communication needed to be transparent and consistent in order to provide information about progress and success on the one hand and avoid rumours on the other hand. Thereby, it was reflected that there need to be communication measures and tools that allow all employees to get access to all relevant information, such as on a prominent Safety Board or by Supervisors and Team Leaders cascading the information on in morning or shift meetings. Supporting, the HSE Consultant confirmed that communication is paramount in his experience in the success of the intervention and that

> *"there needs to be a mixture [of methods][...] so people are constantly aware of what's going on"(Pra6).*

Some practitioners also highlighted the effectiveness of constant communication, even if there were no apparent news to keep up visibility. Furthermore, it was recommended to keep up personal communication in order for employees to ask questions directly, as well as ensure constancy and transparency of progress and information. However, not only the workers need to be kept updated as one practitioner pointed out, but also management will expect regular progress updates.

Summarising, both BEP employees and external practitioners acknowledged the importance of a personal approach to initial communication as well as constant progress updates and the chance for all employees to be updated and be able to feed back.

7.3.5 Characteristics of WG

By far the most discussion within the interviews was around the characteristics and set-up of the WG.

A main challenge identified by all participants was surrounding the recruitment of workers for the WG. As was already presented in Section 7.3.3, the acceptance of the intervention by the workforce was identified as crucial for its success. Based on that acceptance, the willingness to take part actively would be determined.

In that context, the term *"right people"* was used by several BEP employees (H&S01, H&S03, WE10, WM13), we well as some external practitioners (Pra1, Pra6, Pra7). Workers highlighted the need for the workers participating in the WG to be someone familiar and respected by the workforce because the workforce might otherwise not share insight with the WG. Others suggested that supervisors and team leaders may have insights into who would be willing to participate, however, it was noted that they might choose *"yes-man"(WE10)* who will not be accepted by the workforce.

Furthermore, the *"right people"* were characterised by being

- *"engaged in [H&S]"(Mng05),*
- *"want to make a difference"(WM02)* and
- *"keen [and] motivated"(UWV04*).

In addition, participants would need to be able to communicate effectively and not be afraid to voice their opinions towards superiors (WE08). In line with the views by the BEP employees, some external practitioners expressed their view that the people in the WG should be

> *"quite vocal on the shop floor or inspirational or people always turn to them because they seem to be the right fit [as well as] people who are confident people who are not afraid to speak up and talk to people. And they also need to want to see change within their areas as well"(Pra1).*

Moreover, some workers raised questions as to whether the participation of just a few acting as representatives may lead to some workers feeling left out. One worker pointed out that in his opinion, workers who were not chosen (even if they did not come forward in the first place) to be part of the WG, may then reject any output from the WG as they may feel they cannot be

> *"bothered [if they weren't] good enough to be chosen"(WE09).*

Therefore, several BEP employees suggested either the mandatory involvement of all workers on the shop floor through asking for their opinion on matters in meetings (WE09) and/or having rotation in the representatives, where the role is being switched regularly (H&S03). One worker suggested that by making involvement mandatory to a certain degree, may also reduce the social pressure as

> *"maybe the mocking is occurring because the person mocking didn't have an opportunity to go into the group, but maybe that's their reaction of dealing with [it]"(WM02).*

In addition, it was also mentioned that within BEP a strong rivalry between shifts and teams was perceived (Mng11), as workers were described as

> *"get[ting] very territorial about the teams they work in(WE09),*

which was perceived as workers rather solving problems in their own teams instead of working with other teams together (WE09). These notions were not addressed by the practitioners, perhaps they were on the forefront of BEP employees due to their challenging social environment, which may not be as apparent in other plants.

In terms of incentives to participate, it was mentioned that it should be considered what made it worthwhile to the workers, as in financial incentives, official certificates or trainings (WM13). However, it was emphasised, that it was perceived having a photo in a newspaper would not be attractive (WE10). Additionally, one practitioner suggested that maybe offering extra days off, special trainings that improved their CV, employability and overall skillset for promotion might be attractive (Pra1).

In terms of recruitment, another practitioner recommended asking workers, for their recommendation of who they would want to have as their representative in the WG to identify and get informal leaders involved. Controversially, while the same practitioner highlighted that

> *"the workers [were] knowledgeable about the whole company", and "ask the workers at the floor because it's workers at the floor who are the focus"(Pra2),*

he also recommended not involving shop floor workers in the first instance, but staying with H&S personnel who should know the organisation. This is in stark contrast to the BEP employees and external practitioners that highlighted the importance to involve shop floor workers for their contextual knowledge and since they are being the target group of the interventions designed in the WG, and his own comments at a later stage in the interview. Another practitioner warned caution as to who is being volunteered by the teams, as they may choose the most senior person, who may though not be the right fit and may not even be respected for anything but his seniority in the company by his peers (Pra6).

Similar to the notion of some BEP workers, one practitioner suggested whole PLs or teams build WG to feedback insights and work on solutions, so no one is singled out (Pra7). However, he also added that he worked in a smaller plant, where involving everyone might be more manageable as in a plant with more than a thousand people (Pra7). In terms of other roles included in the WG, it was acknowledged from both, BEP employees and the external practitioners, that different skills and hierarchy levels need to be involved to share knowledge, such as H&S professionals and union reps (e.g. Mng05, SWM07, Pra1, Pra2) as well as other roles and levels, such as group leaders, supervisors, managers and contractors (e.g. H&S03, Mng05, WE09, Eng12, Pra6, Pra7*).* One practitioner, who is also a plant manager, suggested, that the plant manager direct involvement may hamper workers' experience of the process being their own, thus suggesting that the plant manager's direct involvement in the WG may impact workers' perceptions of control and autonomy (Pra7).

Within the WG, commentary surrounding the set-up of roles to consider that clarity regarding task allocation, authority and responsibilities were important. One practitioner mentioned:

> *"If you're trying to sell this idea to workers and employees to become a little bit more autonomous, they may perceive that that takes some of the legal responsibilities and*

> *accountabilities away from their managers and supervisors. So ultimately, […] management and directors and business owners are the duty holders, and they are the ones who are ultimately accountable if something does go wrong. So, we've got to make it clear that just by putting a little bit more responsibility on the workers to come up with solutions to these ideas, that by no means […] that the managers and the directors are discharged of their responsibilities."(Pra1)*

The practitioners highlighted the definition and communication of clear responsibilities and accountability structures. Considering this case from another perspective, a BEP employee in a union role reflected on his experience with other workers of being a union safety rep and explained that he often perceived the shop floor workers to have expectations towards him and made him responsible if things they fed back were not realised, even though he was part of a group and not everything was in his sole control (UWV04). Hence, these two accounts depict the need for clear definition and communication of roles as well as their attached responsibilities. Furthermore, BEP workers and practitioners confirmed the need for WG members, especially from the shop floor to be prepared with certain training. However, it was perceived that the skills needed would be dependent on the workers and topics with a particular focus on communication skills – not only presentation skills but also effective communication with peers and people from all hierarchical levels (H&S01, WM02, WM13, Pra3, Pra4).

Also, the intervention framework proposal suggested having mixed groups of roles and hierarchies within the WG, although all hierarchical roles should be equal when working within the WG. One BEP worker commented on this, expressing his preference for someone used to a leading position (i.e. a manager) taking the lead of the WG, and brought up an example of a manager, who was described as his

> *"soft skills are second to none […] he is approachable, he is understandable. Somebody of that nature, who was of a hierarchical position would be suitable to lead the group"(WM02).*

Hence, while there was a desire for someone with leadership skills to lead the WG, it was also suggested that this leader must be accepted by the group as 'approachable'. Another worker suggested that it would help if there was a democratic process and structure to fair

decision-making (UWV04). However, one worker emphasised the importance of taking care that

> *"management shouldn't be able to bully people on the teams"(WE10).*

Therefore, it is important in the beginning to agree upon a shared set of co-operation rules (Mng05, Pra1, Pra6). Regarding this topic, a practitioner suggested that roles within the team might rotate, so that everyone gets the chance to take the lead or report to management (and practice the required skills) to ensure fairness of responsibility and praise (Pra6).

The mediation between WG dynamics resulting from the different hierarchy levels and departments, was also mentioned in the context of facilitation of the WGs. Hence, some practitioners recommended to make sure that the WG was properly facilitated by a practitioner (Pra1, Ex 03, Ex 04). Furthermore, three practitioners advocated the need to initially define a common goal and frame (e.g. timeframe, financial scope) which offers direction in decision-making (Pra3, Pra4, Pra7). These goals can then also be used for measuring the WG's success against and could potentially also be linked to the plant's overall safety goals (Mng05, WM02).

Regarding the work within the WG, the commentary suggested a mix between topics suggested by safety metrics (Pra5, Pra7) and safety culture assessments (Pra7) as well as identified by people (e.g. Pra7), yet one practitioner admitted that the first topic addressed should come from the shop floor to promote support (Pra6). One BEP manager emphasised that initially picking topics that could generate *"quick-wins"* might spark motivation and be a good success story for the WG (Mng05). Similarly, one of the practitioners suggested a focus on topics that are linked to managers' goals to ensure their commitment (Pra1). However, in order for workers in WGs to analyse the issues' root causes, interview their peers efficiently and produce solution ideas, it was emphasised, that they need to be supported by trainers, coaches and subject matter specialists (e.g. WE10, Mng05). Also, from a management and planning perspective, enough time for the organisation to set-up the structure overall and the WG needs to be allowed (Pra6). Similarly, it was expressed that the time for WG meetings needs to be allowed, yet this would be also depending on the individual needs of the company and topic (Pra2).

Therefore, in conclusion, the different directions within the commentary have a degree of commonality, that they all highlight the need for individual solution ideas and flexibility when setting-up the structure overall and WGs, and that a "one-size-fit-all" of the PAR approach would not work, however a flexible recommendation would be transferable to other plants and was considered acceptable within BEP. Hence, depending on the plant's situation, it should be discussed how the broad majority of workers can be involved and voice their insights and feedback. Furthermore, the need for clear guidance within the WG through a capable facilitator as well as cooperation agreements was emphasised.

7.4 Discussion

This interview study examined whether the designed intervention framework proposal on the basis of a PAR structure was considered acceptable, practical and feasible and was perceived as potentially enhancing engagement. The study also sought suggestions to increase the elements related to key uncertainties.

7.4.1 Evaluation of the Intervention's Acceptability, Feasibility and Practicability

The commentary suggested that overall implementing PAR structures in a plant to increase WE was considered acceptable and feasible. Most workers in the plant welcomed the idea of becoming part of the decision-making process. The results contributed to the growing evidence of engagement interventions (Knight, Patterson and Dawson, 2019). Although research had provided evidence of the success of PAR interventions on H&S performance (Park et al., 2004; Rasmussen et al., 2006), the impact on WE has not been extensively investigated yet (Knight *et al.*, 2017b) neither has the use of PAR being explored as a collaborative intervention instead of a research method. However, the intervention framework by considering co-design and workers' actively being part of the decision-making, differs from the common recommendation about how to manage safety in organisations, that are more focused on consulting and having workers as participants in the process (Health and Safety Executive, 2013). Hence, this intervention framework takes it a step further to workers' participation in the sense of voice and being consulted, towards workers' empowerment of playing an equal part of the co-design process and decision-making.

In terms of practicability, it was acknowledged by BEP employees, as well as the external practitioners, that introducing PAR structures in a plant and empowering workers to take

part in such an intervention would involve a major change to current working and decision-making processes in most plants, including BEP. Therefore, it was perceived as essential to prepare the organisation as well as their employees for such a change in working structures. These findings were in line with recommendations from the academic domain (Young, 2006; Macdonald, 2012). Challenges have been identified mainly in the area of recruitment and particularly in BEP leadership support and provision of resources. These issues will be discussed in the following sections.

The external practitioners confirmed transferability of the proposal which was designed based on the BEP-specific research. However, the comments also recommended setting up the intervention in a way targeted to each individual company, which could be done using PAR itself.

7.4.2 Potential Impact on WE

The responses suggested by BEP employees, as well as external practitioners in that particular field, that the impact on workers' perceptions of meaningfulness in their work and similarly bringing employees of different hierarchical levels and departments together through the proposed intervention framework proposal was considered beneficial to engagement as well as safety culture and performance. Psychological meaningfulness was also identified in the literature as important to promote engagement (May, Gilson and Harter, 2004; Simpson, 2009), while alignment of organisational goals and feedback by means of communication as well as training were identified as most successfully used in safety interventions (Lee *et al.*, 2019). Both sides could be catered to through the intervention framework proposal.

Furthermore, several participants commented on the potential of feeling pride and learning through participation in the WG and actively driving change. As a feeling of self-efficacy was identified as the most impactful antecedent in relation to engagement, which might be supported through participating in WG (Guest, 2014), this could be promoted through PAR as anticipated by the interview participants. Going deeper than just a resource demand perception, Guest (2014) recommended increasing workers' skill utilisation and opportunity for learning through job design as well as an increased perception of organisational support to increase engagement, which could all be provided through PAR. Furthermore, it would facilitate a two-way communication as well as being perceived as proof of the company having 'safety engagement' as a value, due to the managers displaying support

Some practitioners also brought up the potential of the intervention to improve on psychological safety through giving workers a voice and a structure to use it. Indeed, MacLeod and Clarke (2009) identified employee voice through participation as one of four major enablers for WE. In accordance, a recent study by Almeida et al. (2020) explored the impact of employee voice through participatory interventions in a rural hospital setting. Their qualitative analysis revealed evidence of a positive link between voice and decision-making possibilities through participation which led to engagement level increase (Almeida, Frino and Milosavljevic, 2020).

Not surprisingly, the benefits of using the contextual knowledge of employees actively in job redesign structures was considered by some of the interview participants. This is indeed in line with research, showing that job crafting interventions were found to have impact on engagement levels, job crafting and decreased psychological stress as well as basic need satisfaction (Sakuraya *et al.*, 2016; Van Wingerden, Derks and Bakker, 2017). Therefore, the identified expected benefits of this intervention framework proposal have the potential of facilitating engagement by means of several other psychological dimensions (e.g. voice, job design, pride).

However, it should be noted, that Knight et al. (2017b) designed their PAR intervention on similar assumptions. They proposed that the increased perception of social support, influence in decision-making and reduction of job demands through PAR would lead to an increase in perceived autonomy, competence and relatedness (the key needs) and in turn increase WE. However, after 12 months their study, using a PAR with a focus on enhancing WE, showed no significant effect using repeated measures ANOVA on forty-five nursing staff caring for older people in acute care NHS wards. They identified four potential main reasons for that finding: a loss of belonging of employees taking part in the PAR intervention with their work teams; lacking line management support, thus no priority was given to this intervention; that the WE of participants was already high and therefore an umbrella effect to WE was experienced; and they also acknowledged that the study design may not have had statistical power to detect any differences due to the small sample size (Knight *et al.*, 2017b). It could also be considered that, based on Conservation of Resources Theory (COR; Hobfoll *et al.*, 2018) gain spirals are less powerful than loss spirals. Thus, measuring after only 6-12 months might be too early to gather positive effects and participants were still too focused

on the new structures and situations they were facing and therefore experienced lower feelings of self-efficacy rather than a gain in resources. This assumption emphasised the importance of preparing the organisation and its employees for such a change in working practice to limit and reduce the potential feelings of insecurity.

7.4.3 Preparation of the Organisation for Implementing and Conducting PAR Structures

Only a few studies have considered the effect of implementation factors on intervention success according to a systematic review combining 103 workplace intervention publications (Egan *et al.*, 2009). However they are critical for success (Egan *et al.*, 2009), therefore, it is essential to consider success factors for implementation carefully.

Research on PAR, but also engagement interventions, have highlighted the importance of preparing the organisation in order for them to support the intervention to ensure sustainable success (McVicar, Munn-Giddings and Seebohm, 2013; Nielsen, 2013; Knight *et al.*, 2017b; Knight, Patterson and Dawson, 2019). The findings of the study conducted as part of this thesis supported the existing evidence of the importance of such preparation.

One topic that came up in almost all PAR papers as advice and which was also a prominent discussion point in the interviews was the assurance of leadership support (McVicar, Munn-Giddings and Seebohm, 2013; Nielsen, 2013; Knight *et al.*, 2017b; Knight, Patterson and Dawson, 2019). Indeed, a longitudinal cross-sectional study analysing when perception of participation and line manager support impacted intervention outcome (i.e. employees' job satisfaction and work ability) over time found that prior to intervention implementation, line manager support needed to be ensured. Hence it was recommended to evaluate current line manager support at the outset of an intervention to establish where resources and additional support is needed (Tafvelin et al., 2019).

While the need of participation in interventions and line manager support is important (Nielsen *et al.*, 2010), the study conducted as part of this thesis revealed that this involvement is more important in some phases of the intervention than in others (Tafvelin et al., 2019). The study showed that while employee participation was relevant throughout the whole project for implementation success – i.e. in the initialisation as well as the active phase towards stabilisation – perceived line manager support was found to be most important during the

initialisation and active phases, however this was not to ensure the outcome of the intervention per se, but to ensure participation of employees, which is in line with other studies' results (Tafvelin et al., 2019). The interviewees' comments contributed to these findings and extended them by emphasising the importance of an alignment between the organisational goals and values and the shared vision displayed in words and actions by management, which in turn needs to be aligned with the interventions' purpose. While the importance of a shared aligned safety mindset and values was acknowledged in generating a resilient safety climate (Zwetsloot *et al.*, 2017), it has not been reported in the research literature relating PAR (to the author's knowledge). One practitioner recommended linking the empowerment of employees and giving them a voice to managers' targets. Considering the Safety Differently mindset, linking managers' financial benefits to a 'perception of employees having a voice', might be counter-productive, as it puts pressure on managers and does not empower them, as well as promoting false-reporting (Dekker, 2018b). Considering that, research suggested that PAR interventions were most successful when there is a trusting relationship between managers and the workforce for the workers to open up about the real problems on the shop floor (McVicar, Munn-Giddings and Seebohm, 2013), having a transparent leadership style that was in line with the organisational values and targets was found to be essential. Along the same line, the interview data suggested that perceived socio-cultural dimensions need to be addressed through communication and leadership showing commitment actively and consistently to promote positive social learning and reduce potential bullying of interested employees. It was also mentioned by BEP workers that certain 'territorial behaviour' of workers was perceived to potentially prevent sharing of solution ideas and the decrease of silo-thinking. While these comments reflect the opinions of the BEP workers and therefore might be an issue linked to the perceived BEP culture, similar experiences may be present in other companies. This topic was not explicitly discussed in the PAR literature, yet it was mentioned that the feeling of belonging, when being a representative in a WG, might decrease to the outer-WG group which may impact WE (Knight *et al.*, 2017b). This may have been related to the employees not being part of the WG feelings excluded. The responses of the interviewees in the current study, particularly the BEP workers, suggested that only having some members of staff involved in the intervention might lead to disappointment, feelings of rejections and therefore, resistance to the whole approach including using social pressure to keep others from participating. In addition, considering Tafvelin et

al.'s (2019) findings, the impact of superiors' behaviour mentioned by the interviewees should be considered. Hence, it was emphasized that in order to give everyone a voice and encourage participation, close superiors, such as team leads and supervisors, need the chance to gain the skills and tools required to ensure involvement of every employee with no individuals feeling just 'being paid lip service to'.

Some BEP workers expressed worries about managers' 'bullying' within the WG, pushing for their own solution ideas and ignoring workers' inputs and opinions. This might reflect the current plant culture and perceived leader behaviour, as was discussed in Chapter 5. Therefore, it indicated the importance of a clear and cooperatively defined framework that guides roles, responsibilities and behaviours within the WG that allows contributing and decision-making on equal terms of all WG members. This is supported by Nielsen (2013) recommending that the relationship within the WG of employees on all levels had an active impact on the intervention success, since, for example the shared perception of values, joint responsibility and co-operative job crafting need to be defined. It could also highlight the importance of a neutral and skilled facilitator in the WG. Nielsen et al. (2021) found evidence in their PAR research for a facilitator significantly improving WE of group members as they may create energy and structure to the participants' experiences and learning processes as well as the creation of a shared vision and goal that may impact the team thinking process.

To anticipate potential social pressure and ensure the transparency and co-creation element of PAR, the importance of initial communication to ensure comprehension of the benefits of participating as well as the importance and gravity of the initiative was emphasised. Considering that most PAR papers either did not explain their recruitment mechanisms for the workforce element (Rasmussen et al., 2006) or seemed to have used workers recommended by management or none at all (Rosecrance and Cook, 2000) this was a novel point. Tafvelin et al. (2019) pointed out the importance of worker participation in all stages of the process for intervention success. Thus, an initial communication needs to tackle the workforce and transmit all relevant information. The commentary by the external practitioners highlighted that in the first instance it is not needed to have the answers to all question, but rather to keep the workforce informed about the current and future steps and give them a platform to ask questions and give feedback, and in turn, prepare the employees for the upcoming changes in structure. Furthermore, continuous communication though varied means was brought up

as a success factor to reduce the risk of rumours and to help people keep up-to-date and be encouraged to support either their team-mate's solution ideas or by becoming part of a WG themselves. Again, this topic was not heavily discussed in the PAR literature, which may be due to the nature of PAR usually being a long-term research method used in a certain department not a long-term collaborative intervention structure to the organisation.

To cater to the specifics of the organisation, most external practitioners and some BEP employees recommended starting with a pilot study to test the approach and alter the distinctive features to ensure their fit to the organisation. While this was recommended as part of the development of solution ideas within the process of PAR (Park et al., 2004; Rasmussen et al., 2006), using the same approach to set-up PAR within the organisation was a step beyond the usual approach. Thus, it was recommended to implement one initial PAR group that then aims to define the overall framework for the intervention determining e.g. participation in WG under consideration of work situations (e.g. shift and department inclusion), communication measures, and other elements specific to the organisation.

A much-discussed topic throughout the interviews was the set-up and characteristics of the WG. The responses overall suggested the groups should be mixed in skill and perspective, which was at the core of the overall PAR literature (McVicar, Munn-Giddings and Seebohm, 2013; Nielsen, 2013). Just one practitioner advised against taking workers on board in the set-up of the approach. While he explained this recommendation through the lack of workers' understanding of overall organisational processes, this could also be seen as defeating the aim of PAR in developing solution ideas collaboratively and benefitting from the perspectives and insights of different employees (Nielsen, 2013). However, the comment should be considered in the sense to acknowledge that not all participants will have the same experience and knowledge level and therefore knowledge gaps need to be considered and potentially closed in relevant topics or by-passed through thematic experts that provide specific insights for all participants to make educated decisions.

Therefore, overall, consensus was reached by the practitioners that the specific set-up of the WGs, as well as the whole approach, should be defined based on the requirements of the respective organisation, while the proposed intervention framework proposal laid out a promising baseline. The BEP employees agreed, while there were some reservations in some workers that BEP would ever allow such participatory measures, the intervention showed

potential to increase engagement and at the same time create valuable H&S solution ideas. However, for this the involvement of representatives versus the whole PL, was mostly reason for debate. While these reservations may be due to the current BEP culture and therefore may not be as problematic in other plants, since this topic was not as strongly brought up by the practitioners, this might be a critical issue to consider prior to setting up individually tailored interventions based on the climate in the specific plant.

7.5 Limitations

This research obtained valuable perspectives of both BEP employees and external practitioners on the PAR-based intervention framework proposal and offered feedback and insights on how to improve on the proposal for an intervention framework. This added to the credibility and acceptability of this intervention framework proposal on a two-dimensional level; within BEP and outside in other PL environments.

Furthermore, practicability and feasibility were not only discussed, but due to the feedback the proposal could be strengthened and refined to better suit PL settings in BEP but also ensure the transferability to other plants.

However, the research was not without its limitation. Considering that the evaluation of the intervention framework proposal was based on a description on paper, and not a pilot study that the participants could have experienced, the perceptions and views were based on hypothetical grounds, and the comments may have changed if they had experienced it in reality. Nevertheless, seeking feedback on the feasibility, practicability and acceptability based on an intervention framework proposal is not uncommon and is even considered a vital part of complex intervention design that has often been overlooked (O'Cathain *et al.*, 2015; Hallingberg *et al.*, 2018).

Additionally, other limitations based on the study design and implementation might be possible. These are addressed in Table 31.

Table 31: Possible Limitations of Intervention Interview Study

#	Bias	Reasoning	Consequence
Sampling			
1	Selection bias/Research Champions BEP	Taking part in the interviews was voluntary, therefore only employees who wanted to speak to the researcher were interviewed. However, due to Covid-19 restrictions, the researcher was not allowed in the plant at first. Therefore, she had to rely on chosen 'Research Champions' within BEP to approach workers. Using champions provided by the company may lead to the risk of participants fearing repercussions if they choose to not participate in the study: Participants may feel obliged to take part when addressed by the 'Research Champion', Similarly, due to the use of 'Research Champions', the likelihood of selection bias might be raised, as they might (implicitly or explicitly) select certain participants to talk to.	Being approached by a 'Research Champion' might put (unintentionally) pressure on the individual who may feel obliged to participate. In order to avoid this, the 'Research Champions' were briefed in-depth about how to approach individuals and were sensitised about the pressure they may insert. Furthermore, they were provided with a flyer (Appendix X.VIII), so that the individuals could contact the researcher directly. This way, the 'Research Champions' did not know who ended up taking part in the study and confidentiality can be ensured to a certain degree (exception see bias 3). During the briefings, the 'Research Champions' were also sensitised for the matter of selection bias, and it was highlighted, that all workers need to be addressed. However, since the nature of the sampling was purposive, a certain selection was necessary. Also, the plant was undergoing commissioning at that time, so only a limited section of the workforce was available.
2	Selection bias BEP	Due to the closure of the plant, the plant was undergoing decommissioning at the time of the study. Therefore, only a limited number of workers was still present. This led to not being able to involve assembly line workers but only machine workers in the research.	Since this intervention framework proposal was primarily aimed at increasing the WE level on the shop floor and their Safety-II performance, being not able to consider perceptions of part of the shop floor element may be a limitation. However, since the machining element was included in the interviews, they could bridge the gap, since they have experience of working on the line before and were working closely with the assembly line workers, therefore knowing their mindset and needs to a certain degree.

3	Incentive-Caused Bias BEP	For the BEP employees, incentives were offered for taking part in the study, as the participation was anticipated to be low. Due to the incentives, that BEP provided, the H&S office as well as the respective supervisor needed to be informed about who took part in the study in order to issue the voucher and certificate as well as to release the respective employee from the line. This may have intimidated certain employees as they feared of repercussions from being known to have taken part in the study. Furthermore, the confidentiality of participation could not have been ensured anymore. Furthermore, the use of incentives may have altered the participants interest in the study and their motive to take part.	While confidentiality of participation could not be completely granted anymore by the researcher (i.e. the name of the participants would be shared between researcher, safety department in the plant and potentially top-management, university), the confidentiality and anonymity of input (i.e. what the participant shares with the researcher) was still ensured. Additionally, in the consent form, the participant could indicate, that they preferred to have their data shared with the plant, however then they needed to agree to sacrifice the £25 voucher, the certificate and the 3 hours' time off the line and only receive the £15 voucher by KESS. Furthermore, due to the incentives, individuals who may not have considered taken part might have become interested. This may have led to participants not taking part based on their personal motivation to aid the project but more based on their interest in receiving the incentives. While this might be true, on the positive side, this may have opened up the sample to more inclusivity as the participants did offer up their time and input. Furthermore, the insights of any individual are valuable, regardless of their motivation.
Interview design/conduction			
4	Researcher/Response bias	The researcher herself might have inflicted bias by showing considerably different characteristics than the population. While most workers in the plant were e.g. male, Welsh and without university education, the researcher was female, German and with academic education. This might have let to cultural misinterpretations between researcher and participant and may have influenced participants' responses due to possible perception of lack of e.g. trust, or credibility.	While the researcher tried to build a trusting relationship with the participants through building rapport and creating a friendly and relaxed atmosphere, the possibility of biased data still had to be considered. However, this could also have seemed more approachable to some participants, since a young female may seem less threatening.

5	Measurement bias: Mixed-methods	Whilst one-to-one interviews were the original aim, one interview could only be conducted with two external practitioners due to circumstances beyond the researcher's control i.e. the only time for the interview was while the two external practitioners were in a car together between meetings.	While there were concerns of potential limitations of group interviews which the researcher did attempt to anticipate, there appeared to be honest and open discourse between the participants, with no sign of restraint or reluctance in voicing opinions or experiences. Since the two external practitioners were working together for a long time, trust between them should not have been an issue. Finally, in this group interview, attempts were made to address each participant equally and ensure both had the chance to add to the conversation. Therefore, it was unlikely for the mixed-method to have critical impact on the theme development. In fact, the setting may have actually enhanced the results since the participants actively discussed their opinions and thus prompted new ideas and thought processes.
6	Observer/analysis bias: Single researcher transcription and analysis	Since the transcription and analysis was done only by the researcher, bias can be assumed.	With respect to the quality of transcription, coding and theme development, after each step in the process, the results were discussed in detail with the supervisory team in order to identify blind-spots or inconsistencies. To ensure quality, the researcher herself critically and repetitively sample checked the work results at each stage in a test-retest format (i.e. allowing one to two days between tests in order to overcome memory effect). While this process may not have eliminated all errors and researcher bias may occur, on the positive side, internal consistency in error can be assumed as only one researcher was involved in the research.

7.6 Implications for This Research Project, Recommendations for Practice and Amendments

Considering the collective feedback from the interview study, the general intervention framework proposal was deemed appropriate and promising for its purpose. Furthermore, the addition of the external practitioners' insights confirmed its potential transferability to other production environments. However, some amendments were suggested (particularly regarding the initial considerations and set-up) that needed to be considered. Based on the input, the researcher developed a question guide, that can be used by a company to prepare their organisation for the PAR approach. These questions are recommended to be discussed by management with worker involvement and together producing solution ideas fitting the individual organisation.

The questions read as follows:

Things to consider and explore before implementation (potentially within the coordination team):

- What has been done to ensure manager and middle manager support?
    - How can insecure or reserved managers be supported in skill or other resources?
    - Potentially, ask the workforce to identify managers that may need more support (Tafvelin et al., 2019).
- Is there a shared vision and targets between management? How is this being reflected in leadership style and everyday actions?
- How do social pressure dimensions (e.g. bullying) impact workers' decisions to take part in an intervention? How can these be addressed?
- What communication channels can be used to ensure two-way information flow reaching every employee for initial communication?
- What is the scope of the intervention?
    - How much time can employees have off the line to take part in meetings or to work on WG tasks?

- What regulations, procedures, etc. are in scope and can be changed – what is untouchable?
- In case experiments need financial investment, up to what amount can WG make decisions without other clearance?

In summary, based on the findings of the feasibility study, four overall recommendations for this research but also for practice can be drawn:

- Make sure the organisation and employees are ready for the intervention: Is everyone committed and has the resources they need to support the success of the intervention?
- Workers need to be part of the solution: Empower your workers to not only be part of the solution, but be the solution. Have the workers design interventions in co-design with managers and specialists.
- Ensure fit and efficiency through testing: Before implementing full-scale, test intervention on a small-scale through experiments and pilots and gather feedback evaluating they work and to improve upon them.
- How can you make it last? Do not think in terms of one-point interventions but continuous inputs and follow-ups.

Chapter 8 - Final Discussion and Conclusion

8.1 Overview of the Thesis and Evaluation of Findings

The aim of this research project was to develop a proposal for an intervention framework, which can be applied to increase H&S engagement levels amongst the plant's PL workers, and to potentially provide a framework, which can be transferred to other MF organisations.

In order to achieve this aim, the research met the following objectives:

- Objective 1: Identify and synthesise the current literature to assert empirical evidence that links WE with H&S behaviour and mindset and its connection to the Safety-II principle through a literature review.
- Objective 2: Evaluate the existing body of research on WE interventions in a production environment to derive measures of good practice and impact on increasing WE by conducting a narrative literature review.
- Objective 3: Utilise a qualitative approach to identify factors influencing H&S engagement in the plant through semi-structured interviews.
- Objective 4: Synthesise the findings from the interviews and the narrative literature review to design a template intervention framework specific to the target group to improve workers' H&S engagement in the production plant.
- Objective 5: Collect and analyse qualitative perceptions on the template intervention framework proposal via a preliminary/exploratory feasibility study involving semi-structured interviews a) with the target group to assess and critically evaluate the fit, feasibility and practicability, and b) with external practitioners to assess and critically evaluate external validity and transferability as well as to identify possible improvements.
- Objective 6: Synthesize the findings of the previous studies in the development of a proposal for an intervention framework and guidelines improving H&S engagement in PL workers within the Safety-II mindset.

These objectives and their achievement are presented and discussed below.

8.1.1 Objective 1: Identify and Synthesise the Current Literature

According to the MRC framework for the development of a complex intervention, the first step of the research, in conjunction with the first objective, was to identify and synthesise the evidence base within the existing literature to assert empirical evidence that links WE with H&S behaviour and mindset, along with its connection to the Safety-II principle through a literature review. This objective was addressed in Chapter 2 and 3, first by gauging the general body of WE research, WE in the context of H&S and Safety-II literature in Chapter 2 and then, funnelling down and assessing the empirical body of WE-related studies in a PL setting.

In order to meet Objective 1 in the second chapter of this research, the literature on engagement, and how WE may promote a safety climate, behaviour and mindset was synthesised. The existing literature indicated that safety performance and workers mindset towards safety was an outcome of engaged workers (Mark *et al.*, 2007; Hansez and Chmiel, 2010; Nahrgang, Morgeson and Hofmann, 2011; Yuan, Li and Tetrick, 2015; Collier *et al.*, 2016; Laurent, Chmiel and Hansez, 2018). However, available research on the topic was scarce, with publications mainly being set in hospitals and focusing on patient safety.

The importance of workers' active involvement and engagement was recognised within the concept of Safety-II (Hollnagel, 2014; Hollnagel, Wears and Braithwaite, 2015a), an evolution of safety approaches aiming for resilience through appreciating workers as proactive, clever resources that enable performance variability through flexibility. However, to date, research into the antecedents of Safety-II in workers and its link to WE has been neglected, even though these insights are particularly important when trying to foster an engaged workforce in the context of a Safety-II mindset. Therefore, the research presented derived psychological Safety-II principles (Hollnagel, 2014a; Hollnagel, Wears and Braithwaite, 2015; Dekker, 2018b). Taking the developed Safety-II principles and the overall WE antecedent research as a base (Christian *et al.*, 2009; Crawford *et al.*, 2010), a safety engagement framework was proposed, marrying the two concepts. As a result, a construct presenting WE antecedents fostering engaged workers within a Safety-II mindset was derived, and practical implications were deduced regarding the resulting concept of H&S engagement within a Safety-II mindset. While this concept is mainly based on theoretical assumption to this date,

practitioners will likely benefit from testing the impact of the derived engagement antecedents supporting the implementation of a Safety-II mindset within the workforce. This theoretical concept adds to the body of literature on system and procedure consideration in the context of Safety-II with a psychological perspective on how to support the workforce in 'engaging' with the Safety-II mindset, so that it becomes natural to them, and consideration of safety and resilience becomes an integral part of everyday decision-making and action.

The research surrounding general WE antecedents indicated that factors impacting their job and personal resources affecting the individual's perception of psychological meaningfulness, safety and availability in a work context are key in encouraging engagement. Furthermore, the literature review on the impact of WE on H&S relevant topics showed that three factors were found to be primarily important: trust, leadership behaviour and the safety environment. These factors were also included in the antecedents linked to the identified Safety-II principles.

Moreover, the findings from the literature reviews revealed:

- Most WE research focused on understanding the concept, as well as the antecedents, of engagement in cross-sectional studies, however, few long-term studies and controlled intervention studies were undertaken;
- A lack of studies taking into account qualitative measures to assess the experience of WE levels in diverse samples;
- A lack of understanding of the differences in WE experience between job types;
- A lack of research on the psychological aspects surrounding Safety-II research and how to foster workers' Safety-II mindset; and
- A lack of practical guidelines or interventions regarding fostering engaged workers' Safety-II mindset context.

Building on the evidence from the initial literature review, a more in-depth look into the existing empirical body of engagement research involving BC/PL workers in a MF setting was reported in the third chapter. This was to better understand and learn from the experiences of the target group of this research in a narrative literature review, based on a systematic literature search. The systematic literature search identified thirty-one publications, indicating the limited amount of PL-specific research. Throughout the review, existing evidence from peer-reviewed publications concerning PL workers was identified and evaluated.

The narrative literature review contributed to the overall body of research by:

- Being, to the best of the researcher's knowledge, the first to synthesise the empirical body of engagement research with a clear focus on PL workers;
- Identifying the lack of qualitative research, even though the need for a deeper understanding of the individual factors driving engagement was acknowledged;
- Identifying the lack of practical guidelines in PL worker engagement research; thus,
- Proposing practical considerations for production environments based on the review's findings;
- Identifying that there are differences between job types in how they experience WE, highlighting the importance of tailored research and understanding the specific needs of the target group.

However, it had to be acknowledged that being aware of the differences between different definitions of engagement, specifically between engagement as an internal affective psychological state and engagement as a behavioural state was difficult. Particularly in relation to production environments and H&S, the behavioural implications appeared to be the focus for researchers, possibly due to the practical interest. As not all papers always explicitly defined their understanding of WE, it was difficult to differentiate between the two. Hence, in the literature review, the two concepts are used interchangeably.

The reviews of the literature reported in Chapters 2 and 3 contributed to the fulfilment of Objective 1 through assessing the empirical evidence that links WE with H&S behaviour and mindset, and its connection to the Safety-II principles through a literature review. Considering the MRC framework, through the findings of the review, an evidence base was identified and theories were derived. As a result, an understanding of the underlying impact and success factors in the context of the intervention target-group could be developed. With regards to the overall intervention framework design, the findings reported in Chapters 2 and 3 emphasised the importance of understanding the specific underlying factors impacting engagement levels, as well as their respective drivers in a safety context in the target sample.

8.1.2 Objective 2: Review on Engagement Intervention Research With a Focus on Production-Line Workers

The second objective was met through the narrative literature review reported in the fourth chapter. This review added to the evidence-base regarding underlying success factors relating to the intervention. This was done by analysing the existing peer-reviewed publications in a BC environment on WE interventions to derive measures of good practice and impact on increasing WE. The review agreed with the findings of a recent systematic review by Knight et al. (2019). Not surprisingly, considering the findings reported in Chapter 3, few interventions were found that had included the same target sample and that had focused on engagement as a measure. Furthermore, although the importance of an in-depth understanding of individual factors was acknowledged, the review showed that none of the studies explored engagement in a qualitative way. However, the review's synthesised findings identified characteristics of interventions that were found to be important in terms of implementation (such as ensuring support in resources and social commitment), intervention focus (tackling job and personal resources, at the individual and team level) and in terms of sustainability of the intervention, as well as its effect. While all interventions included in the review were single, short-term interventions, the results showed that long-term solutions that continuously provide employees with personal and job resources were needed to impact engagement.

8.1.3 Objective 3: Exploring the BEP Workers' Engagement Levels and Drivers

In order to contribute to the evidence base for developing theories on what antecedents have to be tackled to improve H&S engagement in PL workers and to identify the specific factors impacting engagement levels in the plant's workers, Objective 3 was to identify factors influencing H&S engagement in the BEP workers through a qualitative approach. This was addressed in the fifth chapter, which reported on a study of the plant workers' individual perceptions of the factors influencing their H&S engagement, identified through semi-structured interviews. The interviews showed that the workers were inherently internally motivated to work safely, and three main themes were identified impacting their engagement levels:

- Safety focus: Aspects of the safety focus and the behavioural characteristics displayed through dissonance between actions and communication (including how feedback was given and received in order to affect a change in safety behaviour), as well as the organisational aspects that support and reflect that safety focus.
- Communication: Perceived quality, direction and intention of communication in relation to H&S in relation to the workers.
- Environment: Psychological, including concerns and fears that workers displayed with respect to the current economical and physical climate, and social, such as the relationship between workers and managers and between individual workers, factors perceived to have an impact or influence on the level of H&S engagement among workers.

This research identified a certain 'trust barrier', the level of the workers' trust in the genuineness of their leaders, which determines the perceived quality of each engagement driver (i.e. theme) impacting the workers H&S engagement.

These findings have important implications to the intervention framework design, as well as to practical guidelines in general:

- Leaders: Could benefit from adapting their behaviour and allocating time and resources to building meaningful, trusting relationships with their workforce and learning how to support their workers and creating a psychologically safe environment.
- Workers: Need the resources (e.g. skill, communication channels) and opportunities to take responsibility for their work, to voice their concerns and insights, and to help shape their working environment.
- Generally: Processes should be adopted in order to provide a structure and environment for WE.

A successful intervention would need to impact workers' perception of the meaning of their work and support the development of a feeling of purpose in their work and expertise, as well as their perception of safety within the working environment, leading to considering safety as a priority in words and actions. Individual psychological availability could be en-

hanced through not being distracted by a disruptive or challenging physical or social environment, rather having an environment fostering personal resources, such as a feeling of competence and self-efficacy. Therefore, Objective 3 was successfully met. While the study was conducted in challenging times for the plant, which was potentially distressing for the workers and polarising the sample, the findings brought unique insights regarding PL workers' perceptions of their WE drivers in the context of H&S, adding to the findings from studies involving other job roles (Lawani, Hare and Cameron, 2017b).

8.1.4 Objective 4: Design of the Proposed Intervention Framework

Research Objective 4, which was to synthesise the findings from the interviews and the narrative literature review to design a template intervention framework specific to the target group, to improve workers' H&S engagement in the production plant was then conducted. By taking the multidisciplinary findings (from occupational psychology and safety research) from the previous chapters, the proposed intervention framework to increase H&S engagement levels in BEP (and potentially in other MF environments) in a Safety-II mindset context was designed, involving participatory, co-design elements as a base for job design. This was presented in Chapter 6. The basis for the intervention framework was taken from the PAR design, however, instead of using PAR as a research design for a single project, it was proposed to implement the principles of PAR in the organisational structures to support continuous safety job design in a participatory, co-design way. This provided a novel, evidence-based intervention approach in a production setting for fostering H&S engagement based on Safety-II mindset principles. To the best of the researcher's knowledge, this is the first study that proposes not only a single-point intervention, but an integrative framework implemented in an individual organisation, therefore supporting the individual production of targeted solution ideas to overcome organisational H&S challenges hindering H&S engagement and/or Safety-II principles through a joint team of employees of all levels. While PAR has been successfully used as a research method to develop H&S interventions (Rasmussen et al., 2006) and was expected to increase engagement when implemented in a prepared and supportive environment (Knight *et al.*, 2017b), it has never been considered as a long-term structural intervention framework until now.

8.1.5 Objective 5 and 6: Feasibility Study on the Proposed Intervention Framework

The feasibility, practicability and transferability of the proposed intervention framework were then assessed on a hypothetical basis in interviews with BEP employees and external practitioners to address Objective 5. Improvements for the intervention framework characteristics, as well as considerations for the implementation, were then derived, thereby achieving Research Objective 6. The importance of a thorough exploratory feasibility study prior to be pilot study, in order to understand 'key uncertainties' and identify possible improvements on practicability has been emphasised (O'Cathain *et al.*, 2015). Thus, one of the strengths of this study lay in the thorough evaluation of the intervention framework proposal, before piloting, from different relevant perspectives, at the same time assessing and deriving recommendations for better fit to BEP, while also confirming possible transferability of the intervention framework to other MF environments. Furthermore, the overall guidelines derived from this study (as presented in Section 0) can be considered relevant to intervention implementation of other participatory interventions in a busy production environment within similar organisational studies. Thus, practitioners may benefit from bearing these guidelines in mind when implementing any kind of intervention. However, acceptability and practicability of the specific characteristics of an intervention should be assessed in the individual context to ensure specific company fit.

In general, BEP employees, as well as external practitioners, confirmed the three dimensions under study (i.e. feasibility, practicability and transferability). 'Key uncertainties' as well as recommendations were identified surrounding the initial implementation of the intervention framework in a new plant. Foremost, it was recommended to not define the set-up initially, rather to discuss and develop the individual implementation and characteristics of the intervention framework within each company to tailor it within a pilot WG. Based on this valuable recommendation, the researcher developed a question guide, which can be used by a company to prepare their organisation for the PAR approach. Future research would be beneficial to pilot and evaluate the proposed intervention framework presented in this research project in other MF settings.

Overall, the intervention framework proposed in this research was designed based on evidence derived from the systematic and in-depth analysis of the empirical body of knowledge

and qualitative research. Consequently, all research objectives of this research were successfully met. It is grounded in an organisational structure that allows a co-design process of all impacted stakeholders of H&S, for them to develop and decide upon H&S procedures, and, consequently, facilitates an engagement culture and Safety-II mindset through empowerment and job redesign mechanisms. This takes the recommendation of the HSG65 (Health and Safety Executive, 2013) a step further by not only having workers being consulted and involved in the design of solution ideas for H&S issues, they are considered experts in their field of work and, therefore, design solutions and decide upon procedures together with other stakeholders in the organisation (e.g. managers, H&S professionals), and are considered equal partners in the management of H&S. Consequently, through maintaining the intervention framework structure and making it the primary way of managing H&S in the company, a Safety-II mindset and worker engagement will be weaved into the fabric of the organisation. Bearing in mind that the Safety-II principle of H&S is an integral part of decision-making organisation-wide, considerations should be taken to implement this framework throughout the whole organisation, not only to tackle H&S issues solely. While it is acknowledged that an organisational change like this is associated with changes in the organisational structure, working procedures and mindsets, and, thus, means resource investment, the potential positive impact on the organisation's performance and the workers' wellbeing is expected to be considerable (Knight *et al.*, 2017b; Dekker, 2018b). To ensure sustainability as well as transparency of the intervention framework within the WG, clear goals should be developed and progress towards these goals should be measured and communicated openly (Kelly, 2005). Furthermore, an effort must be made not only to keep everyone in the organisation informed, but indeed to be included in the solution idea design. In conclusion, this intervention framework proposes a comprehensive structure and mindset change within the organisation that goes beyond standard H&S practice to become integrated into the general practice and culture of the organisation.

8.2 Recommendation for Practice

Bringing together the individual findings reported in each chapter, a '9-Point Plan for H&S Engagement in Production-Line Workers' was derived. This plan designed to be a guideline for practitioners to identify potential opportunities within their organisations to enhance and foster workers' H&S engagement in a Safety-II context.

Therefore, the final '9-Point Plan for H&S Engagement in Production-Line Workers' reads as follows:

1. Understand the context and cater to your workers: make an effort to understand workers' needs and their respective requirements regarding job and personal resources, as well as understand 'work-as-done '.

   Suggestion: Sensitise and train leaders and managers to show that they care about their workers and hold conversations with workers about their needs as workers. By doing this, they enable their workers to engage with safety and their work as well as provide the resources needed to work safely. Hence, in conversations with employees, superiors should ask the workers questions like:

   - How do you see the situation? Based on the situation, what are the open points/ main uncertainties? (i.e. asking for opinion and perceptions)
   - What would you do to solve it? What other solutions can you see and how do you evaluate them? (i.e. asking about intent and potential 'work-as-done')
   - What do you need to solve it? (i.e. showing support through resource provision)

2. Consider all three dimensions of engagement - The workers' psychological availability, safety and meaningfulness.

   Suggestion: Consider and discuss with workers what impacts their psychological availability, what shaped the purposefulness that workers experience at work, and what social systems impact workers' perceptions of justice and safety in work.

   - How can workers get more autonomy in their work to generate their own resources?
   - Superiors showing genuine interest in their workers' wellbeing and ask what they can do to increase the individual and team wellbeing.
   - In team meetings, discuss between workers and managers how their individual work contributes towards the company's mission and how that impacts the company's clients or the world. Workers' need to understand their impact on the product and the impact the product has on the end-customers.
   - Recognise and celebrate individual as well as team and organisational successes and achievements. Again, workers need to feel they are a valuable part of the organisation and their work is appreciated.

3. Consider providing resources at a team and individual level as well as on an organisational level.

   Suggestion: After understanding the personal and job resources that workers require to be more engaged in a Safety-II context (see points above), it should also be considered how to provide these resources to workers on an individual level as well as within teams. In addition, consideration should be given to the consequences associated with providing those resources on an organisational level.

4. Workers' engagement with safety as a priority in the company on all levels: Organisational processes and decision-making need to reflect this value.
   Suggestion: Critically evaluate existing structures as well as everyday decisions by asking the question: "Does this reflect our appreciation of our workers being engaged with safety?" and adjust accordingly.

5. Leaders as coaches and supporters of their workers: leaders (and that also includes managers) need to be given the time and training to gather and understand workers' perceptions on daily challenges and what they need to overcome them (i.e. 'work-as-done') as well as supporting workers in their daily work and providing resources in challenging day-to-day situations.
   Suggestion: Adjust job descriptions as well as job resources to allow more time on the shop floor as well as training and supporting leaders so they can act accordingly.

6. Consideration and incorporation of all workers: Two-way communication and participatory structures in decision-making should incorporate all employees of the company.
   Suggestion: Consider, within the context of your company, how to ensure two-way communication and input from all employees, also take social structures (e.g. bullying, social pressure) into account.
   - Consider different channels, e.g. personal individual conversations, personal group conversations, anonymous feedback mechanisms (e.g. feedback box or app, surveys), communication of goals and progress in a prominent place with question/comment element
   - Consider different group levels, e.g. team meetings, tool-box talks, cantina meetings

7. Restorative justice should be the guiding principle in decision-making. In case of an event, it should not be about who is to blame and what the consequence of incompliance should be, but organisations need to show care and ethical, value-based leadership. All stakeholders, directly and indirectly affected by the event, need to be considered and learning opportunities on all levels should be derived.

   Suggestion: Incorporate restorative justice into work processes, e.g. through Dekker's (2018a) "Restorative Just Culture Checklist" and also consider how the mindset can be adapted into day-to-day decision-making.
   "Restorative Just Culture Checklist" by Dekker's (2018a) consider the following regarding first victim, second victim, organisation, community and others:
   - Who is hurt?
   - What do they need?
   - Whose obligation is it to meet the need?

8. Consider the corporate impact that the organisational actions and events have on workers and how the company shows social responsibility.

   Suggestion: In discussion with workers find out what makes them feel cared for by the company, and foster these things.
   - Consider social events, that include significant others or show care for (local) causes (e.g. family summer party, charity events).
   - Does the company show ethical and responsible leadership? How is that reflected in day-to-day decision-making (e.g. is it considered in sourcing of supplies, how contractors are treated)?

9. Any kind of change and intervention in the company needs consideration and preparation.

   Suggestion: To ensure long-term effects of intervention, consider the following aspects:
   a) Make sure the organisation and employees are ready for the intervention: Is everyone committed and do they have the resources they need to support the success of the intervention?

b) Workers need to be part of the solution: Empower workers to not only be part of the solution, but be the solution. Have the workers design interventions in co-design with managers and specialists.

c) Ensure fit and efficiency through testing: Before implementing a full-scale intervention, test the intervention on a small-scale through experiments and pilots and gather feedback evaluating whether it works and how to improve upon it.

d) How can the improvements be made to last? As opposed to a one-point interventions ensure continuous inputs and follow-ups.

8.3 Original Contribution

To the researcher's knowledge, this is the first research that

- analysed and derived the parallels of the concepts of Safety-II and WE with a focus on the psychological factors of the workforce, hence, deriving factors that, if fostered may enhance both, the workers' engagement and their Safety-II mindset;
- had a clear focus on enhancing the PL workforce's engagement in the context of H&S and, therefore, offering insights into an understudied population;
- consolidated findings from multidisciplinary literature as well as from primary research on WE in the context of H&S into a clear and available intervention framework, consequently deriving a proposal for a structural long-term change within production companies that will turn an organisation's way of working and decision-making, and in doing that fostering their workers' engagement and Safety-II mindset;
- consolidated findings from multidisciplinary literature as well as from primary research on WE in the context of H&S into a clear and available '9-Point Plan for H&S Engagement in Production-Line Workers', thus deriving accessible practical guidelines that practitioners can use to enhance H&S engagement in their workers in their MF organisations.

In conclusion, the work presented in this thesis combined existing research evidence with the findings of qualitative studies - designed to meet the aim of this project - to produce the first practical intervention framework and set of guidelines for improving engagement in

H&S practice in a MF environment. Initial evaluation of the framework demonstrated the viability of the recommendations and laid the groundwork for future research to test it in a pilot intervention.

8.4 Limitations of the Research

While the research presented offered many strengths and added novel contributions to the practical as well as academic knowledge, there were overall limitations to this research project, which were mostly related to the environmental impact on the research as well as conceptual and methodological issues in researching the concept of engagement.

Despite some limitations of the particular studies, which were already discussed in the respective chapters, this section presents an overall discussion of the limitations impacting the complete research project.

As mentioned before, during the course of this research project, the researcher faced several challenges impacting the plan, namely the closure of the plant and the COVID-19 pandemic in 2020. While the overall impact these had on the research process were discussed in Section 1.2, these also had particular effects on the studies conducted.

The recruitment of participants at the different stages of this research project was fraught with challenges that were sensitively dealt with by following the ethical guidelines as well as openness to practicality and flexibility. During the first interview study, it had just been announced that the plant would close entirely and, therefore, all workers would lose their jobs, and during the second interview study, the first wave of the COVID-19 pandemic in 2020 was unfolding in the UK, the plant was in a partial lockdown as well as in the decommissioning phase. On both occasions, it was difficult to recruit workers to take part in the respective studies, even though research champions were used. Most workers showed resistance in being involved in anything extra to their role or feared that what was discussed during interviews would be leaked and used against them by management. While these reactions were reflective of the trust gap between management and workers, they also meant that the researcher had to adapt to the circumstances. Thus, the experience showed that a researcher had to be (to a certain degree):

- pragmatic and flexible in their approach and academic mindset;

- able to build an environment of trust; and
- adaptable to the research environment and participants.

However, the implications of the adaptions have to be evaluated in respect to ethics, reliability and validity of the study. Hence, the researcher made an effort showing that she cared for the input of the workers as well as that she can be trusted to keep the anonymity and not share any transcripts or recordings through personal contact and clear explanation of the research procedure as well as the independence of the researcher with respect to management. Furthermore, the circumstances also meant, therefore, that not all workers were willing or available (i.e. as they had already left the plant) to take part and some perspectives might be missing or underrepresented. However, care was taken to ensure that the researcher was aware of this limitation and that a balanced sample was recruited. However, valuable insights could still be gained as the number of participants does not necessarily add meaning to qualitative research (Sullivan and Forrester, 2019). In addition, the demonstrated transparency and reflectivity displayed within the situation and the research added contextual information to the overall research, which allows the readers to make their own educated assessment of transferability of the findings (Egan *et al.*, 2009).

With regards to the feasibility testing and evaluation of the intervention framework, it would have been interesting and beneficial to the overall project if the opportunity and time were given to pilot the proposed intervention framework in BEP or another MF environment. However, due to the outside circumstances of the project, this was not possible. Nevertheless, within the MRC framework for complex intervention development, it is recommended to assess feasibility, acceptability and practicability within the modelling process to improve upon the intervention template and possibly abandoned the idea if major problems were detectable within the first exploratory study (Hallingberg *et al.*, 2018). Hence, the procedure realised in this research project, through assessing the hypothetical implementation of the proposed intervention framework, gave valuable insights regarding feasibility and improvement opportunities before any company had to invest the resources to realise a pilot. The pilot would be the next reasonable step for further research.

From a conceptual perspective, the confusion around the definition and characteristics of the term ‘engagement’ are well recorded (Schaufeli and Bakker, 2010; Schaufeli and Salanova, 2011; Ababneh and Macky, 2015; Bakker and Albrecht, 2018). Indeed, in the research it is

not always clear what the respective author means by the term ‘engagement’, and often the lines were blurred between an understanding of engagement as an affectionate psychological state or a behavioural trait. This might be due to the strong interest of practitioners in engagement research for the potential benefits of engagement (e.g. increased work performance), which are mostly behavioural. This fact also made it sometimes unclear what was being measured in the literature. Within this research project, engagement was defined as an affective psychological state that may lead to a certain behaviour and the researcher tried to ensure that in the interviews, the workers understood how the term ‘engagement’ was being defined, although a complete understanding and a certain purity of the concept cannot be guaranteed. However, the researcher tried to stay vigilant throughout the evaluation of publications and her own study.

From a practical perspective, it should be acknowledged that the implementation of the proposed intervention framework can be considered ‘ambitious’ as it would be associated with major changes to the company’s structure and resource distribution. However, considering the change from a directive safety system to a Safety-II culture, where workers’ engagement is being fostered, usually means a major change in mindset for many companies and, therefore, needs structural changes to support this. The external practitioner interviews supported the potential effectiveness of the intervention framework as well as the feasibility of resource distribution (while acknowledging challenges that need to be addressed individually), and one plant manager displayed genuine interest in implementing the intervention framework in their plant. Also, a pilot of the implementation of intervention framework, as proposed within this research project, will allow tailored and incremental implementation of the intervention into the company’s structure.

Overall, the limitations presented warrant a call of caution when interpreting and transferring the results of this research project. Nevertheless, the researcher’s constant endeavours to ensure transparency and a systematic approach to the entire process as well as her reflectivity regarding the process and the findings, ensured the quality of the research and a diaphanous process of knowledge construction and meaning-making that the reader can take into account when making their own interpretations and are considering transferability.

8.5 Implications for Future Research

The research findings and consideration within this research project suggest several directions for future research.

In terms of general engagement research, the literature reviews showed that little research in this area has been conducted that takes different job types into account, even though the variability between engagement experience between job types and job characteristics were acknowledged (Bakker and Albrecht, 2018). More in-depth research into the differences between working groups, e.g. construction workers versus PL workers, would be useful and more qualitative research is needed to analyse and understand in-depth differences in experiences between working types.

With regards to the Safety-II engagement framework, the potential marriage between the two concepts warrants further exploration into the links between a Safety-II mindset and workers' engagement. This would lead to a clearer understanding of the joint concept for researchers as well as for practitioners. Specifically, the development of recommendations on how to transform a company iteratively towards an engaged workforce within a Safety-II mindset could be derived. A first step towards that was already presented within this research project with the '9-Point Plan for H&S Engagement in Production-Line Workers', however, it would be beneficial for practitioners to derive and test the effectiveness of interventions that realise the steps recommended in the '9-Point Plan for H&S Engagement in Production-Line Workers'.

Considering the MRC, the next step within the framework would be the evaluation (i.e. assessing the effectiveness of the intervention in detail, understanding the factors impacting the change process, and the financial aspects of the intervention implementation) as well as the final implementation of the intervention. The practical as well as academic world could benefit from further long-term-intervention studies using qualitative (and potentially also quantitative measures (e.g. based around the UWES)) to evaluate the effectiveness of the proposed intervention framework on workers' safety engagement in a Safety-II context, within a different case study setting, and derive further specific recommendation for PL workers. However, considering the ontological and epistemological stance within this research, quantitative measures should be used in a way that still allows considering workers'

construction of their reality. Yet, it might be an interesting avenue to integrate observational methods to consider workers behaviour as an indicator of such constructions.

Based on the additional pilots, the specifics of the development and implementation as well as the effectiveness could be assessed and improved upon in a further pilot study in a plant setting. Furthermore, a thorough evaluation of the factors promoting success of the intervention and its implementation could be conducted on the base of the additional case studies under consideration of the limitations of transferability. Additionally, potentially testing the effectiveness of the intervention framework in different BC environments either by a change of perspective on focus, e.g. food safety instead of H&S, or by expanding on the population, e.g. construction workers, would offer valuable insights into the transferability of this intervention framework as well as adding to the current body of engagement intervention research.

From a methodological stance, the consideration of the Capability, Opportunity, Motivation – Behaviour (COM-B) model, a behavioural change model frequently used in the design of complex health intervention, and the Theoretical Domains Framework (TDF), which has been designed to evaluate behaviour change intervention implementation issues, and advise intervention development (Michie, van Stralen and West, 2011; Cane *et al.*, 2012; Michie, Atkins and West, 2014) may offer new insights and perspectives into the drivers of engagement in a Safety-II mindset context. Indeed, Morgan et al. (2021) applied the TDF in an occupational safety context to assess safety behaviour influencers and to derive a questionnaire on the elements of the TDF, which after testing showed reliability and stability and potentially could support H&S professionals in designing respective interventions. A similar approach to H&S engagement within a Safety-II mindset context would offer valuable insights into the factors relevant for behaviour change towards an engaged workforce.

8.6 Reflections of the Research and the Researcher's Experiences as Part of That

8.6.1 Introduction

Reflective practice is seen as an essential part of qualitative research, allowing the researcher to consider how she herself as well as the contextual circumstances influenced the research process. Reflective practice shows a sensitivity to the impact of these two factors as well as a critical transparent approach to the research process, thus enhancing its rigour (Frost and

Kinmond, 2012). Considering the ontological Critical Realist as well as epistemological Constructivist stance taken in this research, it cannot be objective and, therefore, the subjectivity in research needs to be given "an overt role" (Frost and Kinmond, 2012, p. 159) through reflectivity. Moreover, it was also acknowledged that reflective practice provides contextual information, which may help to assess transferability of the knowledge constructed (Lincoln and Guba, 1985; Braun and Clarke, 2013). It can also confront assumptions and bias that the researcher may bring into the research process, thus creating sensitivity and learning opportunities (Bolton and Delderfield, 2018). It should be noted, that there is a difference between reflection and reflectivity; Reflection refers to making-sense of past events to evaluate thoughts and feelings related to that event and its actors, while reflectivity describes an active attempt of showing critical thinking regarding the role of the researcher in the research process and developing strategies to evaluate and understand the impact (Bolton and Delderfield, 2018).

Throughout the report of this research project, reflectivity and reflection can be found throughout. Most prominently, in the first chapter (see Section 1.5.1), the researcher's motivation and experiences were introduced as well as first observational notes presented to a) provide the reader with ethnographical information about context within which the research was started; and b) writing the section as one of the first exercises when starting this research project provided the researcher with an opportunity to sensitise herself for personal potential bias and thus, ensuring that awareness was paid to these vignettes throughout the whole project. Furthermore, reflective practice was also demonstrated within the qualitative studies presented in this research project. The role and bias of the researcher was also considered in the limitation section and further reflective practice was continued, e.g. through the research journal to ensure transparency, credibility and contextual insights into the research process.

During the course of the research, the researcher kept a research journal in which reflections and all other research-related decisions and considerations were recorded (Bolton and Delderfield, 2018). Furthermore, the researcher often developed reflexivity in a collaborative way through sharing and discussing concerns with peers, other researchers or the supervisor team (Frost and Kinmond, 2012).

Throughout this research project, the researcher came across a number of 'reflective encounters' that were shared in the relevant sections to provide clarity of experiences. A commonly

used reflective framework was loosely adapted to reflect upon the experiences; namely Gibbs' Reflective Circle (1988), encompassing the phases: (1) Description of the experience, (2) Feelings and thoughts regarding the experience, (3) Evaluation of the experience, (4) Analysis of the experience for sense-making, (5) Conclusion about the learnings, and (6) Action plan for identifying change to improve on the situation now and in the future. Gibbs' Reflective Circle (Gibbs, 1988) was chosen as it provided a systematic structure and by considering the impact of personal feelings on situations fitted the researchers philosophical stance. As a result, the researcher shared the four most impactful or personally meaningful reflections. The reflections will be partly written in first person as they are presented from the researchers' view.

8.6.2 Reflection 1: The Need for Reflection in Research

The importance of reflection and keeping up reflective practice throughout the whole project was evident. However, I found it challenging to find a mode of operation regarding the reflection, as I was not used to writing a diary. I tested several different methods and used them in parallel in an attempt to find the one method that was right for me, i.e. meeting minutes, reflective diary, list of open points and decisions. I felt at times frustrated with the process and it felt arduous sometimes. However, the commencement of reflective practice and noting down decisions, reasoning and reflective observations regularly also allowed for needed clarity and transparency, and felt more natural over time. While possibly sticking with one method would have improved the process, to me, testing out new methods kept me going, interested, and served the purpose of the reflective practice. In future research projects, I would again use reflective practice from the beginning and may consider an audio journal instead of written notes.

8.6.3 Reflection 2: Imposter Syndrome – or the two Hearts in my Chest: Business Consultant's Practicality vs. Researcher's Rigour

As mentioned before, I have worked as a business consultant in the automotive industry before I became a researcher; therefore, I was already used to project work as well as handling stakeholder expectations. However, as a business consultant, I was used to a more fast-paced process and finding quick fixes for problems. While analysing the problem was part of the job, it usually did not require the methodical rigour that was expected from me in an academic research project. Since I have not worked in an academic environment for a while,

I had a constant feeling of uncertainty regarding meeting the standards of research and was constantly unsure whether what I did had shown enough academic rigour, particularly with regards to the changes and amendments, I had to conduct due to the volatile circumstances throughout my research project. I am aware that I set high expectations for myself, and starting a PhD brought me out of my familiar comfort-zone where I knew how to perform. I also have a strong need for feeling in control, which I partly lost due to the unfamiliar expectations. In order to overcome this uncertainty on my part, I made sure that I became deeply immersed in my research and gained knowledge on the subject through books, visiting lectures and building a network of PhD peers as well as academic professionals with whom to discuss my ideas, worries and thoughts. In particular, the exchange with the different individuals helped me to gain confidence in my practice and knowledge. For future projects, not only in academia, I will maintain and extend that network, since I found that to me, 'bouncing off ideas' and hearing other people's views helps me in my creative process.

8.6.4 Reflection 3: "…But This is how it's always Been Done." – Focusing on the Individuals' Perception Instead of the Wider System

Throughout my research project, I often discussed my research with my aforementioned network. Since I have no H&S background, particular views and processes interested me. In conversation with H&S practitioners, I felt they often based their recommendations on the existing safety system and communication measures, thus, setting the H&S system at the core of safety in the organisation and measuring its success on people's behaviour. I was often told that I have to analyse the existing SMS in detail to be able to tell in my research, for example the interviews, if the participants were lying to me or misinterpreting the 'truth'. However, coming from a constructivist view, and considering the nature of the affective psychological state of engagement, to me, analysing in-depth the existing system did not make sense, considering that, in the end, the thing that mattered was how the workers perceived the safety to be handled in the organisation, because that was what influenced their behaviour and mindset. Hence, to me, even if the organisation had the most amazing state-of-the-art SMS with the most brilliant communication measures, it all would have been worth nothing if the workers did not believe in the genuineness of the organisation and their leaders and, thus, rejected the safety directive. However, having professionals in their field telling me how it has always been done led to certain insecurities due to my lack of expertise in the field. In the end, after discussions with my supervisor team, I had to learn to put those

uncertainties aside and trust my instinct and the research that backed me up. This knowledge will help me adjust in future situations too, while taking other views into account and contemplating them, but not being afraid to go my own way and believe in my knowledge.

8.6.5 Reflection 4: Continuous Uncertainty Throughout This Research Project (The Plant's Closure)

As mentioned before, the future of this research project was threatened for a long time during the PhD, as it was debated if the research could proceed within BEP or be transferred to a neighbouring plant within the global company or to a completely different environment altogether. During the discussions within Ford, the research could not really commence much on the applied site, as each decision outcome would have meant a different research plan. As also mentioned before, feeling in control is important to my wellbeing and during that time, my resilience was tested. Due to my consultant background, I was used to changing project plans and amending milestone plans and I have learned that there is no value in dwelling on what cannot be done, and rather focus on what is possible. However, due to the personal nature of this research project (i.e. the success of the PhD vs. a client project's success), it felt more intense than in the past. Therefore, I got back my feeling of control through agile adjustment to the circumstances and amending the research plan accordingly, using the time for literature reviews and writing up papers. This led to an increase of my perceived resilience, and when several supervisors changed or the COVID-19 crisis hit, I only perceived them as minor bumps in my research project process, compared to what I have experienced already, and changing the course of my research again could be conducted smoothly. For future projects, the experiences gained for me are invaluable, having increased my resilience and flexibility in challenging and uncertain circumstances.

8.7 Conclusion

The state of engagement can have many positive effects in terms of H&S performance. Taking the Safety-II principles into account, this research has shown that similar antecedents apply between the fostering of an engaged workforce and fostering a Safety-II mindset and behaviour within the workforce. Therefore, the argument was made that if an organisation supports their workers in being more engaged with H&S, this will also lead to a greater focus on a Safety-II mindset. The research reported in this thesis has analysed the evidence base

for this argument, as well as the drivers to facilitate the fostering of an engaged workforce within a Safety-II mindset, with a special focus on PL workers (particularly BEP workers), and derived relevant practical guidelines from it that culminated into a proposal for an intervention framework to support H&S engagement in a Safety-II mindset.

More precisely, the research was set out to design an intervention for a MF plant improving the workers' engagement with H&S. The presented research project encompassed first the building of an evidence-base through a thorough and systematic analysis of the multidisciplinary literature. Throughout the literature review that focused on the two concepts 'WE' and 'Safety-II', the parallels of the concepts of Safety-II and WE with a focus on the psychological factors of the workforce were analysed and derived. This is the first research, to the author's knowledge, that joins the two concepts to synthesise and develop a combined framework with a special focus on the common antecedents of the psychological state. In addition, a lack of safety engagement research that looks specifically at how PL workers experience engagement was identified. Secondly, a qualitative approach of in-depth interviews was taken; the driving factors for the BEP workers in terms of H&S engagement were analysed, which was a unique insight into PL workers' understanding of their engagement levels and their perception on what supports or hinders their engagement with H&S. Thirdly, lessons learned were drawn from the existing engagement intervention literature base in a MF context. Fourthly, these findings were then taken together with the previous multidisciplinary findings from the literature, as well as from the qualitative study, and consolidated into a clear and available intervention framework with the aim to support workers' engagement in a Safety-II context. The results from the final exploratory feasibility study then supported the potential feasibility and transferability, as well as identified areas for improvement of the intervention framework. It was perceived as acceptable within BEP as well as potentially within other MF environments. This research project delivered meaningful insights into the concept of WE within a PL context as well as safety management, particularly Safety-II, as well as a novel joint concept, namely H&S engagement within a Safety-II mindset. Moreover, at each step of the research, not only the relevant implications for this research project were derived, but also valuable recommendations for practitioners. These practical recommendations derived from each step of the research were consolidated into a clear and available '9-point Plan for H&S engagement in production-line workers' to support practitioners on their way to an engaged workforce with a Safety-II mindset.

Overall, this research transformed theoretical approaches into a practical intervention framework and set of guidelines, that can be applied to the business world to support practitioners in fostering a H&S engagement environment in a Safety-II context.

IX List of References

Ababneh, O. M. A. and Macky, K. (2015) 'The Meaning and Measurement of Employee Engagement: A Review of the Literature', New Zealand Journal of Human Resources Management, 15(1), pp. 1–35. Available at: https://www.researchgate.net/publication/291698308_The_meaning_and_measurement_of_employee_engagement_A_review_of_the_literature.

Admasachew, L. and Dawson, J. (2011) 'The association between presenteeism and engagement of National Health Service staff', Journal of Health Services Research and Policy, 16(1), pp. 29–33. doi: 10.1258/jhsrp.2010.010085.

Advisory Committee on the Safety of Nuclear Installations (1993) 'ACSNI study group on human factors. Third report'. Available at: http://books.hse.gov.uk/hse/public/saleproduct.jsf?catalogueCode=9780717608652.

Agarwal, U. A. et al. (2012) 'Linking LMX, innovative work behaviour and turnover intentions: The mediating role of work engagement', Career Development International, 17(3), pp. 208–230. doi: 10.1108/13620431211241063.

Agarwal, U. A. (2014) 'Linking justice, trust and innovative work behaviour to work engagement', Personnel Review, 43(1), pp. 41–73. doi: 10.1108/PR-02-2012-0019.

Aikens, K. A. et al. (2014) 'Mindfulness Goes to Work: Impact of an On-Line Workplace Intervention', Journal of Occupational and Environmental Medicine, 56(7), pp. 721–31. doi: 10.1097/JOM.0000000000000209.

Airila, A. et al. (2012) 'Risk factors of disc degeneration and its association with Low-back pain', International Archives of Occupational and Environmental Health, 85(8), pp. 915–925. doi: 10.1007/s00420-012-0732-1.

Albery, S., Tepe, S. and Borys, D. (2018) 'An evaluation of the Functional Resonance Analysis Method (FRAM) as a practical risk assessment tool within a manufacturing environment', in Safety and Reliability - Safe Societies in a Changing World - Proceedings of the 28th International European Safety and Reliability Conference, ESREL 2018, pp. 1493–1502. doi: 10.1201/9781351174664-189.

Albrecht, S. L., Breidahl, E. and Marty, A. (2018) 'Organizational resources, organizational engagement climate, and employee engagement', Career Development International, 23(1), pp. 67–8. doi: 10.1108/CDI-04-2017-0064.

Alfes, K. et al. (2013) 'The link between perceived human resource management practices, engagement and employee behaviour: A moderated mediation model', International Journal of Human Resource Management, 24(2), pp. 330–351. doi: 10.1080/09585192.2012.679950.

Almeida, S., Frino, B. and Milosavljevic, M. (2020) 'Employee voice in a semi-rural hospital: impact of resourcing, decision-making and culture', Asia Pacific Journal of Human Resources, 58(4), pp. 578–606. doi: 10.1111/1744-7941.12257.

Alzyoud, A. A. Y. (2018) 'The Influence of Human Resource Management Practices on Employee Work Engagement', Foundations of Management, 10(1), pp. 251–256. doi: 10.2478/fman-2018-0019.

American National Standards Institute (2012) American National Standard for Occupational Health and Safety Management Systems. Washington, DC: American National Standard Institute.

Andersen, L. P. et al. (2015) 'Social identity in the construction industry: implications for safety perception and behaviour', Construction Management and Economics, 33(8), pp. 640–652. doi: 10.1080/01446193.2015.1087645.

Anderson, J. E. et al. (2018) 'Resilience engineering for quality improvement: case study in a unit for the care of older people', in Hollnagel, E., Braithwaite, J., and Wears, R. L. (eds) Delivering Resilient Health Care. Milton Park, UK: CRC Press LLC, pp. 32–34. Available at: https://www.taylorfrancis.com/books/e/9780429469695/chapters/10.4324/9780429469695-4.

Armenakis, A. A., Harris, S. G. and Mossholder, K. W. (1993) 'Creating Readiness for Organizational Change', Human Relations, 46(6), pp. 681–703. doi: 10.1177/001872679304600601.

Aryee, S. et al. (2012) 'Human Performance Transformational Leadership, Innovative Behavior, and Task Performance: Test of Mediation and Moderation Processes', Human Performance, 25(1), pp. 1–25. doi: 10.1080/08959285.2011.631648.

Attridge, M. (2009) 'Measuring and Managing Employee Work Engagement: A Review of the Research and Business Literature', Journal of Workplace Behavioral Health, 24(4), pp. 383–398. doi: 10.1080/15555240903188398.

Atwater, L. E. (2007) 'The Relative Importance of Situational and Individual Variables in Predicting Leader Behavior', Group & Organization Studies, 13(3), pp. 290–310. doi: 10.1177/105960118801300304.

Bagraim, J. J. and Hime, P. (2012) 'The dimensionality of workplace interpersonal trust and its relationship to workplace affective commitment', SA Journal of Industrial Psychology, 33(3), pp. 43–48. doi: 10.4102/sajip.v33i3.394.

Bailey, C. et al. (2017) 'The Meaning, Antecedents and Outcomes of Employee Engagement: A Narrative Synthesis', International Journal of Management Reviews, 19(1), pp. 31–53. doi: 10.1111/ijmr.12077.

Bailey, C. et al. (2019) 'A Review of the Empirical Literature on Meaningful Work: Progress and Research Agenda', Human Resource Development Review, 18(1), pp. 83–113. doi: 10.1177/1534484318804653.

Baker, L. (2006) 'Ten common pitfalls to avoid when conducting qualitative research', British Journal of Midwifery, 14(9), pp. 530–531. doi: 10.12968/bjom.2006.14.9.21794.

Bakker, A. B. et al. (2007) 'Job Resources Boost Work Engagement, Particularly When Job Demands Are High', Journal of Educational Psychology, 99(2), pp. 274–284. doi: 10.1037/0022-0663.99.2.274.

Bakker, A. B. (2014) 'Daily fluctuations in work engagement: An overview and current directions', European Psychologist, 19(4), pp. 227–236. doi: 10.1027/1016-9040/a000160.

Bakker, A. B. and Albrecht, S. L. (2018) 'Work engagement: current trends', Career Development International, 23(1), pp. 4–11. doi: 10.1108/CDI-11-2017-0207.

Bakker, A. B., Albrecht, S. L. and Leiter, M. P. (2011) 'Key questions regarding work engagement', European Journal of Work and Organizational Psychology, 20(1), pp. 4–28. doi: 10.1080/1359432X.2010.485352.

Bakker, A. B. and Bal, M. P. (2010) 'Weekly work engagement and performance: A study among starting teachers', Journal of Occupational and Organizational Psychology, 83, pp. 189–206. doi: 10.1348/096317909X402596.

Bakker, A. B. and Demerouti, E. (2007) 'The Job Demands-Resources model: state of the art', Journal of Managerial Psychology, 22(3), pp. 309–328. doi: 10.1108/02683940710733115.

Bakker, A. B. and Demerouti, E. (2008) 'Towards a Model of Work Engagement', Career Development International, 13(3), pp. 209–223. doi: 10.1108/13620430810870476.

Bakker, A. B. and Demerouti, E. (2017) 'Job demands-resources theory: Taking stock and looking forward', Journal of Occupational Health Psychology, 22(3), pp. 273–285. doi: 10.1037/ocp0000056.

Bakker, A. B., Demerouti, E. and Sanz-Vergel, A. I. (2014) 'Burnout and Work Engagement: The JD–R Approach', The Annual Review of Organizational Psychology and Organizational Behavior, 1, pp. 389–411. doi: 10.1146/annurev-orgpsych-031413-091235.

Bakker, A. B., Demerouti, E. and Schaufeli, W. (2003) 'Dual processes at work in a call centre: An application of the job demands – resources model', European Journal of Work and Organizational Psychology, 12(4), pp. 393–417. doi: 10.1080/13594320344000165.

Bakker, A. B., Demerouti, E. and Schaufeli, W. B. (2005) 'The crossover of burnout and work engagement among working couples', Human Relations, 58(5), pp. 661–689. doi: 10.1177/0018726705055967.

Bakker, A. B., Van Emmerik, H. and Euwema, M. C. (2006) 'Crossover of burnout and engagement in work teams', Work and Occupations, 33(4), pp. 464–489. doi: 10.1177/0730888406291310.

Bakker, A. B. and Van Wingerden, J. (2017) 'Human Resource Management', Human Resource Management, 56(1), pp. 51–67. doi: 10.1002/hrm.21758.

Bakker, J., Denessen, E. and Brus-Laeven, M. (2007) 'Socio-economic background, parental involvement and teacher perceptions of these in relation to pupil achievement', Educational Studies, 33(2), pp. 177–192. doi: 10.1080/03055690601068345.

Barling, J., Loughlin, C. and Kelloway, E. K. (2002) 'Development and test of a model linking safety-specific transformational leadership and occupational safety.', Journal of Applied Psychology, 87(3), pp. 488–496. doi: 10.1037//0021-9010.87.3.488.

Barling, J., Weber, T. and Kelloway, E. K. (1996) 'Effects of Transformational Leadership Training on Attitudinal and Financial Outcomes: A Field Experiment', Journal of Applied Psychology, 81(6), pp. 827–832. doi: https://doi.org/10.1037/0021-9010.81.6.827.

Baum, F. et al. (2006) 'Participatory action research', Journal of Epidemiol Community Health, 60, pp. 854–857. doi: 10.1136/jech.2004.028662.

Beckers, D. G. J. et al. (2004) 'Working Overtime Hours: Relations with Fatigue, Work Motivation, and the Quality of Work', Journal of Occupational Environmental Medicine, 46(12), pp. 1282–1289. doi: 10.1097/01.jom.0000147210.95602.50.

De Beer, L. T., Tims, M. and Bakker, A. B. (2016) 'Job crafting and its impact on work engagement and job satisfaction in mining and manufacturing', South African Journal of Economic and Management Sciences, 19(3), pp. 400–412. doi: 10.17159/2222-3436/2016/v19n3a7.

Bell, N. N. (2018) Exploring the Association Between Worker Engagement and Safety Behaviours. Cardiff Metropolitan University.

Bell, N., Sykes, P. and Powell, C. (2014) 'Give & take', The Safety & Health Practitioner, 32(12), pp. 39–41. Available at: https://search.proquest.com/central/docview/1647082032/fulltextPDF/D95BA0391E0D4229PQ/12?accountid=15588 (Accessed: 20 May 2019).

Benedicto, A. M. (2017) 'Engaging All Employees in Efforts to Achieve High Reliability', Frontiers of Health Services Management, 33(4), pp. 33–40. doi: 10.1097/HAP.0000000000000011.

Bews, N. and Martins, N. (2012) 'An evaluation of the facilitators of trustworthiness', SA Journal of Industrial Psychology, 28(4), pp. 14–19. doi: 10.4102/sajip.v28i4.70.

Black, J. K., Balanos, G. M. and Whittaker, A. C. (2017) 'Resilience, work engagement and stress reactivity in a middle-aged manual worker population', International Journal of Psychophysiology, 116, pp. 9–15. doi: 10.1016/j.ijpsycho.2017.02.013.

Blaikie, N. (2007) No Approaches to social enquiry: Advancing knowledge. 2nd edn. Cambridge, UK: Polity Press.

Bledow, R. et al. (2011) 'The Affective Shift Model of Work Engagement', Article in Journal of Applied Psychology, 96(6), pp. 1246–1257. doi: 10.1037/a0024532.

Blokland, P. and Reniers, G. (2017) Safety & Performance Total Respect Management (TR3M): A Novel Approach to Achieve Safety and Performance Proactively in Any Organisation. Hauppauge, NY: Nova Science Publishers.

Bolton, G. and Delderfield, R. (2018) Reflective practice : writing and professional development. 5th edn. Los Angeles, CA: SAGE Publications.

Bond, F. W. and Bunce, D. (2001) 'Job control mediates change in a work reorganization intervention for stress reduction.', Journal of occupational health psychology, 6(4), pp. 290–302. doi: 10.1037/1076-8998.6.4.290.

Borst, R. T. et al. (2019) 'The Attitudinal, Behavioral, and Performance Outcomes of Work Engagement: A Comparative Meta-Analysis Across the Public, Semipublic, and Private Sector', Review of Public Personnel Administration, 40(4), pp. 613–640. doi: 10.1177/0734371X19840399.

Bowen, D. J. et al. (2009) 'How We Design Feasibility Studies', American Journal of Preventive Medicine, 36(5), pp. 452–457. doi: 10.1016/j.amepre.2009.02.002.

Brandis, S., Rice, J. and Schleimer, S. (2017) 'Dynamic workplace interactions for improving patient safety climate', Journal of Health Organization and Management, 31(1), pp. 38–53. doi: 10.1108/JHOM-09-2016-0185.

Braun, V. et al. (2006) 'Using thematic analysis in psychology', Qualitative Research in Psychology, 3(2), pp. 77–101. doi: 10.1191/1478088706qp063oa.

Braun, V. and Clarke, V. (2013) Successful qualitative research - a practical guide for beginners. Edited by M. Carmichael. London, UK: SAGE Publications Ltd.

Breevaart, K., Bakker, A. B. and Demerouti, E. (2014) 'Daily self-management and employee work engagement', Journal of Vocational Behavior, 84, pp. 31–38. doi: 10.1016/j.jvb.2013.11.002.

Breevaart, K., Bakker, A. B., Demerouti, E., & Van Den Heuvel, M. (2015). Leader-member exchange, work engagement, and job performance. Journal of Managerial Psychology. 40(7), pp. 754-770. doi: http://dx.doi.org/10.1108/JMP-03-2013-0088.

Britt, T. W., Castro, C. A. and Adler, A. B. (2005) 'Self-Engagement, Stressors, and Health: A Longitudinal Study', Personality and Social Psychology Bulletin, 31(11), pp. 1475–1486. doi: 10.1177/0146167205276525.

Van Den Broeck, A. et al. (2008) 'Explaining the relationships between job characteristics, burnout, and engagement: The role of basic psychological need satisfaction', Work and Stress, 22(3), pp. 277–294. doi: 10.1080/02678370802393672.

Brooks, J. and King, N. (2012) 'Qualitative psychology in the real world: The utility of template analysis', in 18th British Psychological Society Annual Conference. London. Available at: http://eprints.hud.ac.uk/id/eprint/13656/1/Brooks (Accessed: 6 June 2019).

Brooks, J. and King, N. (2014) Doing Template Analysis: Evaluating an End-of-Life Care Service. London, UK: SAGE Publications, Ltd. doi: 10.4135/9781446273050135127 55.

Brunetto, Y. et al. (2013) 'The impact of workplace relationships on engagement, well-being, commitment and turnover for nurses in Australia and the USA', Journal of Advanced Nursing, 69(12), pp. 2786–2799. doi: 10.1111/jan.12165.

Cameron, I. et al. (2006) An investigation of approaches to worker engagement. Glasgow, UK. Available at: http://www.hse.gov.uk/research/rrpdf/rr516.pdf (Accessed: 22 June 2018).

Cane, J. et al. (2012) 'Validation of the theoretical domains framework for use in behaviour change and implementation research', Implementation Science, 7(37), pp. 1–17. doi: 10.1186/1748-5908-7-37.

Catteeuw, F., Flynn, E. and Vonderhorst, J. (2007) 'Employee Engagement: Boosting Productivity in Turbulent Times', Organization Development Journal, 25(2), pp. 151–157.

Available at: https://search-proquest-com.ezproxy.cardiff-met.ac.uk/docview/198008244/fulltextPDF/1C542EE752434C9EPQ/1?accountid=15588 (Accessed: 2 August 2019).

Chain, G. et al. (2018) 'Learning from Excellence : The "Yaytix" Programme', Scottish Medical Journal, 63(4), pp. 104–107.

Chambel, M. J., Castanheira, F. and Sobral, F. (2014) 'Temporary Agency Versus Permanent Workers: A multi-group analysis of human resources management', Economic and Industrial Democracy, 37(4), pp. 665–689. doi: 10.1177/0143831X14550695.

Charmaz, K. (2006) Constructing Grounded Theory. London, UK: Sage Publications Inc.

Cheng, J. W. et al. (2013) 'Voice behavior and work engagement: The moderating role of supervisor-attributed motives', Asia Pacific Journal of Human Resources, 51(1), pp. 81–102. doi: 10.1111/j.1744-7941.2012.00030.x.

Cheung, C. M. and Qingbin, C. (2016) 'Setting the Stage for Effective Safety Leadership in Construction: The Antecedents of Safety-Specific Transformational Leadership Behaviours', in Chan, P. W. and Neilson, C. J. (eds) Proceedings of the 32nd Annual ARCOM Conference. Manchester, UK: Association of Researchers in Construction Management, pp. 477–486. Available at: http://www.arcom.ac.uk/-docs/proceedings/6308e768fd85ffe4972f56c3631ae6e6.pdf (Accessed: 20 May 2019).

Chmiel, N., Laurent, J. and Hansez, I. (2017) 'Employee perspectives on safety citizenship behaviors and safety violations', Safety Science, 93, pp. 96–107. doi: 10.1016/J.SSCI.2016.11.014.

Choo, L. S., Mat, N. and Al-Omari, M. (2013) 'Organizational practices and employee engagement: a case of Malaysia electronics manufacturing firms', Business Strategy Series, 14(1), pp. 3–10. doi: 10.1108/17515631311295659.

Choudhry, R. M., Fang, D. and Mohamed, S. (2007) 'The nature of safety culture: A survey of the state-of-the-art', Safety Science, 45(10), pp. 993–1012. doi: 10.1016/J.SSCI.2006.09.003.

Christian, M. S. et al. (2009) 'Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors', Journal of Applied Psychology, 94(5), pp. 1103–1127. doi: 10.1037/a0016172.

Christian, M. S. et al. (2011) 'Work Engagement: A Quantitative Review and Test of its Relations with Task and Contextual Performance', Personnel Psychology, 64(1), pp. 89–136. doi: 10.5465/AMBPP.2007.26536346.

Cifre, E., Salanova, M. and Rodríguez, A. M. (2011) 'Dancing between Theory and Practice: Work Stress Intervention through the Action-Research Approach', Human Factors and Ergonomics in Manufacturing & Service Industries, 21(3), pp. 269–286. doi: 10.1038/132817a0.

Clarke, S. (2000). Safety culture: under-specified and overrated?. International Journal of Management Reviews, 2(1), pp. 65-90. doi: https://doi.org/10.1111/1468-2370.00031.

Coffey, A. and Atkinson, P. (1996) Making sense of qualitative data: Complementary research strategies. Thousand Oaks, CA: SAGE Publications, Inc.

Collier, S. L. et al. (2016) 'Employee Engagement and a Culture of Safety in the Intensive Care Unit', Journal of Nursing Administration, 46(1), pp. 49–54. doi: 10.1097/NNA.0000000000000292.

Colquitt, J. A. and Rodell, J. B. (2011) 'Justice, Trust, and Trustworthiness: A Longitudinal Analysis Integrating Three Theoretical Perspectives', Academy of Management Journal, 54(6), pp. 1183–1206. doi: http://dx.doi.org/10.5465/amj.2007.0572 JUS.

Conchie, S. M., Moon, S. and Duncan, M. (2013) 'Supervisors' engagement in safety leadership: Factors that help and hinder', Safety Science, 51, pp. 109–117. doi: 10.1016/j.ssci.2012.05.020.

Coomer, K. and Houdmont, J. (2019) 'Contribution of work ability and core self-evaluations to worker health', Occupational Medicine, 69(5), pp. 366–371. doi: 10.1093/occmed/kqz081.

Cooper, D. (2016) 'Practical Employee Engagement: Key Drivers for Delivering a Safety Partnership', in ASSE Professional Development Conference and Exposition. American Society of Safety Engineers.

Cooter, R. and Luckin, B. (1997) ‘Accidents in history: An introduction’, in Cooter, R. and Luckin, B. (eds) Accidents in history: Injuries, Fatalities and Social Relations. Brill, pp. 1–16. doi: https://doi.org/10.1163/9789004418516.

Costigan, C. and Cox, M. J. (2002) ‘Participation in Family Research: Is There a Self-Selection Bias?’, Journal of Family Psychology, 15(4), pp. 706–720. doi: 10.1037/0893-3200.15.4.706.

Cox, S. and Flin, R. (1998) ‘Safety culture: Philosopher’s stone or man of straw?’, Work and Stress, 12(3), pp. 189–201. doi: 10.1080/02678379808256861.

Craig, P. et al. (2008) ‘Developing and evaluating complex interventions: the new Medical Research Council guidance’, Bmj, 337(a1655). doi: 10.1136/bmj.a1655.

Craig, P. et al. (2019) Developing and evaluating complex interventions. Swindon, UK. Available at: www.mrc.ac.uk/complexinterventionsguidance (Accessed: 24 June 2019).

Crawford, E. R. et al. (2010) ‘Linking Job Demands and Resources to Employee Engagement and Burnout: A Theoretical Extension and Meta-Analytic Test’, Journal of Applied Psychology, 95(5), pp. 834–848. doi: 10.1037/a0019364.

Crawford, E. R. et al. (2014) ‘The antecedents and drivers of employee engagement’, in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 57–81. doi: 10.4324/9780203076965.

Creswell, J. W. and Poth, C. N. (2018) Qualitative Inquiry & Research Design: Choosing Among Five Approaches. 4th edn, Sage Publications. 4th edn. Thousand Oaks, CA: SAGE Publications Ltd. doi: 10.1111/1467-9299.00177.

Cropanzano, R. and Mitchell, M. (2005) ‘Social Exchange Theory: An Interdisciplinary Review Article in Journal of Management’, Journal of Management, 31, pp. 874–900. doi: 10.1177/0149206305279602.

Cullinane, S.-J. J. et al. (2017) ‘Job crafting for lean engagement: The interplay of day and job-level characteristics’, European Journal of Work and Organizational Psychology, 26(4), pp. 541–554. doi: 10.1080/1359432X.2017.1320280.

Daisley, B. (2019) Work engagement // The secret of 'story night', [podcast] Eat Sleep Work Repeat. Available at: https://open.spotify.com/episode/1MPkB9QNFQjM7rG02vyFom?si=aXYvT43_RQaDLnMJwqXnCg (Accessed: 5 June 2019).

Davis, N. (2021) 'Email to Franziska Homann'. 26/01/2021.

Deci, E. L. and Ryan, R. M. (2000) 'The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior', Psychological Inquiry, 11(4), pp. 227–268.

Defranc, A. et al. (2008) 'Measuring oral health behaviour in Flemish health care workers: An application of the theory of planned behaviour', Community Dental Health, 25(2), pp. 107–114. doi: 10.1922/CDH_2120VandenBroucke08.

Dekker, S. (2012) Just culture: Balancing safety and accountability. 2nd edn. London, UK: Routledge. doi: 10.4324/9781315251271.

Dekker, S. (2015) Safety Differently: Human Factors for a New Era. 2nd edn, Safety Differently. 2nd edn. Boca Raton, FL: CRC Press. doi: 10.1201/b17126.

Dekker, S. (2018a) 'Restorative Just Culture Checklist'. Griffith University, Delft University and Art of Work. Available at: http://sidneydekker.com/wp-content/uploads/2018/12/RestorativeJustCultureChecklist.pdf (Accessed: 14 February 2020).

Dekker, S. (2018b) The Safety Anarchist: Relying on human expertise and innovation, reducing bureaucracy and compliance. New York, US: Routledge. doi: 10.4324/9780203733455.

Dekker, S. and Pitzer, C. (2016) 'Examining the asymptote in safety progress: a literature review', International Journal of Occupational Safety and Ergonomics, 22(1), pp. 57–65. doi: 10.1080/10803548.2015.1112104.

Demerouti, E., Mostert, K. and Bakker, A. B. (2010) 'Burnout and Work Engagement: A Thorough Investigation of the Independency of Both Constructs', Journal of Occupational Health Psychology, 15(3), pp. 209–222. doi: 10.1037/a0019408.

Department of Health (NHS) (2015) The NHS Constitution – the NHS belongs to us all. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/480482/NHS_Constitution_WEB.pdf (Accessed: 22 June 2018).

Dienesch, R. M., & Liden, R. C. (1986). Leader-member exchange model of leadership: A critique and further development. Academy of management review, 11(3), pp. 618-634. doi: https://doi.org/10.5465/amr.1986.4306242.

Dollard, M. F. et al. (1997) 'Conducive production howto produce a par worksite proposal', New Solutions, 7(2), pp. 58–69. doi: 10.2190/NS7.2.i.

Dollard, M. F. and Karasek, R. A. (2010) 'Building Psychosocial Safety Climate: Evaluation of a Socially Coordinated PAR Risk Management Stress Prevention Study', Contemporary Occupational Health Psychology: Global Perspectives on Research and Practice, Volume 1, (April), pp. 208–233. doi: 10.1002/9780470661550.ch11.

Döös, M. and Backström, T. (2003) 'Constructing workplace safety through control and learning: Conflict or compatibility?', in Berner, B. and Summerton, J. (eds) Constructing Risk and Safety in Technological Practice. London, UK: Routledge, pp. 175–192. doi: 10.4324/9780203216774.

Dundon, T. et al. (2004) 'The meanings and purpose of employee voice', International Journal of Human Resource Management International Journal of Human Resource Management, 15(6), pp. 1150–1171. doi: 10.1080/09585190410001677335 9.

Eatough, E. M. and Spector, P. E. (2014) 'The role of workplace control in positive health and wellbeing', in Chen, P. Y. and Cooper, C. (eds) Wellbeing: A Complete Reference Guide (Vol. III) Work and Wellbeing. John Wiley & Sons, pp. 1–19. doi: https://doi.org/10.1002/9781118539415.wbwell021.

Edmondson, A. (1999) 'Psychological Safety and Learning Behavior in Work Teams', Administrative Science Quarterly, 44(2), pp. 350–383. Available at: https://www.jstor.org/stable/pdf/2666999.pdf (Accessed: 13 June 2019).

Egan, M. et al. (2009) 'Reviewing evidence on complex social interventions: Appraising implementation in systematic reviews of the health effects of organisational-level workplace

interventions', Journal of Epidemiology and Community Health, 63(1), pp. 4–11. doi: 10.1136/jech.2007.071233.

Elst, T. Vander et al. (2010) 'The role of organizational communication and participation in reducing job insecurity and its negative association with work-related well-being', Economic and Industrial Democracy, 31(2), pp. 249–264. doi: 10.1177/0143831X09358372.

European Agency for Safety and Health at Work (2012) Worker representation and consultation on health and safety An analysis of the findings of the European Survey of Enterprises on New and Emerging Risks (ESENER) European Risk Observatory Report European Agency for Safety and Health at Work. Luxembourg. Available at: https://osha.europa.eu/en/tools-and-publications/publications/reports/esener_workers-involvement (Accessed: 22 June 2018).

Farley, J., Duppong Hurley, K. and Aitken, A. A. (2020) 'Monitoring implementation in program evaluation with direct audio coding', Evaluation and Program Planning, 83(August), p. 101854. doi: 10.1016/j.evalprogplan.2020.101854.

Farooq, M. S. and Salam, M. (2020) 'Cleaner production practices at company level enhance the desire of employees to have a significant positive impact on society through work', Journal of Cleaner Production. doi: 10.1016/j.jclepro.2020.124605.

Fisher, R. (2012) 'Integrating human performance concepts into processes, procedures and analysis', in HP Summit. Cleveland, Ohio, US.

Flin, R., Mearns, K., O'Connor, P., & Bryden, R. (2000). Measuring safety climate: identifying the common features. Safety science, 34(1-3), pp. 177-192. doi: https://doi.org/10.1016/S0925-7535(00)00012-6.

Flyvbjerg, B. (2006) 'Five misunderstandings about case-study research', Qualitative Study, 12(2), pp. 219–245. doi: 10.4135/9781848608191.d33.

Ford Bridgend Engine Plant (2019) 'Bridgend Engine Plant - Introduction'. Bridgend, UK, pp. 1–7.

Freeney, Y. and Fellenz, M. R. (2013) 'Work engagement as a key driver of quality of care: A study with midwives', Journal of Health, Organisation and Management, 27(3), pp. 330–349. doi: 10.1108/JHOM-10-2012-0192.

Frone, M. R., Reis, D. and Ottenstein, C. (2018) 'A German version of the Three-Dimensional Work Fatigue Inventory (3D-WFI): Factor structure, internal consistency, and correlates', Stress and Health, 34(5), pp. 674–680. doi: 10.1002/smi.2828.

Frost, N. and Kinmond, K. (2012) 'Evaluating Qualitative Research', in Sullivan, C., Gibson, S., and Riley, S. (eds) Doing Your Qualitative Psychology Project. Thousand Oaks, CA: Sage Publications Inc., pp. 154–172.

Gajdzik, B. (2013) 'Diagnosis of employee engagement in metallurgical enterprise', Metalurgija, 52(1), pp. 139–142.

Galpin, A. et al. (2017) '"Thanks for Letting Us All Share Your Mammogram Experience Virtually": Developing a Web-Based Hub for Breast Cancer Screening', Journal of Medical Internet Research - Cancer, 3(2), pp. 1–9. doi: 10.2196/cancer.8150.

Geldart, S. et al. (2010) 'Organizational practices and workplace health and safety: A cross-sectional study in manufacturing companies', Safety Science, 48, pp. 562–569. doi: 10.1016/j.ssci.2010.01.004.

Ghorbannejad, P. and Esakhani, A. (2016) 'Capacity to engage: studying role of individual differences in work engagement-evidences from Iran', Journal of Management Development, 35(9), pp. 1174–1183. doi: 10.1108/JMD-02-2015-0029.

Gibbs, G. (1988) Learning by Doing: A guide to teaching and learning methods. Oxford, UK: Further Education Unit.

González-Romá, V. et al. (2006) 'Burnout and work engagement: Independent factors or opposite poles?', Journal of Vocational Behavior, 68, pp. 165–174. doi: 10.1016/j.jvb.2005.01.003.

Gordon, H. J. et al. (2017) 'Individual job redesign: Job crafting interventions in healthcare', Journal of Vocational Behavior, 104, pp. 98–114. doi: 10.1016/j.jvb.2017.07.002.

Gordon, R. P. et al. (1996) 'Assessing the human factors causes of accidents in the offshore oil industry', in International conference on health, safety and environment in oil and gas exploration and production. doi: 10.16373/j.cnki.ahr.150049.

Gorter, R. C. et al. (2008) ‘Positive engagement and job resources in dental practice’, Community Dentistry and Oral Epidemiology. doi: 10.1111/j.1600-0528.2007.00350.x.

Govender, M. and Bussin, M. H. R. (2020) ‘Performance management and employee engagement: A South African perspective’, SA Journal of Human Resource Management, 18, pp. 1–19. doi: 10.4102/sajhrm.v18i0.1215.

Grant, A. M. (2003) ‘The impact of life coaching on goal attainment, metacognition and mental health’, Social Behavior and Personality. doi: 10.2224/sbp.2003.31.3.253.

Grant, A. M. (2011) ‘Is it time to REGROW the GROW model? Issues related to teaching coaching session structure’, Coaching Psychologist, 7(2), pp. 118–126.

Griffin, M. A. and Neal, A. (2000) ‘Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation’, Journal of Occupational Health Psychology, 3(3), pp. 347–358. doi: 10.1037//1076-8998.5.3.347.

Griffith, C. J., Livesey, K. M. and Clayton, D. A. (2010) ‘Food safety culture: the evolution of an emerging risk factor?’, British Food Journal, 112(4), pp. 426–438. doi: 10.1108/00070701011034439.

Guan, X. and Frenkel, S. (2018) ‘How HR practice , work engagement and job crafting in fl uence employee performance’, 12(3), pp. 591–607. doi: 10.1108/CMS-11-2017-0328.

Guan, X. and Frenkel, S. (2019) ‘How perceptions of training impact employee performance: Evidence from two Chinese manufacturing firms’, Personnel Review, 48(1), pp. 163–183.

Guba, E. G. and Lincoln, Y. S. (2013) ‘Competing Paradigms in Qualitative Research’, in Denzin, N. K. and Lincoln, Y. S. (eds) Handbook of qualitative research. Thousand Oaks, CA: Sage Publications Inc., pp. 105–117. Available at: http://steinhardtapps.es.its.nyu.edu/create/courses/3311/reading/10-guba_lincoln_94.pdf.

Guest, D. (2014) ‘Employee engagement: A sceptical analysis’, Journal of Organizational Effectiveness: People and Performance, 1(2), pp. 141–156. doi: 10.1108/JOEPP-04-2014-0017.

Guldenmund, F. W. (2000) 'The nature of safety culture: a review of theory and research', Safety Science, 34(1–3), pp. 215–257. doi: 10.1016/S0925-7535(00)00014-X.

Gusterson, H. (2008) 'Ethnographic Research', in Klotz A. and Prakash D. (eds) Qualitative Methods in International Relations. Research Methods Series. London, UK: Palgrave Macmillan, pp. 93–113. Available at: https://s3.amazonaws.com/academia.edu.documents/37025138/Klotz.pdf?response-content-disposition=inline%3B filename%3DEthnographic_Research.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWOWYYGZ2Y53UL3A%2F20190715%2Fus-east-1%2Fs3%2Faws4_requ (Accessed: 15 July 2019).

Gyensare, M. A. et al. (2017) 'Occupational Health and Safety Dimensions and Work Outcomes in the Mental Hospitals in Ghana: The Moderating Effect of Job Satisfaction', in Arezes, P. (ed.) Advances in Intelligent Systems and Computing 604. Springer International Publishing AG, pp. 564–577. doi: 10.1007/978-3-319-60525-8_58.

Haarmans, M., Perkins, E. and Jellicoe-Jones, L. (2020) '"It's Us Doing It!" The Power of Participatory Action Research in Prison: A Contradiction in Terms?–Phase 1', International Journal of Forensic Mental Health, 11(3), pp. 445–455. doi: 10.1080/14999013.2020.1863524.

Hackman, J. R. (1980) 'Work redesign and motivation', Professional Psychology: Research and Practice. doi: 10.1037/0735-7028.11.3.445.

Hakanen, J. J., Bakker, A. B. and Demerouti, E. (2005) 'How dentists cope with their job demands and stay engaged: the moderating role of job resources', European Journal of Oral Science, 113, pp. 479–487. doi: 10.1111/j.1600-0722.2005.00250.x.

Hakanen, J. J., Bakker, A. B. and Schaufeli, W. B. (2006) 'Burnout and work engagement among teachers', Journal of School Psychology, 43(6), pp. 495–513. doi: 10.1016/j.jsp.2005.11.001.

Hakanen, J. J., Perhoniemi, R. and Toppinen-Tanner, S. (2008) 'Positive gain spirals at work: From job resources to work engagement, personal initiative and work-unit innovativeness', Journal of Vocational Behavior, 73, pp. 78–91. doi: 10.1016/j.jvb.2008.01.003.

Hakanen, J. J., Schaufeli, W. B. and Ahola, K. (2008) 'The Job Demands-Resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement', Work & Stress, 22(3), pp. 224–241. doi: 10.1080/02678370802379432.

Halbesleben, J. R. B. (2010) 'A meta-analysis of work engagement: Relationships with burnout, demands, resources, and consequences', in Work engagement: A handbook of essential theory and research. Eau Claire, WI: Psychology Press, pp. 102–117.

Halbesleben, J. R. B., Harvey, J. and Bolino, M. C. (2009) 'Too Engaged? A Conservation of Resources View of the Relationship Between Work Engagement and Work Interference With Family', Journal of Applied Psychology, 94(6), pp. 1452–1465. doi: 10.1037/a0017595.

Hallberg, U. E. and Schaufeli, W. B. (2006) '"Same same" but different? Can work engagement be discriminated from job involvement and organizational commitment?', European Psychologist, 11(2), pp. 119–127. doi: 10.1027/1016-9040.11.2.119.

Hallingberg, B. et al. (2018) 'Exploratory studies to decide whether and how to proceed with full-scale evaluations of public health interventions: A systematic review of guidance', Pilot and Feasibility Studies, 4(1), pp. 1–12. doi: 10.1186/s40814-018-0290-8.

Ham, C. and Dickinson, H. (2008) Engaging Doctors in Leadership: What we can learn from international experience and research evidence? Birmingham, UK. Available at: https://www.birmingham.ac.uk/Documents/college-social-sciences/social-policy/HSMC/research/engaging-doctors-leadership.pdf (Accessed: 22 June 2018).

Hamid, S. N. A. and Yahya, K. K. (2016) 'Mediating Role of Work Engagement on the Relationship between Person-Job Fit and Employees' Retention: Evidence from Semiconductor Companies in Northern Region of Malaysia', International Review of Management and Marketing, 6(S7), pp. 11–13. Available at: http:www.econjournals.com (Accessed: 12 August 2019).

Hansez, I. and Chmiel, N. (2010) 'Safety Behavior: Job Demands, Job Resources, and Perceived Management Commitment to Safety', Journal of Occupational Health Psychology, 15(3), pp. 267–278. doi: 10.1037/a0019528.

Häring, I. et al. (2017) 'Towards a Generic Resilience Management, Quantification and Development Process: General Definitions, Requirements, Methods, Techniques and Measures, and Case Studies', in Linkov, I. and Palma-Oliveira, J. M. (eds) Resilience and Risk. Berlin, DE: Springer International Publishing, pp. 21–80. doi: 10.1007/978-94-024-1123-2.

Harter, J. K. et al. (2009) Q 12 ® Meta-Analysis: The Relationship Between Engagement at Work and Organizational Outcomes. Omaha, NE. Available at: https://www.hrbartender.com/images/Gallup.pdf (Accessed: 16 May 2019).

Harter, J. K., Schmidt, F. L. and Hayes, T. L. (2002) 'Business-Unit-Level Relationship Between Employee Satisfaction, Employee Engagement, and Business Outcomes: A Meta-Analysis', Journal of Applied Psychology, 87(2), pp. 268–279. doi: 10.1037//0021-9010.87.2.268.

Hayes, J. R. (2012) 'Modeling and Remodeling Writing', Written Communication, 29(3), pp. 369–388. doi: 10.1177/0741088312451260.

Health and Safety at Work etc. Act 1974 Chapter 37 (2019) Health and Safety at Work etc. Act 1974 Chapter 37. London, UK. Available at: https://www.legislation.gov.uk/ukpga/1974/37/contents (Accessed: 2 September 2019).

Health and Safety Executive (2005) rr367 - A review of safety culture and safety climate literature for the development of the safety culture inspection toolkit. Bristol. Available at: http://www.hse.gov.uk/research/rrpdf/rr367.pdf (Accessed: 26 November 2018).

Health and Safety Executive (2013) Managing for health and safety (HSG65). London, UK. doi: 978 0 7176 6604 1.

Health and Safety Executive (2017) Health and safety at work - Summary statistics for Great Britain 2017. Available at: http://www.hse.gov.uk/statistics/overall/hssh1617.pdf (Accessed: 22 June 2018).

Health and Safety Executive (2020) Manufacturing statistics in Great Britain, 2020. Sudbury, UK. Available at: https://www.hse.gov.uk/statistics/industry/manufacturing.pdf.

Heinrich, H. W. (1954*). Industrial Accident Prevention: A scientific approach* (4th ed.). New York: McGraw-Hill.

Hengel, K. K. M. O. K. et al. (2012) 'Effectiveness of an intervention at construction worksites on work engagement, social support, physical workload, and need for recovery: results from a cluster', BMC Public Health, 12(1008). doi: 10.1186/1471-2458-12-1008.

Hesse-Biber, S. N. and Leavy, P. (2010) The Practice of Qualitative Research. Thousand Oaks, CA: SAGE Publications, Inc.

Higgins, J. P. and Green, S. (eds) (2008) Cochrane Handbook for Systematic Reviews of Interventions. Chichester, UK: Wiley-Blackwell. Available at: http://www.mri.gov.lk/assets/Uploads/Research/Cochrane-Hand-booktext.pdf (Accessed: 11 June 2018).

Hiles, D. R. (2008) 'Transparency', in Given, L. M. (ed.) The SAGE Encyclopedia of Qualitative Research Methods. Thousand Oaks, CA: SAGE Publications, pp. 890–892.

Hobfoll, S. E. et al. (2018) 'Dynamic Self-Regulation and Multiple-Goal Pursuit Dynamic system: a system in which the elements change over time', Annual Review of Organizational Psychology and Organizational Behavior, 5, pp. 103–128. doi: 10.1146/annurev-orgpsych-032117-104640.

Hodgins, M., Battel-Kirk, B. and Asgeirsdottir, A. G. (2010) 'Building capacity in workplace health promotion: the case of the Healthy Together e-learning project', Global Health Promotion, 17(1), pp. 60–68. doi: 10.1177/1757975909356629.

Hofmann, D. A., Morgeson, F. P. and Gerras, S. J. (2003) 'Climate as a Moderator of the Relationship Between Leader–Member Exchange and Content Specific Citizenship: Safety Climate as an Exemplar', Journal of Applied Psychology, 88(1), pp. 170–178. doi: 10.1037/0021-9010.88.1.170.

Hollnagel, E. (2004) 'Time to think and time to do? I can fail, and so can you!', Human factors and aerospace safety, 4(3), pp. 169–179.

Hollnagel, E. (2008b) 'Risk + barriers = safety?', Safety Science, 46, pp. 221–229. doi: 10.1016/j.ssci.2007.06.028.

Hollnagel, E. (2014a) 'From Safety-I to Safety-II : A brief introduction to resilience engineering', Communications of the Operations Research Society of Japan, 59(8), pp. 435–439.

Hollnagel, E. (2014b) Safety-I and safety-II: The past and future of safety management. Ashgate Publishing, Limited. doi: 10.1201/9781315607511.

Hollnagel, E., Hounsgaard, J. and Colligan, L. (2012) FRAM: The functional resonance analysis method: Modelling complex socio-technical systems. Farnham, UK: Ashgate. doi: 10.3357/asem.3712.2013.

Hollnagel, E., Hounsgaard, J. and Colligan, L. (2014) FRAM: The Functional Resonance Analysis Method - a handbook for the practical use of the method. Centre for Quality, Region of Southern Denmark.

Hollnagel, E., Wears, R. L. and Braithwaite, J. (2015) 'From Safety-I to Safety-II: A White Paper', The resilient health care net: published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia. doi: 10.13140/RG.2.1.4051.5282.

Hollnagel, E., Woods, D. D. and Leveson, N. (eds) (2007) Resilience Engineering Concepts, Resilience Engineering: Concepts and Precepts. Aldershot, UK: Ashgate Publishing Ltd. doi: 10.3390/molecules18022328.

Hollnagel, Erik (2008a) 'Resilience Engineering in a Nutshell', in Hollnagel, E., Nemeth, C. P., and Dekker, S. (eds) Resilience Engineering Perspectives, Volume 1: Remaining Sensitive to the Possibility of Failure. Aldershot, UK: Ashgate Publishing Ltd, pp. xi–xiv. Available at: http://erikhollnagel.com/onewebmedia/Hollnagel_preface.pdf (Accessed: 30 March 2020).

Houghton, C. et al. (2013) 'Rigour in qualitative case-study research', Nurse Researcher, 20(4), pp. 12–17. doi: 10.7748/nr2013.03.20.4.12.e326.

Hu, Q. and Schaufeli, W. B. (2011) 'Job insecurity and remuneration in Chinese family-owned business workers', Career Development International, 16(1), pp. 6–19. doi: 10.1108/13620431111107784.

Hu, Q., Schaufeli, W. B. and Taris, T. W. (2011) 'The Job Demands-Resources model: An analysis of additive and joint effects of demands and resources', Journal of Vocational Behavior, 79(1), pp. 181–190. doi: 10.1016/j.jvb.2010.12.009.

Hu, Q., Schaufeli, W. B. and Taris, T. W. (2013) 'Does equity mediate the effects of job demands and job resources on work outcomes?: An extension of the job demands-resources model', Career Development International, 18(4), pp. 357–376. doi: 10.1108/CDI-12-2012-0126.

Huang, L.-C. et al. (2019) 'The influence of abusive supervision on employees' motivation and extra-role behaviors: The daily-basis investigation', Chinese Management Studies, 13(3), pp. 514–530. doi: 10.1108/CMS-04-2018-0495.

Huang, Y.-H. et al. (2016) 'Beyond safety outcomes: An investigation of the impact of safety climate on job satisfaction, employee engagement and turnover using social exchange theory as the theoretical framework', Applied Ergonomics, 55, pp. 248–257. doi: 10.1016/j.apergo.2015.10.007.

Hughes, J. A. et al. (2016) The Philosophy of Social Research. 3rd edn. Milton Park, UK: Routledge. doi: 10.4324/9781315840710-1.

Huo, M.-L. and Boxall, P. (2017) 'Lean production and the well-being of the frontline manager: the job demands – resources model as a diagnostic tool in Chinese manufacturing', Asia Pacific Journal of Human Resources, 55, pp. 280–297. doi: 10.1111/1744-7941.12152.

Huo, M.-L., Boxall, P. and Cheung, G. W. (2020) 'How does line-manager support enhance worker wellbeing? A study in China', International Journal of Human Resource Management, 31(14), pp. 1825–1843. doi: 10.1080/09585192.2017.1423103.

Inoue, A. et al. (2010) 'Organizational justice, psychological distress, and work engagement in Japanese workers', International Archive of Occupational and Environmental Health, 83, pp. 29–38. doi: 10.1007/s00420-009-0485-7.

Inoue, A. et al. (2013) 'Job demands, job resources, and work engagement of Japanese employees: a prospective cohort study', International Archive of Occupational and Environmental Health, 86, pp. 441–449. doi: 10.1007/s00420-012-0777-1.

International Organization for Standardization (2018) Occupational health and safety management systems - Requirements with guidance for use (ISO Standard No. 45001:2018). Switzerland: International Organization for Standardization [ISO]. Available at: https://www.iso.org/standard/63787.html (Accessed: 28 July 2020).

Jackson, L. T. B., Rothmann, S. and Van De Vijver, F. J. R. (2006) 'A model of work-related well-being for educators in South Africa', Stress and Health, 22(7), pp. 263–274. doi: 10.1002/smi.1098.

Jeffcott, S., Pidgeon, N., Weyman, A., & Walls, J. (2006). Risk, trust, and safety culture in UK train operating companies. Risk analysis, 26(5), pp. 1105-1121. doi: https://doi.org/10.1111/j.1539-6924.2006.00819.x.

Jefferson, G. (2014) 'Glossary of transcript symbols with an introduction', in Lerner, G. H. (ed.) Conversation analysis: Studies from the first generation. Amsterdam, NL: John Benjamins Publishing, pp. 13–31. doi: 10.1075/pbns.125.02jef.

Jin, R. and Chen, Q. (2013) 'Safety Culture: Effects of Environment, Behavior & Person', Professional Safety, 58(5), pp. 60–70. Available at: http://web.b.ebscohost.com.ezproxy.cardiffmet.ac.uk/ehost/pdfviewer/pdfviewer?vid=1&sid=a6ef2d9b-9f59-4ec7-88ce-239fe20b76b8%40sessionmgr104 (Accessed: 21 August 2018).

Johari, J. et al. (2013) 'Fostering employee engagement through human resource practices: A case of manufacturing firms in Malaysia', Jurnal Pengurusan, 38, pp. 15–26. Available at: https://ejournal.ukm.my/pengurusan/article/view/4608.

Johnson, J. L. (1997) 'Generalizability in qualitative research', in Morse, J. M. (ed.) Completing a qualitative project: Details and dialogue. Thousand Oaks, CA: Sage Publications Inc.

Jones, C. E. L., Phipps, D. L. and Ashcroft, D. M. (2018) 'Understanding procedural violations using Safety-I and Safety-II: The case of community pharmacies', Safety Science, 105(February 2017), pp. 114–120. doi: 10.1016/j.ssci.2018.02.002.

Kahn, W. A. (1990) 'Psychological Conditions of Personal Engagement and Disengagement At Work', Academy of Management Journal, 33(4), pp. 692–724. doi: 10.2307/256287.

Kahn, W. A. (1992) 'To Be Fully There: Psychological Presence at Work', Human Relations, 45(4), pp. 321–349. doi: 0803973233.

Kahn, W. A. (2010) 'The essence of engagement: Lessons from the field', in Albrecht, S. L. (ed.) Handbook of Employee Engagement: Perspectives, Issues, Research and Practice.

Cheltenham, UK: Edward Elgar Publishing Limited, pp. 20–30. doi: 10.4337/9781849806374.00008.

Kahn, W. A. and Heaphy, E. D. (2014) 'Relational contexts of personal engagement at work', in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 82–96. doi: 10.4324/9780203076965.

Kelliher, C., Hailey, V. H. and Farndale, E. (2014) 'Employee engagement in multinational organizations', in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 180–194. doi: 10.4324/9780203076965.

Kelly, P. J. (2005) 'Practical suggestions for community interventions using participatory action research', Public Health Nursing, 22(1), pp. 65–73. doi: 10.1111/j.0737-1209.2005.22110.x.

Khan, K. et al. (2011) Systematic reviews to support evidence-based medicine. 2nd edn. Boca Raton, FL: CRC Press.

Kim, H. J., Shin, K. H., & Swanger, N. (2009). Burnout and engagement: A comparative analysis using the Big Five personality dimensions. International Journal of Hospitality Management, 28(1), pp. 96-104. doi: https://doi.org/10.1016/j.ijhm.2008.06.001.

Kim, J. T. et al. (2018) 'Development of a quantitative resilience model for nuclear power plants', Annals of Nuclear Energy, 122, pp. 175–184. doi: 10.1016/j.anucene.2018.08.042.

Kim, W., Kolb, J. A. and Kim, T. (2013) 'The Relationship Between Work Engagement and Performance: A Review of Empirical Literature and a Proposed Research Agenda', Human Resource Development Review, 12(3), pp. 248–276. doi: 10.1177/1534484312461635.

King, N. (2017) 'Doing Template Analysis', in Symon, G. and Cassell, C. (eds) Qualitative Organizational Research: Core Methods and Current Challenges. London, UK: SAGE Publications, pp. 426–450. doi: 10.4135/9781526435620.n24.

King, N. and Brooks, J. M. (2018) Template Analysis for Business and Management Students. Edited by D. Martinez-Alfonso. London, UK: Sage Publications Inc. doi: 10.4135/9781473983304.

King, N., Brooks, J. and Tabari, S. (2017) 'Template Analysis in Business and Management Research', in Ciesielska, M. and Jemielniak, D. (eds) Qualitative Methodologies in Organization Studies. Cham, CH: Palgrave Macmillan, pp. 179–206. doi: https://doi.org/10.1007/978-3-319-65442-3_8.

Kinnunen, U., Mauno, S. and Siltaloppi, M. (2010) 'Job insecurity, recovery and well-being at work: Recovery experiences as moderators', Economic and Industrial Democracy, 31(2), pp. 179–194. doi: 10.1177/0143831X09358366.

Kitchenham, B. A., Dybå, T. and Jørgensen, M. (2004) 'Evidence-based Software Engineering', in Proceedings of the 26th International Conference on Software Engineering (ICSE'04). Edinburgh, UK: IEEE. doi: 10.1109/ICSE.2004.1317449.

Kmiec, J. J. J. (2010) A Study of the Effectiveness of a Pilot Training Program in an Organizational Setting: An Intervention for Work Engagement, ProQuest Dissertations and Theses. The University of Southern Mississippi. Available at: http://flagship.luc.edu/login?url=http://search.proquest.com/docview/734815316?accountid=12163%5Cnhttp://loyola-primo.hosted.exlibris-group.com/openurl/01LUC/01LUC_SERVICES?genre=dissertations+%26+theses&issn=&title=A+study+of+the+effectiveness+of+a+pilot+ (Accessed: 12 August 2019).

Knight, C., Patterson, M. and Dawson, J. (2017b) 'Building and sustaining work engagement – a participatory action intervention to increase work engagement in nursing staff', European Journal of Work and Organizational Psychology, 26(5), pp. 634–649. doi: 10.1080/1359432X.2017.1336999.

Knight, C., Patterson, M. and Dawson, J. (2019) 'Work engagement interventions can be effective: a systematic review', European Journal of Work and Organizational Psychology, 28(3), pp. 348–372. doi: 10.1080/1359432X.2019.1588887.

Knight, C., Patterson, M. and Dawson, J. F. (2017a) 'Building work engagement: A systematic review and meta-analysis investigating the effectiveness of work engagement interventions', Journal of Organizational Behavior, 38(6), pp. 792–812. doi: 10.1002/job.2167.

Korunka, C. et al. (2009) 'Work engagement and burnout: Testing the robustness of the Job Demands-Resources model', Journal of Positive Psychology, 4(3), pp. 243–255. doi: 10.1080/17439760902879976.

Kulikowski, K. (2017) 'Do we all agree on how to measure work engagement? Factorial validity of Utrecht Work Engagement Scale as a standard measurement tool – A literature review', International Journal of Occupational Medicine and Environmental Health, 30(2), pp. 161–175. doi: 10.13075/ijomeh.1896.00947.

de la Rocha, A. M. (2015) The relationship between employee engagement and survey response rate with union membership as a moderator. San Jose State University.

Lacey, A. J. (2018) 'Novice researchers' nightmare journey of paradigms and methodologies: "It's hard to know what is right or wrong"', Advances in Intelligent Systems and Computing, 621, pp. 204–212. doi: 10.1007/978-3-319-61121-1_18.

Laurent, J., Chmiel, N. and Hansez, I. (2018) 'Jobs and safety: A social exchange perspective in explaining safety citizenship behaviors and safety violations', Safety Science, 110, pp. 291–299. doi: 10.1016/j.ssci.2018.08.027.

Lawani, K., Hare, B. and Cameron, I. (2017a) 'A worker engagement maturity model for improving wellbeing and social sustainability in construction', in International Conference on Sustainable Futures (ICSF) Bahrain 2017. Available at: https://ed-share.gcu.ac.uk/id/eprint/5179.

Lawani, K., Hare, B. and Cameron, I. (2017b) 'Developing a worker engagement maturity model for improving occupational safety and health (OSH) in construction', Journal of construction project management and innovation, 7(2), pp. 130–140. doi: 10.10520/EJC-c2435ba52.

Lawani, K., Hare, B. and Cameron, I. (2019) 'Evaluating workplace trust as a construct of worker engagement in construction', in Proceedings of the ICE-Management, pp. 125–134. doi: 10.1680/jmapl.18.00034.

Lawler, E. E. I. (1986) 'Union growth and decline: The impact of employer and union tactics', Journal of Occupational Psychology, 59(3), pp. 217–230. doi: 10.1111/j.2044-8325.1986.tb00226.x.

Lawler, E. E. I., Mohrman, S. A. and McMahan, G. C. (1995) Creating High Performance Organizations: Survey of Practices and Results of Employee Involvement and TQM in Fortune 1000 Companies. San Francisco, US: Wiley. doi: 10.1177/088636879502700412.

Lazarus, R. S. and Folkman, S. (1984) Stress, appraisal, and coping. New York, US: Springer Publishing Company. doi: 10.1016/0005-7967(85)90087-7.

Leaver, M., Griffiths, A. and Reader, T. (2018) 'Near Misses in Financial Trading: Skills for Capturing and Averting Error', Human Factors, 60(5), pp. 640–657. doi: 10.1177/0018720818769598.

Lee, J. et al. (2019) 'A Systematic Review of the Safety Climate Intervention Literature: Past Trends and Future Directions', Journal of Occupational Health Psychology, 24(1), pp. 66–91. doi: 10.1037/ocp0000113.

Lee, M. C. C. and Idris, M. A. (2017) 'Psychosocial safety climate versus team climate: The distinctiveness between the two organizational climate constructs', Personnel Review, 46(5), pp. 988–1003. doi: 10.1108/PR-01-2016-0003.

Lee, W. et al. (2020) 'Workforce development: understanding task-level job demands-resources, burnout, and performance in unskilled construction workers', Safety Science, 123(November 2019). doi: 10.1016/j.ssci.2019.104577.

Lekka, C. and Healey, N. (2012) RR952 - A review of the literature on effective leadership behaviours for safety. London, UK. Available at: http://www.hse.gov.uk/research/rrpdf/rr952.pdf (Accessed: 22 June 2018).

Liang, T.-L. et al. (2017) 'Transformational leadership and employee voices in the hospitality industry', International Journal of Contemporary Hospitality Management, 29(1), pp. 374–392. doi: 10.1108/IJCHM-07-2015-0364.

Lincoln, Y. S. and Guba, E. G. (1985) Naturalistic inquiry. Edited by E. G. Guba. London, UK: Sage Publications Inc.

Lines, R. (2004) 'Influence of participation in strategic change: resistance, organizational commitment and change goal achievement', Journal of Change Management, 4(3), pp. 193–215. doi: 10.1080/1469701042000221696.

Llorens, S. et al. (2007) 'Does a positive gain spiral of resources, efficacy beliefs and engagement exist?', Computers in Human Behavior, 23, pp. 825–841. doi: 10.1016/j.chb.2004.11.012.

Lockwood, M. A. (2008) The relationship of self-efficacy, perceptions of supervisor leadership styles and blue-collar employee engagement. University of Phoenix. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.564.348&rep=rep1&type=pdf (Accessed: 12 August 2019).

Lockwood, N. R. (2007) 'Leveraging Employee Engagement for Competitive Advantage: HR's Strategic Role', Society for Human Resource Management Research Quarterly, 1(1), pp. 1–12. Available at: http://gmj.gallup.com (Accessed: 6 August 2019).

Van Loggerenberg, N. and Nienaber, H. (2017) 'Employee well-being framework to facilitate a total safety culture within a nuclear power plant', International Topical Meeting on Probabilistic Safety Assessment and Analysis, PSA, 2, pp. 1301–1310. Available at: http://uir.unisa.ac.za/bitstream/handle/10500/23325/22426 - Paper.pdf?sequence=1 (Accessed: 20 May 2019).

Lorente Prieto, L. et al. (2008) 'Extension of the Job Demands-Resources model in the predictionof burnout and engagement among teachers over time', Psicothema, 20(3), pp. 354–360. Available at: https://www.redalyc.org/html/727/72720303/ (Accessed: 20 May 2019).

Lucy, D. et al. (2011) Leadership and worker involvement on the Olympic Park (Research Report 896). HSE Books.

Macdonald, C. (2012) 'Understanding Participatory Action Research: A Qualitative Research Methodology Option', Canadian Journal of Action Research, 13(2), pp. 34–50. doi: https://doi.org/10.33524/cjar.v13i2.37.

Macey, W. H. and Schneider, B. (2008) 'The Meaning of Employee Engagement', Industrial and Organizational Psychology, 1(01), pp. 3–30. doi: 10.1111/j.1754-9434.2007.0002.x.

MacLeod, D. and Clarke, N. (2009) 'Engaging for success : enhancing performance through employee engagement - A report to Government', Department for Business Innovation & Skills, 1, pp. 1–124. doi: 10.1037/e576512011-001.

Madill, A., Jordan, A. and Shirley, C. (2000) 'Objectivity and reliability in qualitative analysis: Realist, contextualist and radical constructionist epistemologies', British Journal of Psychology, 91(1), pp. 1–20. doi: 10.1348/000712600161646.

Madni, A. M. and Jackson, S. (2011) 'Towards a conceptual framework for resilience engineering', IEEE Engineering Management Review, 39(4), pp. 181–191. doi: 10.1109/EMR.2011.6093891.

Maguire, M. and Delahunt, B. (2017) 'Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars. *', AISHE-J: The All Ireland Journal of Teaching and Learning in Higher Education, 8(3), pp. 3351–33514. Available at: http://ojs.aishe.org/index.php/aishe-j/article/view/335 (Accessed: 1 April 2019).

Mäkikangas, A. et al. (2013) 'Does Personality Matter? A Review of Individual Differences in Occupational Well-Being', in Bakker, A. B. (ed.) Advances in positive organizational psychology (Volume 1). 1st edn. Bingley, UK: Emerald Group Publishing Limited, pp. 107–143. doi: 10.1108/S2046-410X(2013)0000001008.

Manimegalai, S. and Baral, R. (2018) 'Examining the mediating role of organizational trust in the relationship between CSR practices and job outcomes', Social Responsibility Journal, 14(3), pp. 433–447. doi: 10.1108/SRJ-01-2017-0007.

Mark, B. A. et al. (2007) 'Does safety climate moderate the influence of staffing adequacy and work conditions on nurse injuries?', Journal of Safety Research, 38(4), pp. 431–446. doi: 10.1016/j.jsr.2007.04.004.

Martinetti, A. et al. (2019) 'Safety I–II, resilience and antifragility engineering: a debate explained through an accident occurring on a mobile elevating work platform', International Journal of Occupational Safety and Ergonomics, 25(1), pp. 66–75. doi: 10.1080/10803548.2018.1444724.

Maslach, C., Schaufeli, W. B. and Leiter, M. P. (2001) 'Job Burnout', Annual review of Psychology, 52(1), pp. 397–422. doi: 10.1146/annurev.psych.52.1.397.

Mason, J. (2002) Qualitative Researching. 2nd edn. London, UK: Sage Publications Inc.

Mason, R. O. (2004) 'Lessons in Organizational Ethics from the Columbia Disaster: Can a Culture be Lethal?', Organizational Dynamics, 33(2), pp. 128–142. doi: 10.1016/j.orgdyn.2004.01.002.

Mathisen, G. E. and Bergh, L. I. V. (2016) 'Action errors and rule violations at offshore oil rigs: The role of engagement, emotional exhaustion and health complaints', Safety Science, 85, pp. 130–138. doi: 10.1016/j.ssci.2016.01.008.

Matthews, B. and Ross, L. (2010) Research methods: a practical guide for the social sciences. Harlow, UK: Pearson Education Limited.

Mauno, S. et al. (2005) 'Psychological consequences of fixed-term employment and perceived job insecurity among health care staff', European Journal of Work and Organizational Psychology, 14(3), pp. 209–237. doi: 10.1080/13594320500146649.

Mauno, S., Kinnunen, U. and Ruokolainen, M. (2007) 'Job demands and resources as antecedents of work engagement: A longitudinal study', Journal of Vocational Behavior, 70, pp. 149–171. doi: 10.1016/j.jvb.2006.09.002.

May, D. R., Gilson, R. L. and Harter, L. M. (2004) 'The psychological conditions of meaningfulness, safety and availability and the engagement of the human spirit at work', Journal of Occupational and Organizational Psychology, 77, pp. 11–37. doi: https://doi.org/10.1348/096317904322915892.

Mays, N. and Pope, C. (1995) 'Rigour and qualitative research', British Medical Journal, 311, pp. 109–112. doi: https://doi.org/10.1136/bmj.311.6997.109.

Mays, N. and Pope, C. (2000) 'Assessing quality in qualitative research', British Medical Journal, 320, pp. 50–52. doi: 10.1136/bmj.320.7226.50.

McAllister, D. J. (1995) 'Affect- and Cognition-Based Trust as Foundations for Interpersonal Cooperation in Organizations', The Academy of Management Journal, 38(1), pp. 24–59. doi: 10.2307/256727.

McElveen, L. (2019) 'Advancing a Transit Strategic Safety Culture Paradigm', Professional Safety Journal, 64(07), pp. 32–41.

McMahan, G. C., Bell, M. P. and Virick, M. (1998) 'Strategic human resource management: employee involvement, diversity, and international issues', Human Resource Management Review, 8(3), pp. 193–241. doi: https://doi.org/10.1016/S1053-4822(98)90002-X.

McVicar, A., Munn-Giddings, C. and Seebohm, P. (2013) 'Workplace stress interventions using participatory action research designs', International Journal of Workplace Health Management, 6(1), pp. 18–37. doi: 10.1108/17538351311312303.

Mearns, K., Whitaker, S. M. and Flin, R. (2003) 'Safety climate, safety management practice and safety performance in offshore environments', Safety Science, 41, pp. 641–680. doi: 10.1016/S0925-7535(02)00011-5.

Merandi, J. et al. (2018) 'Safety II behavior in a pediatric intensive care unit', Pediatrics, 141(6), p. e20180018. doi: 10.1542/peds.2018-0018.

Merrill, R. M. et al. (2013) 'Health Enhancement Research Organization Research Committee (Drs Anderson and Grossmeier)', Journal of of Occupational and Environmental Medicine, 55(1), pp. 10–18. doi: 10.1097/JOM.0b013e31827b73af.

Meshkati, N. (1997) Human Performance, Organisational Factors and Safety Cultur, Corporate culture and transportation safety. Washington, DC: National Transport Safety Board.

Michie, S., Atkins, L. and West, R. (2014) The Behaviour Change Wheel: A Guide to Designing Interventions. London, UK: Silverback Publishing.

Michie, S., van Stralen, M. M. and West, R. (2011) 'The behaviour change wheel: A new method for characterising and designing behaviour change interventions', Implementation Science, 6(42), pp. 1–28. doi: 10.1186/1748-5908-6-42.

Mishra, S. and Mohanty, J. K. (2016) 'The Predictors of Employee Engagement: A Study in a Ferro Alloys Company of India', Global Business Review, 17(6), pp. 1441–1453. doi: 10.1177/0972150916660429.

Mitonga-Monga, J. and Hlongwane, V. (2017) 'Effects of employees' sense of coherence on leadership style and work engagement', Journal of Psychology in Africa, 27(4), pp. 351–355. doi: 10.1080/14330237.2017.1347757.

Moletsane, M., Tefera, O. and Migiro, S. (2019) 'The relationship between employee engagement and organisational productivity of sugar industry in South Africa: the employees' perspective', African Journal of Business and Economic Research, 14(1), pp. 113–134. doi: 10.31920/1750-4562/2019/v14n1a6.

Molino, M., Cortese, C. G. and Ghislieri, C. (2020) 'The promotion of technology acceptance and work engagement in industry 4.0: From personal resources to information and training', International Journal of Environmental Research and Public Health, 17(3), p. 2438. doi: 10.3390/ijerph17072438.

Moore, G. F. et al. (2015) 'Process evaluation of complex interventions: Medical Research Council guidance', British Medical Journal, 350, pp. 1–7. doi: 10.1136/bmj.h1258.

Morgan, J. I. et al. (2021) 'Implementing the theoretical domains framework in occupational safety: Development of the safety behaviour change questionnaire', Safety Science, 136, p. 105135. doi: 10.1016/j.ssci.2020.105135.

Morgan, P. E. (2018) The Effects of Work in an Exemplar Continuously Improving Lean Production System: A Case Study. University of Phoenix. Available at: https://media.proquest.com/media/pq/classic/doc/4326041751/fmt/ai/rep/NPDF?_a=ChgyMDE5MDgxMjE5NDI1MTExODo4NDU2MDEaCk9ORV9TRUFSQ0giDDgyLjEwLjE0My4yNioFMTg3NTAyCjIwMzcyMDM1ODE6EU9wZW52aWV3UGFnZUltYWdlQgExUgZPbmxpbmVaAkZUYgNQRlRqCjIwMTgvMDEvMDFyCjIwMTgvMTIvM (Accessed: 12 August 2019).

Morrow, S. L. et al. (2010) 'Relationships between psychological safety climate facets and safety behavior in the rail industry: A dominance analysis', Accident Analysis and Prevention, 42(5), pp. 1460–1467. doi: 10.1016/j.aap.2009.08.011.

Mostert, K. and Rothmann, S. (2006) 'Work-related well-being in the South African Police Service', Journal of Criminal Justice, 34(5), pp. 479–491. doi: 10.1016/j.jcrimjus.2006.09.003.

Muhonen, T., Jönsson, S. and Bäckström, M. (2014) 'Consequences of cyberbullying behaviour in working life: The mediating roles of social support and social organisational climate', International Journal of Workplace Health Management, 10(5), pp. 1753–8351. doi: 10.1108/IJWHM-10-2016-0075.

Naeem, R. M. et al. (2018) 'How does perceived career support make employees bright-eyed and bushy-tailed? The mediating role of career self-efficacy', Australian Journal of Career Development, 28(2), pp. 92–102. doi: 10.1177/1038416218822122.

Naeem, R. M. et al. (2019) 'Ethical Leadership and Work Engagement: A moderated mediation model', Ethics & Behavior, 0(0), pp. 1–20. doi: 10.1080/10508422.2019.1604232.

Nahrgang, J. D., Morgeson, F. P. and Hofmann, D. A. (2011) 'Safety at Work: A Meta-Analytic Investigation of the Link Between Job Demands, Job Resources, Burnout, Engagement, and Safety Outcomes', Journal of Applied Psychology, 96(1), pp. 71–94. doi: 10.1037/a0021484.

Nahrgang, J. D., Morgeson, F. P. and Ilies, R. (2009) 'The development of leader–member exchanges: Exploring how personality and performance influence leader and member relationships over time', Organizational Behavior and Human Decision Processes, 108(2), pp. 256–266. doi: 10.1016/j.obhdp.2008.09.002.

Nakamura, S. et al. (2013) 'Job Resources Enhance Work Engagement Through Positive Affect and Meaningful Work Among Japanese Employees', in Sarracino, F. (ed.) The Happiness Compass. Hauppauge.: Nova Science Publishers, Inc., pp. 141–151.

Nasima, A. and Shalini, P. (2018) 'Determinants of engaging employees at work place', Eurasian Journal of Analytical Chemistry, 13(6), pp. 143–151.

Nazaruk, M. (2011) Developing Safety Culture Interventions in the Manufacturing Sector. University of Bath. Available at: https://purehost.bath.ac.uk/ws/portalfiles/portal/240834/UnivBath_PhD_2011_M.Nazaruk.pdf (Accessed: 21 August 2018).

Neal, A., Griffin, M. A. and Hart, P. M. (2000) 'The impact of organizational climate on safety climate and individual behavior', Safety Science, 34(1–3), pp. 99–109. doi: 10.1016/S0925-7535(00)00008-4.

Nembhard, I. M. and Edmondson, A. C. (2006) 'Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams', Journal of Organizational Behavior, 27(7), pp. 941–966. doi: 10.1002/job.413.

Newman, D. A., Joseph, D. L. and Hulin, C. L. (2010) 'Job attitudes and employee engagement: considering the attitude "A-factor"', in Albrecht, S. L. (ed.) New horizons in management. Handbook of employee engagement: Perspectives, issues, research and practice. Northampton, MA: Edward Elgar Publishing, pp. 43–61. doi: https://doi.org/10.4337/9781849806374.00010.

Ni, G. et al. (2020) ‘Influencing mechanism of job satisfaction on safety behavior of new generation of construction workers based on Chinese context: The mediating roles of work engagement and safety knowledge sharing’, International Journal of Environmental Research and Public Health, 17(22), pp. 1–24. doi: 10.3390/ijerph17228361.

Nielsen, K. et al. (2010) ‘Conducting organizational-level occupational health interventions: What works?’, Work and Stress, 24(3), pp. 234–259. doi: 10.1080/02678373.2010.515393.

Nielsen, K. (2013) ‘Review Article: How can we make organizational interventions work? Employees and line managers as actively crafting interventions’, Human Relations, 66(8), pp. 1029–1050. doi: 10.1177/0018726713477164.

Nielsen, K. et al. (2021) ‘Is it me or us? The impact of individual and collective participation on work engagement and burnout in a cluster-randomized organisational intervention’, Work and Stress, pp. 1–24. doi: 10.1080/02678373.2021.1889072.

O’Cathain, A. et al. (2015) ‘Maximising the impact of qualitative research in feasibility studies for randomised controlled trials: Guidance for researchers’, Pilot and Feasibility Studies, 1(1), pp. 1–13. doi: 10.1186/s40814-015-0026-y.

O’Cathain, A. et al. (2019) ‘Guidance on how to develop complex interventions to improve health and healthcare’, British Medical Journal Open, 9(8), pp. 1–9. doi: 10.1136/bmjopen-2019-029954.

O’Hara, J. K., Baxter, R. and Hardicre, N. (2020) ‘“Handing over to the patient”: A FRAM analysis of transitional care combining multiple stakeholder perspectives’, Applied Ergonomics, 85(January), p. 103060. doi: 10.1016/j.apergo.2020.103060.

Occupational Safety and Health Administration (2011) Voluntary protection program. Washington, DC: Government Printing Office.

Owen, M. S., Bailey, T. S. and Dollard, M. F. (2016) ‘Psychosocial Safety Climate as a Multilevel Extension of ERI Theory: Evidence from Australia’, in Siegrist, J. and Wahrendorf, M. (eds) Work Stress and Health in a Globalized Economy, Aligning Perspectives on Health, Safety and Well-Being. Cham, CH: Springer International Publishing Switzerland, pp. 189–217. doi: 10.1007/978-3-319-32937-6_9.

Pardo-Ferreira, M. del C. et al. (2020) ‘Using functional resonance analysis method to understand construction activities for concrete structures’, Safety Science, 128(February), p. 104771. doi: 10.1016/j.ssci.2020.104771.

Park, K. O. et al. (2004) ‘Effectiveness of a healthy work organization intervention: Ethnic group differences’, Journal of Occupational and Environmental Medicine, 46(7), pp. 623–634. doi: 10.1097/01.jom.0000131793.44014.91.

Parker, D., Lawrie, M. and Hudson, P. (2006) ‘A framework for understanding the development of organisational safety culture’, Safety Science, 44, pp. 551–562. doi: 10.1016/j.ssci.2005.10.004.

Parker, S. K. and Griffin, M. A. (2011) ‘Understanding active psychological states: Embedding engagement in a wider nomological net and closer attention to performance’, European Journal of Work and Organizational Psychology, 20(1), pp. 60–67. Available at: https://www-tandfonline-com.ezproxy.cardiff-met.ac.uk/doi/pdf/10.1080/1359432X.2010.532869?needAccess=true (Accessed: 18 September 2019).

Patriarca, R. et al. (2018) ‘An Analytic Framework to Assess Organizational Resilience’, Safety and Health at Work, 9(3), pp. 265–276. doi: 10.1016/j.shaw.2017.10.005.

Peccei, R. (2013) ‘Employee Engagement: An Evidence-based Review’, in Bach, S. and Edwards, M. R. (eds) Managing human resources : human resource management in transition. 5th edn. Chichester, West Sussex, UK: John Wiley & Sons Ltd., pp. 336–363.

Peláez, M. J., Coo, C. and Salanova, M. (2019) ‘Facilitating Work Engagement and Performance Through Strengths-Based Micro-coaching: A Controlled Trial Study’, Journal of Happiness Studies, 21, pp. 1–20. doi: 10.1007/s10902-019-00127-5.

Peláez Zuberbuhler, M. J., Salanova, M. and Martínez, I. M. (2020) ‘Coaching-Based Leadership Intervention Program: A Controlled Trial Study’, Frontiers in Psychology, 10(January), pp. 1–22. doi: 10.3389/fpsyg.2019.03066.

Pidgeon, N. and O’Leary, M. (2000) ‘Man-made disasters: why technology and organizations (sometimes) fail’, Safety Science, 34(1–3), pp. 15–30. doi: https://doi.org/10.1016/S0925-7535(00)00004-7.

Lo Presti, A., D'Aloisio, F. and Pluviano, S. (2016) 'With a little help from my family: A mixed-method study on the outcomes of family support and workload', Europe's Journal of Psychology, 12(4), pp. 584–603. doi: 10.5964/ejop.v12i4.1159.

Prins, J. T. et al. (2010) 'Burnout, engagement and resident physicians' self-reported errors', Psychology, Health & Medicine, 14(6), pp. 654–666. doi: 10.1080/13548500903311554.

Provan, D. J. et al. (2020) 'Safety II professionals: How resilience engineering can transform safety practice', Reliability Engineering and System Safety, 195, p. 106740. doi: 10.1016/j.ress.2019.106740.

Prussia, G. E., Brown, K. A. and Willis, P. G. (2003) 'Mental models of safety: do managers and employees see eye to eye?', Journal of Safety Research, 34(2), pp. 143–156. doi: 10.1016/S0022-4375(03)00011-2.

Punnett, L. et al. (2013) 'Participatory ergonomics as a model for integrated programs to prevent chronic disease', Journal of Occupational and Environmental Medicine, 55(12 Supplement, December 2013), pp. S19–S24. doi: 10.1097/JOM.0000000000000040.

Purcell, J. et al. (2008) People management and performance, People Management and Performance. London, UK: Routledge. doi: 10.4324/9780203885604.

Purcell, J. (2014) 'Employee voice and engagement', in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 236–250. doi: 10.4324/9780203076965.

Raben, D. C. et al. (2018) 'Application of a non-linear model to understand healthcare processes: using the functional resonance analysis method on a case study of the early detection of sepsis', Reliability Engineering and System Safety, 177(April), pp. 1–11. doi: 10.1016/j.ress.2018.04.023.

Rahmadani, V. G. et al. (2020) 'Engaging leadership and its implication for work engagement and job outcomes at the individual and team level: A multi-level longitudinal study', International Journal of Environmental Research and Public Health, 17(3), pp. 1–21. doi: 10.3390/ijerph17030776.

Raines, M. S. (2011) 'Engaging Employees: Another Step in Improving Safety', Professional Safety, 56(4), pp. 36–43. Available at: https://aeasseincludes.assp.org/professional-safety/pastissues/056/04/036_043_F2Raines_0411Z.pdf (Accessed: 20 May 2019).

Rasmussen, K. et al. (2006) 'Worker participation in change processes in a Danish industrial setting', American Journal of Industrial Medicine, 49(9), pp. 767–779. doi: 10.1002/ajim.20350.

Reader, T. W. et al. (2017) 'Organizational support for the workforce and employee safety citizenship behaviors: a social exchange relationship', Human Relations, 70(3), pp. 362–385. doi: https://doi.org/10.1177/0018726716655863.

Rees, C., Alfes, K. and Gatenby, M. (2013) 'Employee voice and engagement: connections and consequences', The International Journal of Human Resource Management, 24(14), pp. 2780–2798. doi: 10.1080/09585192.2013.763843.

Rhoades, L. and Eisenberger, R. (2002) 'Perceived Organizational Support: A Review of the Literature', Journal of Applied Psychology, 87(4), pp. 698–714. doi: 10.1037/0021-9010.87.4.698.

Rich, B. L., Lepine, J. A. and Crawford, E. R. (2010) 'Job engagement: Antecedents and effects on job performance', Academy of Management Journal, 53(3), pp. 617–635. doi: 10.5465/AMJ.2010.51468988.

Righi, A. W., Saurin, T. A. and Wachs, P. (2015) 'A systematic literature review of resilience engineering: Research areas and a research agenda proposal', Reliability Engineering and System Safety, 141, pp. 142–152. doi: 10.1016/j.ress.2015.03.007.

Robinson, O. C. (2014) 'Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide', Qualitative Research in Psychology, 11(1), pp. 25–41. doi: 10.1080/14780887.2013.801543.

Rongen, A. et al. (2014) 'The Contribution of Work Engagement to Self-Perceived Health, Work Ability, and Sickness Absence Beyond Health Behaviors and Work-Related Factors', Journal of Occupational and Environmental Medicine, 56(8), pp. 892–897. doi: 10.1097/JOM.0000000000000196.

Rosecrance, J. C. and Cook, T. M. (2000) 'The use of participatory action research and ergonomics in the prevention of work-related musculoskeletal disorders in the newspaper industry', Applied Occupational and Environmental Hygiene, 15(3), pp. 255–262. doi: 10.1080/104732200301575.

Ross, A. J. et al. (2014) 'Inpatient diabetes care: Complexity, resilience and quality of care', Cognition, Technology and Work, 16(1), pp. 91–102. doi: 10.1007/s10111-012-0247-2.

Rothbard, N. P. (2001) 'Enriching or Depleting? The Dynamics of Engagement in Work and Family Roles', Administrative Science Quarterly, 46(4), pp. 655–684. Available at: https://www.jstor.org/stable/pdf/3094827.pdf (Accessed: 20 May 2019).

Ryan, R. M. and Deci, E. L. (2000a) 'Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions', Contemporary Educational Psychology, 25(1), pp. 54–67. doi: https://doi.org/10.1006/ceps.1999.1020.

Ryan, R. M. and Deci, E. L. (2000b) 'Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being', American Psychologist, 55(1), pp. 68–78. doi: 10.1037/0003-066X.55.1.68.

Sagan, S. D. (1993) The Limits of Safety: Organizations, Accidents, and Nuclear Weapons, Princeton Studies in International History and Politics. Princeton, US: Princeton University Press. doi: https://doi.org/10.1515/9780691213064.

Saks, A. M. (2006) 'Antecedents and consequences of employee engagement', Journal of Managerial Psychology, 21(7), pp. 600–619. doi: 10.1108/02683940610690169.

Saks, A. M. (2008) 'The Meaning and Bleeding of Employee Engagement: How Muddy Is the Water?', Industrial and Organizational Psychology, 1(1), pp. 40–43. doi: 10.1111/j.1754-9434.2007.00005.x.

Sakuraya, A. et al. (2016) 'Effects of a job crafting intervention program on work engagement among Japanese employees: a pretest-posttest study', BMC Psychology, 4(49), pp. 1–9. doi: 10.1186/s40359-016-0157-9.

Sakuraya, A. et al. (2017) 'Job crafting, work engagement, and psychological distress among Japanese employees: a cross-sectional study', BioPsychoSocial Medicine, 11(6), pp. 1–7. doi: 10.1186/s13030-017-0091-y.

Salanova, M. et al. (2010) ‘The gain spiral of resources and work engagement: Sustaining a positive worklife’, in Bakker, A. B. and Leiter, M. P. (eds) Work Engagement: A Handbook of Essential Theory and Research. Milton Park, UK: Routledge. doi: 10.4324/9780203853047.

Salanova, M. and Llorens, S. (2014) ‘Employee empowerment and engagement’, in Arla Day, E. Kevin Kelloway, Joseph J., J. H. (ed.) Workplace well-being: How to build psychologically healthy workplaces. New York, US: Wiley-Blackwell, pp. 117–141.

Salanova, M. and Schaufeli, W. B. (2008) ‘A cross-national study of work engagement as a mediator between job resources and proactive behaviour’, The International Journal of Human Resource Management, 19(1), pp. 116–131. doi: 10.1080/09585190701763982.

Saldanha, M. C. W. et al. (2020) ‘Understanding and improving safety in artisanal fishing: A safety-II approach in raft fishing’, Safety Science, 122, p. 104522. doi: 10.1016/j.ssci.2019.104522.

Salfenauer, H. (1986) ‘Erfahrungen bei einem Seminar für Schulleiter’, Erziehung und Unterricht: Österreichische Pädagogische Zeitschrift, 8(86), p. 622.

Salmon, P. M. et al. (2017) ‘Fitting methods to paradigms: are ergonomics methods fit for systems thinking?’, Ergonomics, 60(2), pp. 194–205. doi: 10.1080/00140139.2015.1103385.

Sandelowski, M. (1994) ‘Focus on qualitative methods. The use of quotes in qualitative research’, Research in Nursing & Health, 17(6), pp. 479–482. doi: 10.1002/nur.4770170611.

Santhanam, N. and Srinivas, S. (2019) ‘Modeling the impact of employee engagement and happiness on burnout and turnover intention among blue-collar workers at a manufacturing company’, Benchmarking, 27(2), pp. 499–516. doi: 10.1108/BIJ-01-2019-0007.

Saracutu, M. et al. (2018) ‘Protocol for a feasibility and acceptability study using a brief ACT-based intervention for people from Southwest Wales who live with persistent pain’, British Medical Journal Open, 8(11), pp. 1–9. doi: 10.1136/bmjopen-2018-021866.

Saunders, M., Lewis, P. and Thornhill, A. (2009) Research Methods for Business Students. 5th edn. Essex, UK: Pearson Education Limited.

Saunders, M., Thornhill, P. and Lewis, A. (2019) 'Template Analysis', in Research Methods for Business Students. 8th edn. Harlow, UK: Pearson Education Limited, pp. 660–664. Available at: https://ebookcentral.proquest.com/lib/cardiffmet/reader.action?docID=5774742.

Saward, J. R. E. and Stanton, N. A. (2018) 'Individual latent error detection: Simply stop, look and listen', Safety Science, 101(March 2017), pp. 305–312. doi: 10.1016/j.ssci.2017.09.023.

Schaufeli, W. B., Salanova, M., Gon Alezro, V. A., et al. (2002) 'The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach', Journal of Happiness Studies, 3, pp. 71–92. doi: 10.1023/A:1015630930326.

Schaufeli, W. B., Salanova, M., González-Romá, V. A., et al. (2002) 'The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach', Journal of Happiness Studies, 3, pp. 71–92. Available at: http://www.jwalkonline.org/docs/Grad Classes/Fall 07/Org Develop/presentation/ARTICLES/measure engage and burnout.pdf (Accessed: 22 June 2018).

Schaufeli, W. B. (2012) 'Measurement of Work Engagement', in Sinclair, R. R., Wang, M., and Tetrick, L. E. (eds) Research methods in occupational health psychology: Measurement, design and data analysis. New York: Routledge, pp. 138–153.

Schaufeli, W. B. et al. (2014) 'A Critical Review of the Job Demands-Resources Model: Implications for Improving Work and Health', in Bauer, G. F. and Hämmig, O. (eds) Bridging Occupational, Organizational and Public Health: A Transdisciplinary Approach. Dordrecht: Springer, pp. 43–68. doi: 10.1007/978-94-007-5640-3.

Schaufeli, W. B. (2014) 'What is Engagement?', in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 15–35. Available at: https://www.wilmarschaufeli.nl/publications/Schaufeli/414.pdf (Accessed: 3 July 2018).

Schaufeli, W. B. and Bakker, A. B. (2004) 'Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study', Journal of Organizational Behavior, 25(3), pp. 293–315. doi: 10.1002/job.248.

Schaufeli, W. B. and Bakker, A. B. (2010) 'Defining and measuring work engagement: Bringing clarity to the concept', in Bakker, A. B. and Leiter, M. P. (eds) Work engagement: A handbook of essential theory and research. Milton Park, UK: Psychology Press, pp. 10–24. doi: 10.4324/9780203853047.

Schaufeli, W. B., Bakker, A. B. and van Rhenen, W. (2009) 'How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism', Journal of Organizational Behavior, 30(7), pp. 893–917. doi: https://doi.org/10.1002/job.595.

Schaufeli, W. B., Bakker, A. B. and Salanova, M. (2006) 'The Measurement of Work Engagement With a Short Questionnaire: A Cross-National Study', Educational and Psychological Measurement, 66(4), pp. 701–716. doi: 10.1177/0013164405282471.

Schaufeli, W. B. and Salanova, M. (2011) 'Work engagement: On how to better catch a slippery concept', European Journal of Work and Organizational Psychology, 20(1), pp. 39–46. doi: 10.1080/1359432X.2010.515981.

Schaufeli, W. B., Taris, T. W. and Van Rhenen, W. (2008) 'Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being?', Applied Psychology, 57(2), pp. 173–203. doi: 10.1111/j.1464-0597.2007.00285.x.

Schein, E. (1985) *Organizational culture and leadership*. San Francisco: Jossey-Bass.

Schneider, B. (1975) 'Organizational Climates: an Essay', Personnel Psychology, 28(4), pp. 447–479. doi: 10.1111/j.1744-6570.1975.tb01386.x.

Schneider, B. et al. (2010) 'The role of employee trust in understanding employee engagement', in Albrecht, S. L. (ed.) Handbook of employee engagement: Perspectives, issues, research and practice. Cheltenham, UK: Edward Elgar Publishing, pp. 159–173. doi: 10.4337/9781849806374.

Schultz, C. and Bezuidenhout, A. (2013) 'A Leadership Initiative to Enhance Employee Engagement amongst Engineers at a Gold Mining Plant in South Africa', in Proceedings of PICMET'13: Technology Management in the IT-Driven Services (PICMET). IEEE, pp. 1192–1199. Available at: http://uir.unisa.ac.za/bitstream/handle/10500/13883/Picmet artikel Leadership initiative _Anglo.pdf?sequence=1&isAllowed=y (Accessed: 12 August 2019).

Schurman, S. J. (1996) ‘Making the “New American workplace” safe and healthy: A joint labor-management-researcher approach’, American Journal of Industrial Medicine, 29(4), pp. 373–377. doi: 10.1002/(SICI)1097-0274(199604)29:4<373::AID-AJIM18>3.0.CO;2-Z.

Schwandt, T. (1997) Qualitative Inquiry: A Dictionary of Terms. Thousand Oaks, CA: Sage Publications Inc.

Sekhon, M., Cartwright, M. and Francis, J. J. (2017) ‘Acceptability of healthcare interventions: An overview of reviews and development of a theoretical framework’, BMC Health Services Research, 17(1), pp. 1–13. doi: 10.1186/s12913-017-2031-8.

Sexton, B. J. et al. (2018) ‘Providing feedback following Leadership WalkRounds is associated with better patient safety culture, higher employee engagement and lower burnout’, British Medical Journal Quality & Safety, 27(4), pp. 261–270. doi: 10.1136/bmjqs-2016-006399.

Shannon, H. S. et al. (1997) ‘Overview of the relationship between organizational and workplace factors and injury rates’, Safety Science, 26(3), pp. 201–217. doi: https://doi.org/10.1016/S0925-7535(97)00043-X.

Shantz, A., Alfes, K. and Latham G. P. (2016) ‘The Buffering Effect of Perceived Organizational Support on the Relationship Between Work Engagement and Behavioral Outcomes’, Human Resource Management, 55(1), pp. 25–38. doi: 10.1002/hrm.21653.

Sharman, A. (2018) Naked Safety, Naked Safety. Milton Park, UK: Routledge. doi: 10.4324/9781315858692.

Shearn, P. (2004) Workforce Participation in the Management of Occupational Health (Report Nr: HSL/2005/09). Sheffield. Available at: http://www.hse.gov.uk/research/hsl_pdf/2005/hsl0509.pdf (Accessed: 22 June 2018).

Shilling, V. et al. (2018) ‘Development and validation of the patient roles and responsibilities scale in cancer patients’, Quality of Life Research, 27(11), pp. 2923–2934. doi: 10.1007/s11136-018-1940-2.

Shin, I. and Jeung, C.-W. (2019) ‘Uncovering the Turnover Intention of Proactive Employees: The Mediating Role of Work Engagement and the Moderated Mediating Role of Job

Autonomy', International Journal of Environmental Research and Public Health, 16(5), p. 843. doi: 10.3390/ijerph16050843.

Shirom, A. (2003) 'Vigor's Construct Validity 1 Feeling Vigorous at Work? The Construct of Vigor and the Study of Positive Affect in Organizations', Research in organizational stress and well-being, 3, pp. 135–156.

Shuck, B. (2011) 'Four Emerging Perspectives of Employee Engagement: An Integrative Literature Review', Human Resource Development Review, 20(10), pp. 1–25. doi: 10.1177/1534484311410840.

Shuck, B. and Rocco, T. S. (2013) 'Human resource development and employee engagement', in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. Oxon, UK: Routledge, pp. 116–130. doi: 10.4324/9780203076965.

Shuck, B. and Rocco, T. S. (2014) 'Human resource development and employee engagement', in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 116–130. doi: 10.4324/9780203076965.

Shuck, B. and Wollard, K. (2010) 'Employee engagement and HRD: A seminal review of the foundations', Human Resource Development Review, 9(1), pp. 89–110. doi: 10.1177/1534484309353560.

Shuck, M. B. (2010) Employee Engagement: An Examination of Antecedent and Outcome Variables. Florida International University. doi: 10.25148/etd.FI10080415.

Siddiqi, M. A. (2015) 'Employee Innovative Work Behavior and Its Roots in Their Work Engagement: An Indian Experience', Pranjana, 18(2), pp. 1–18. doi: 10.5958/0974-0945.2015.00008.4.

Siegrist, J. (1996) 'Adverse Health Effects of High-Effort/Low-Reward Conditions', Journal of Occupational Health Psychology, 1(1), pp. 27–41. doi: 10.1037//1076-8998.1.1.27.

Siltaloppi, M., Kinnunen, U. and Feldt, T. (2009) 'Recovery experiences as moderators between psychosocial work characteristics and occupational well-being', Work & Stress, 23(4), pp. 330–348. doi: 10.1080/02678370903415572.

Simpson, M. R. (2009) ‘Engagement at work: A review of the literature’, International Journal of Nursing Studies, 46, pp. 1012–1024. doi: 10.1016/j.ijnurstu.2008.05.003.

Smith, J. A. (1995) ‘Semi-Structured Interviewing and Qualitative Analysis’, in Smith, J. A., Harre, R., and Van Langenhove, L. (eds) Rethinking Methods in Psychology. London, UK: SAGE Publications Ltd., pp. 9–26. doi: 10.4135/9781446221792.n2.

Soane, E. et al. (2012) ‘Development and application of a new measure of employee engagement: the ISA engagement scale’, Human Resource Development International, 15(5), pp. 529–547. doi: 10.1080/13678868.2012.726542.

Soane, E. (2014) ‘Leadership and employee engagement’, in Truss, C. et al. (eds) Employee Engagement in Theory and Practice. London, UK: Routledge, pp. 149–162. doi: 10.4324/9780203076965.

Sonnentag, S. (2003) ‘Recovery, Work Engagement, and Proactive Behavior: A New Look at the Interface Between Nonwork and Work’, Journal of Applied Psychology, 88(3), pp. 518–528. doi: https://doi.org/10.1037/0021-9010.88.3.518.

Sonnentag, S., Dormann, C. and Demerouti, E. (2010) ‘Not all days are created equal: The concept of state work engagement’, in Bakker, A. B. and Leiter, M. P. (eds) Work Engagement: A Handbook of Essential Theory and Research. London, UK: Psychology Press, pp. 25–38. doi: 10.4324/9780203853047.

Sosik, J. J. (2006) ‘Full range leadership: Model, research, extensions, and training’, in Inspiring Leaders. Milton Park, UK: Routledge. doi: 10.4324/9780203013199.

Sparkes, A. C. and Smith, B. (2014) Qualitative research methods in sport exercise and health: From process to product. Milton Park, UK: Routledge. doi: 10.4324/9780203852187.

Stake, R. E. (1995) The art of case study research xi. Thousand Oaks, CA: Sage Publications Inc.

Starks, H. and Trinidad, S. B. (2007) ‘Choose your method: A comparison of phenomenology, discourse analysis, and grounded theory’, Qualitative Health Research, 17(10), pp. 1372–1380. doi: 10.1177/1049732307307031.

Stead, M. L. et al. (2001) ‘Communication about sexual problems and sexual concerns in ovarian cancer: qualitative study’, British Medical Journal, 323, pp. 836–837. doi: https://doi.org/10.1136/bmj.323.7317.836.

Stearns, S., Shoji, K. and Benight, C. C. (2018) ‘Burnout Among US Military Behavioral Health Providers’, The Journal of nervous and mental disease, 206(6), pp. 398–409. doi: 10.1097/NMD.0000000000000823.

Stephens, J. P. et al. (2013) ‘Relationship quality and virtuousness: Emotional carrying capacity as a source of individual and team resilience’, The Journal of Applied Behavioral Science, 49(1), pp. 13–41. doi: 10.1177/0021886312471193.

Sulea, C. et al. (2012) ‘Work engagement as mediator between job characteristics and positive and negative extra-role behaviors’, Career Development International, 17(3), pp. 188–207. doi: 10.1108/13620431211241054.

Sullivan, C. and Forrester, M. A. (2019) Doing Qualitative Research in Psychology: A Practical Guide. 2nd edn, Qualitative Research in Psychology. 2nd edn. Edited by C. Sullivan and M. A. Forrester. London, UK: SAGE Publications Ltd. doi: 10.1080/14780887.2011.578541.

Sunstein, B. S. and Chiseri-Strater, E. (2012) FieldWorking: Reading and Writing Research. 4th edn. Edited by K. S. Henry. Boston, US: Bedford/St. Martin’s.

Tafvelin, S. et al. (2019) ‘Employees’ and line managers’ active involvement in participatory organizational interventions: Examining direct, reversed, and reciprocal effects on well-being’, Stress and Health, 35(1), pp. 69–80. doi: 10.1002/smi.2841.

Tappura, S., Nenonen, N. and Kivistö-Rahnasto, J. (2017) ‘Managers’ viewpoint on factors influencing their commitment to safety: An empirical investigation in five Finnish industrial organisations’, Safety Science, 96, pp. 52–61. doi: 10.1016/j.ssci.2017.03.007.

Taylor, J. A. et al. (2019) ‘Development and validation of the fire service safety climate scale’, Safety Science, 118, pp. 126–144. doi: 10.1016/j.ssci.2019.05.007.

Tharaldsen, J. E., Mearns, K. J. and Knudsen, K. (2010) ‘Perspectives on safety: The impact of group membership, work factors and trust on safety performance in UK and Norwegian

drilling company employees', Safety Science, 48(8), pp. 1062–1072. doi: 10.1016/j.ssci.2009.06.003.

Thomas, E. C., du Plessis, M. and Thomas, K. G. F. (2020) 'An evaluation of job crafting as an intervention aimed at improving work engagement', SA Journal of Industrial Psychology, 46, pp. 1–12. doi: 10.4102/sajip.v46i0.1703.

Thoroman, B., Goode, N. and Salmon, P. (2018) 'System thinking applied to near misses: a review of industry-wide near miss reporting systems', Theoretical Issues in Ergonomics Science, 19(6), pp. 712–737. doi: 10.1080/1463922X.2018.1484527.

Thorp, J. et al. (2012) 'Workplace engagement and workers' compensation claims as predictors for patient safety culture', Journal of Patient Safety, 8(4), pp. 194–201. doi: 10.1097/PTS.0b013e3182699942.

Tims, M., Bakker, A. B. and Xanthopoulou, D. (2011) 'Do transformational leaders enhance their followers' daily work engagement?', The Leadership Quarterly, 22(1), pp. 121–131. doi: 10.1016/j.leaqua.2010.12.011.

Totterdell, P. et al. (1995) 'Recovery From Work Shifts: How Long Does It Take?', Article in Journal of Applied Psychology, 80(1), pp. 43–57. doi: 10.1037/0021-9010.80.1.43.

Townsend, A. S. (2016) Safety Can't Be Measured: An evidence-based approach to improving risk reduction. London, UK: Routledge. doi: 10.4324/9781315607474.

Trinchero, E., Farr-Wharton, B. and Brunetto, Y. (2019) 'A social exchange perspective for achieving safety culture in healthcare organizations', International Journal of Public Sector Management, 32(2), pp. 142–156. doi: 10.1108/IJPSM-06-2017-0168.

Truss, C. et al. (eds) (2014) Employee engagement in theory and practice. London, UK: Routledge. doi: 10.4324/9780203076965.

Tsuno, K. et al. (2009) 'Intragroup and intergroup conflict at work, psychological distress, and work engagement in a sample of employees in Japan', Industrial Health, 47(6), pp. 640–648. doi: 10.2486/indhealth.47.640.

Turner, D. W. I. (2010) 'Qualitative Interview Design: A Practical Guide for Novice Investigators', Qualitative Report, 15(3), pp. 754–760. doi: . https://doi.org/10.46743/2160-3715/2010.1178.

Turner, J. A. (2017) How is Safety-II Being Applied in Practice and is it Working? East Carolina University. Available at: https://pdfs.semanticscholar.org/8747/dbaa7e22826c3ceef2b5554ca21737ad245a.pdf (Accessed: 29 August 2019).

Vance, R. J. (2006) 'Employee engagement and commitment: A guide to understanding, measuring and increasing engagement in your organization.', SHRM Foundation's Effective Practice Guidelines, pp. 1–53. Available at: www.shrm.org/foundation. (Accessed: 10 August 2019).

Vera, M., Salanova, M. and Lorente, L. (2012) 'The predicting role of self-efficacyin the Job Demands-Resources Model: A longitudinal study', Estudios de Psicología, 33(2), pp. 167–178. doi: 10.1174/021093912800676439.

Victor, J. and Hoole, C. (2017) 'The influence of organisational rewards on workplace trust and work engagement', SA Journal of Human Resource Management, 15(0), p. a853. doi: 10.4102/sajhrm.v15i0.853.

Vignoli, M. (2018) 'The Role of Safety Training and Safety Leadership in Determining Safety Organisational Citizenship Behaviours', Chemical Engineering Transactions, 67, pp. 331–336. doi: 10.3303/CET1867056.

Vîrgă, D., Maricuţoiu, L. P. and Iancu, A. (2019) 'The efficacy of work engagement interventions: A meta-analysis of controlled trials', Current Psychology, Advance on. doi: 10.1007/s12144-019-00438-z.

de Waal, J. J. and Pienaar, J. (2013) 'Towards understanding causality between work engagement and psychological capital', SA Journal of Industrial Psychology, 39(2 SPL), pp. 1–10. doi: 10.4102/sajip.v39i2.1113.

Wachter, J. K. and Yorio, P. L. (2014) 'A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation', Accident Analysis & Prevention, 68, pp. 117–130. doi: 10.1016/j.aap.2013.07.029.

Waefler, T., Nisoli, G. and Gugerli, R. (2019) 'Measure evaluation tool MET: Promoting safety by optimizing the human scope of action', Advances in Intelligent Systems and Computing, 791, pp. 24–34. doi: 10.1007/978-3-319-94589-7_3.

Wahl, A., Kongsvik, T. and Antonsen, S. (2020) 'Balancing Safety I and Safety II: Learning to manage performance variability at sea using simulator-based training', Reliability Engineering and System Safety, 195(March 2019), p. 106698. doi: 10.1016/j.ress.2019.106698.

Wang, D.-S. and Hsieh, C. C. (2013) 'The effect of authentic leadership on employee trust and employee engagement', Social Behavior and Personality, 41(4), pp. 613–624. doi: 10.2224/sbp.2013.41.4.613.

Wang, H., Lu, C. and Siu, O. L. (2014) 'Job Insecurity and Job Performance: The Moderating Role of Organizational Justice and the Mediating Role of Work Engagement', Journal of Applied Psychology, Advance on. doi: http://dx.doi.org/10.1037/a0038330.

Weber, R. (2004) 'Editor's Comments: The Rhetoric of Positivism versus Interpretivism: A Personal View', Management Information Systems Quaterly, 28(1), pp. iii–xii. doi: https://doi.org/10.2307/25148621.

Webster, J. and Watson, R. T. (2002) 'Analyzing the Past to Prepare for the Future: Writing a Literature Review', MIS Quarterly - Management Information Systems, 26(2), pp. xiii–xxiii. doi: 10.1.1.104.6570.

Weigl, M. et al. (2010) 'Work engagement accumulation of task, social, personal resources: A three-wave structural equation model', Journal of Vocational Behavior, 77(1), pp. 140–153. doi: 10.1016/J.JVB.2010.03.002.

West, M. A. and Dawson, J. F. (2012) Employee engagement and NHS performance, The King's Fund. London, UK. Available at: https://pdfs.semanticscholar.org/7f50/37858ee5ce44cd71c4ea1b2135994f58b2c3.pdf (Accessed: 11 June 2018).

Węziak-Białowolska, D., Białowolski, P. and McNeely, E. (2019) 'Worker's well-being. Evidence from the apparel industry in Mexico', Intelligent Buildings International, 11(3–4), pp. 158–177. doi: 10.1080/17508975.2019.1618785.

Whitford, T. and Moss, S. A. (2009) 'Transformational Leadership in Distributed Work Groups: The Moderating Role of Follower Regulatory Focus and Goal Orientation', Communication Research, 36(6), pp. 810–837. doi: 10.1177/0093650209346800.

Wiegmann, D. A. et al. (2004) 'Safety culture: An integrative review', International Journal of Aviation Psychology, pp. 117–134. doi: 10.1207/s15327108ijap1402_1.

Wiegmann, D. A. and Von Thaden, T. L. (2002) 'Safety Culture: A Concept in Chaos?', in Proceedings of the 46th Annual Meeting of the Human Factors and Ergonomics Society. Santa Monica, US: Human Factors and Ergonomics Society. doi: 10.1177/154193120204601520.

Wiezer, N., Bakhuys Roozeboom, M. and Oprins, E. (2013) 'Serious gaming used as management intervention to prevent work-related stress and raise work-engagement among workers', Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 8026 LNCS(PART 2), pp. 149–158. doi: 10.1007/978-3-642-39182-8_18.

Van Wingerden, J., Derks, D. and Bakker, A. B. (2017) 'The Impact of Personal Resources and Job Crafting Interventions on Work Engagement and Performance', Human Resource Management, 56(1), pp. 51–67. doi: 10.1002/hrm.21758.

van Woerkom, M., Oerlemans, W. and Bakker, A. B. (2016) 'Strengths use and work engagement: a weekly diary study', European Journal of Work and Organizational Psychology, 25(3), pp. 384–397. doi: 10.1080/1359432X.2015.1089862.

Van Wyk, S. M. et al. (2016) 'The psychometric properties of a workplace boredom scale (DUBS) within the South African context', SA Journal of Industrial Psychology, 42(1), pp. 1–10. doi: 10.4102/sajip.v42i1.1326.

Xanthopoulou, D. et al. (2008) 'Working in the Sky: A Diary Study on Work Engagement Among Flight Attendants', Journal of Occupational Health Psychology, 13(4), pp. 345–356. doi: 10.1037/1076-8998.13.4.345.

Xanthopoulou, D. et al. (2009) 'Reciprocal relationships between job resources, personal resources, and work engagement', Journal of Vocational Behavior, 74, pp. 235–244. doi: 10.1016/j.jvb.2008.11.003.

Xanthopoulou, D. and Demerouti, E. (2007) 'The Role of Personal Resources in the Job Demands-Resources', International Journal of Stress Management, 14(2), pp. 121–141. doi: 10.1037/1072-5245.14.2.121.

Yang, W. et al. (2018) 'Towards better work in China: mapping the relationships between high-performance work systems, trade unions, and employee well-being', Asia Pacific Journal of Human Resources, 57, pp. 553–576. doi: 10.1111/1744-7941.12205.

Yardley, L. (2007) 'Demonstrating validity in qualitative psychology', Qualitative psychology: A practical guide to research methods, 12(3), pp. 295–296. doi: 10.1017/CBO9781107415324.004.

Young, L. (2006) 'Participatory Action Research (PAR): A research strategy for nursing?', Western Journal of Nursing Research, 28(5), pp. 499–504. doi: 10.1177/0193945906288597.

Yuan, Z., Li, Y. and Tetrick, L. E. (2015) 'Job hindrances, job resources, and safety performance: The mediating role of job engagement', Applied Ergonomics, 51, pp. 163–171. doi: 10.1016/j.apergo.2015.04.021.

Zanko, M. and Dawson, P. (2012) 'Occupational health and safety management in organizations: A review', International Journal of Management Reviews, 14(3), pp. 328–344. doi: https://doi.org/10.1111/j.1468-2370.2011.00319.x.

Zohar, D. (1980) 'Safety climate in industrial organizations: Theoretical and applied implications', Journal of Applied Psychology, 65(1), pp. 96–102. doi: 10.1037/0021-9010.65.1.96.

Zohar, D. (2014) 'Safety Climate: Conceptualization, Measurement, and Improvement', in Schneider, B. and Barbera, K. M. (eds) Oxford Handbook of Organizational Climate and Culture. New York, US: Oxford University Press, Incorporated, pp. 444–467. doi: 10.1093/oxfordhb/9780199860715.001.0001.

Zondo, R. W. D. (2020) 'The influence of employee engagement on labour productivity in an automotive assembly organisation in South Africa', South African Journal of Economic and Management Sciences, 23(1), pp. 1–9. doi: 10.4102/sajems.v23i1.3043.

Zwetsloot, G. I. J. M. et al. (2017) ‘The importance of commitment, communication, culture and learning for the implementation of the Zero Accident Vision in 27 companies in Europe’, Safety Science, 96, pp. 22–32. doi: 10.1016/j.ssci.2017.03.001.

X Appendix

X.I Interview Study 1: Ethics Application

X.I.I Application Form (incl. Amendments)

When undertaking a research or enterprise project, Cardiff Met staff and students are obliged to complete this form in order that the ethics implications of that project may be considered.

If the project requires ethics approval from an external agency (e.g. NHS), you will not need to seek additional ethics approval from Cardiff Met. You should however complete Part One of this form and attach a copy of your ethics letter(s) of approval in order that your School has a record of the project.

The document ***Ethics application guidance notes*** will help you complete this form. It is available from the Cardiff Met website. The School or Unit in which you are based may also have produced some guidance documents, please consult your supervisor or School Ethics Coordinator.

Once you have completed the form, sign the declaration and forward to the appropriate person(s) in your School or Unit.

PLEASE NOTE:

Participant recruitment or data collection MUST NOT commence until ethics approval has been obtained.

PART ONE

Name of applicant:	Franziska Homann
Supervisor (if student project):	Dr. Peter Sykes, Dr. Caroline Limbert
School /Unit:	School of Sport and Health Sciences
Student number (if applicable):	ST20144610
Programme enrolled on (if applicable):	10870 MPhil/PhD
Project Title:	Engaging workers in health and safety measures: Increased health, safety and wellbeing performance by worker engagement

Expected start date of data collection:	15/10/201815/10/2018
Approximate duration of data collection:	12 months
Funding Body (if applicable):	KESS (http://kess2.ac.uk/)
Other researcher(s) working on the project:	none
Will the study involve NHS patients or staff?	NoNo
Will the study involve human samples and/or human cell lines?	NoNo

Does your project fall entirely within one of the following categories:	
Paper based, involving only documents in the public domain	NoNo
Laboratory based, not involving human participants or human samples	NoNo

Practice based not involving human participants (eg curatorial, practice audit)	NoNo
Compulsory projects in professional practice (eg Initial Teacher Education)	NoNo
A project for which external approval has been obtained (e.g. NHS)	NoNo
If you have answered YES to any of these questions, expand on your answer in the non-technical summary. No further information regarding your project is required. If you have answered NO to all of these questions, you must complete Part 2 of this form	

In no more than 150 words, give a non-technical summary of the project
Over the past decade, safety research focused mainly on the prevention of safety errors (i.e. Safety-I), and only recently changed to taking humans as proactive resources into

account (Hollnagel, Wears and Braithwaite, 2015). A positively perceived safety culture is found to be positively related to cognitively and emotionally engaged workers, who consequently show increased safety performance outcome (Nahrgang, Morgeson and Hofmann, 2011; Wachter and Yorio, 2014).

Thus, this project aims to explore the critical factors and identify strategies that help to understand worker engagement and dimensions that have a positive impact on health and safety performance and worker wellbeing. This study marks the project's first stage consisting of qualitative semi-structured interviews to identify themes regarding the current safety culture and climate plus health, safety and wellbeing barriers at an automotive plant, to consequently inform the next stage: a mixed-methods approach using qualitative and quantitative studies.

References:

Health and Safety Executive (HSE) (2017) Health and safety at work - Summary statistics for Great Britain 2017. Available at: http://www.hse.gov.uk/statistics/overall/hssh1617.pdf (Accessed: 22 June 2018).

Hollnagel, E., Wears, R. L. and Braithwaite, J. (2015) 'From Safety-I to Safety-II: A White Paper', The resilient health care net: published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia. Available at: https://www.england.nhs.uk/signuptosafety/wp-content/uploads/sites/16/2015/10/safety-1-safety-2-whte-papr.pdf (Accessed: 2 July 2018).

Nahrgang, J. D., Morgeson, F. P. and Hofmann, D. A. (2011) 'Safety at Work: A Meta-Analytic Investigation of the Link Between Job Demands, Job Resources, Burnout, Engagement, and Safety Outcomes', Journal of Applied Psychology, 96(1), pp. 71–94. doi: 10.1037/a0021484.

Wachter, J. K. and Yorio, P. L. (2014) 'A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation', Accident Analysis and Prevention, 68, pp. 117–130. doi: 10.1016/j.aap.2013.07.029.

DECLARATION: **I confirm that this project conforms with the Cardiff Met Research Governance Framework** **I confirm that I will abide by the Cardiff Met requirements regarding confidentiality and anonymity when conducting this project.** **STUDENTS: I confirm that I will not disclose any information about this project without the prior approval of my supervisor.**	
Signature of the applicant:	Date:
FOR STUDENT PROJECTS ONLY	
Name of supervisor: Dr. Peter Sykes Dr Caroline Limbert	Date:
Signature of supervisor:	

Research Ethics Committee use only	
Decision reached:	Project approved ☐ Project approved in principle ☐ Decision deferred ☐ Project not approved ☐ Project rejected ☐
Project reference number: Click here to enter text.	
Name: Click here to enter text.	Date: Click here to enter a date.
Signature:	
Details of any conditions upon which approval is dependant: Click here to enter text.	

PART TWO

A RESEARCH DESIGN	
A1 Will you be using an approved protocol in your project?	NoNo
A2 If yes, please state the name and code of the approved protocol to be used[8]	
n/a	

[8] An Approved Protocol is one which has been approved by Cardiff Met to be used under supervision of designated members of staff; a list of approved protocols can be found on the Cardiff Met website here

A3 Describe the research design to be used in your project
Background: The complete research project consists of four stages in all. In the first stage, qualitative semi structured interviews will be conducted in order to get a first overview of the current safety culture and climate at Ford Bridgend Engine Plant (BEP) as well as current issues and barriers regarding health, safety and wellbeing on all hierarchy levels. The interviews aim to identify themes that have to be taken into account and inform the next stage. This ethic application is for the first stage of this research project, i.e. the semi-structured interviews for a first exploration of the current state of worker engagement as well as health and safety performance and worker wellbeing. **Aim/objectives:** The first stage aims to achieve the following objectives: 1. Objective: Themes that are relevant to explore in terms of the current state of the culture and climate at BEP regarding safety, health and wellbeing are identified. 2. Objective: A first understanding for the current state of BEP's culture and climate as well as workers' engagement regarding safety, health and wellbeing is established. **Research method:** Semi-structured interviews will be conducted. Therefore, an interview guideline for the structured part is constructed (see attachment). Those questions are based on first observations as well as a first initial literature research. The study will be designed confirming to the guidelines used in Interpretative Phenomenological Analysis (IPA). Each interview will take 20-30 minutes. The flexibility will allow to go deeper into topics that seem significant and also give the participant an opportunity to share whatever he/she perceives as relevant.

The participant will get a participant information sheet with all necessary information before starting the interview (see attachment). After reading, the researcher will answer all questions that the participants might have. The participants will be asked to give written consent (see attachment) to participate as well as to the session being recorded. After the session, the participant will be able to request to have the transcript sent to him/her for review and with a clear understanding, that he/she can withdraw any statement made within 2 weeks of the interview.

Sample and sampling:

The research is in cooperation with BEP. Since all participants will be employees of the plant, this can be considered a purposive sample. Since the aim of the study is to identify the themes that are relevant to BEP's current state of culture and climate as well as workers' engagement regarding safety, health and wellbeing, the perfect sample size is reached, when saturation of themes has been reached. To reach saturation, the data collection will be performed iteratively. Keeping IPA in mind, the study will start with a sample size of 8-10 participants. If no new themes and insights occur after those initial number of interviews, the data collection will be considered as saturated. If still new themes arise, the number of participants will be increased until saturation is reached.

In order to gain a comprehensive view and insights from all angles, special attention will be paid to recruiting a broad sample of participants across hierarchical levels, product lines and departments.

Recruitment of participants:

Using the organisational chart of the plant, possible participants will be identified and contacted. The researcher and the project already was introduced to the plant and therefore contacts could be cultivated with most of the management and some shop floor workers. Further, the researcher will present the planned research at the next management meeting, at which she can then also invite the attendants to participate in the study as well as advertise the participation to their teams.

Additionally, posters will be distributed across the plant at popular places for the shop floor workers in order to recruit them to take part in the study (see attachment). **Analytical techniques:** The interviews will be analysed according to the IPA guidelines, generating codes to identify patterns and respectively themes across all data. **Further information:** Some of the conversations during the interview sessions will be recorded using an audio tape recorder. The purpose of the recording is to allow the researcher to capture all the information discussed during the interview, which is important to analyse them later. The recordings will later be transcribed, with all personal information being coded and anonymised. Once the transcription has been completed and checked by the interviewer for accuracy, the audiotape will be erased. All data will be stored in accordance with the Data Protection Act and GDPR. All electronic data can only be accessed with a secure password. For this purpose, encryption software will be used (boxcryptor). Only the researchers, sponsors, regulatory authorities and Research & Development auditors will have access to the data. No employees at BEP will have access to the data or be allowed to read the transcripts to ensure confidentiality. The transcribed data will be filed in a different folder to the consent forms. Meeting rooms are provided to perform the interviews in a safe and undisturbed environment. Yet, each participant can choose where he/she feels most comfortable to conduct the interview and the researcher will try to comply.	
A4 Will the project involve deceptive or covert research?	NoNo

A5 If yes, give a rationale for the use of deceptive or covert research	
n/a	
A6 Will the project have security sensitive implications?	NoNo
A7 If yes, please explain what they are and the measures that are proposed to address them	
n/a	

B PREVIOUS EXPERIENCE
B1 What previous experience of research involving human participants relevant to this project do you have?
The researcher has conducted a Masters projects (2010-2011) using implicit (i.e. IAT) and explicit (i.e. questionnaire) measures and during the masters programme she also conducted research within a project consisting of questionnaires and focus groups. Although, the studies' topics are different to the PhD, it provided the researcher with skills and confidence to conduct the interviews.
B2 **Student project only** What previous experience of research involving human participants relevant to this project does your supervisor have?
The supervisory team has extensive experience of supervising students undertaking this type of research at masters and PhD level. They have also conducted their own research with human participants as part of their own research activities using interview methodology in a workplace environment.

C POTENTIAL RISKS
C1 What potential risks do you foresee?
1. All research will be conducted on site. Even though, most studies will be conducted in a separate area, such as a meeting room, an office or an employee break

area, where no heavy machinery will be handled, some interviews and observations may be carried out while employees are on the job for their convenience. This means, that the interviews may take place in a running production environment with heavy machinery, where extra safety protection policies may have to be taken into account as well as extra attention has to be paid to those potentially dangerous machinery.

2. Personal data as well as commercially sensitive information will be handled. The security and privacy for personal data and sensitive information has to be secured. Yet, the risk of breaches of confidentiality may arise.

3. Participants may develop feelings of distress or upset during the interview. Further, they may get offensive or violent to the researcher.

C2 How will you deal with the potential risks?

1. Interviews and observations while on the job will be kept to a minimum. During those sessions, naturally all health and safety regulations will be followed and extra attention will be paid to possible challenging situations, such as being close to moving vehicles or other machinery.

2. Before taking part in the study, participants will be informed in detail about factors relevant to the study. This will enable them to give informed consent to participate and be aware of their risks and rights. Further, each participant will be given the opportunity to review the transcript of their interview and can redact any statement in it or withdraw from the study at that point.

On the same note, a confidentiality agreement between the researcher and Ford was signed.

Regarding the security of data, the recorded conversation will be transcribed. All information will be coded and anonymised. Once the transcription has been completed and checked by the interviewer for accuracy, the audiotape will be erased. The information that was collected as paper copies will be digitalised and all electronic data can only be accessed with a secure password using an encryption provider (boxcryptor). Only the researchers, sponsors, regulatory authorities and Research & Development auditors will

have access to the data. This means, no employees at BEP will have access to the data or be allowed to read the transcripts to ensure confidentiality.

3. This risk is unlikely, since the questions asked are designed to be neither personal nor offensive. Yet, the researcher will always clearly communicate to a colleague where she will be with whom for how long. Further, the participant information form will contain a link to a helpline in case the participant will feel upset during or after the interview. Participants will be made aware that they can withdraw from taking part in the interview at any time and there will be no pressure to talk about anything they are not comfortable discussing.

When submitting your application you **MUST** attach a copy of the following:

- All information sheets
- Consent/assent form(s)

An exemplar information sheet and participant consent form are available from the Research section of the Cardiff Met website.

X.I.II Participant Information Sheet

Participant Information Sheet

Reference Number: PGR-57

Engaging workers in health and safety measures: Increased health, safety and wellbeing performance by worker engagement

Information Sheet

What is this all about?

This project aims to explore the critical factors as well as identify strategies and interventions that help to understand worker engagement and dimensions that are known to have a positive impact on health and safety performance and worker wellbeing.

That means, we are keen to try to understand what your current concerns and barriers regarding health and safety measures are, what is working well and what are the strengths/benefits of working at Ford Bridgend Engine Plant (BEP) as well as what you need to be able to proactively support BEP in creating a safer and healthier work environment for you and your colleagues.

For this purpose, this research is conducted in several stages. In this first stage, in order to get an overview of the current safety culture and climate at BEP as well as current issues and barriers regarding health, safety and wellbeing on all hierarchy levels, semi structured interviews will be conducted. The interviews aim to identify themes that will inform the next stage of the research.

This study focuses on the first stage of a larger Research project project based at Cardiff Metropolitan University. The results of this research will be presented to BEP management and might also be published. However, all personal data, statements or other information will be kept protected and anonymised.

Why were you asked to participate?

You are invited to take part in this research project because the aim of it is to benefit you and your colleagues and therefore, we need your insights and experience. Taking part in an interview will give you an opportunity to have your opinions heard and taken into account.

Your participation is entirely voluntary and it is up to you to decide whether or not to take part. If you decide not to take part, there will be no penalty and nobody at BEP will know who has taken part and who has not.

What will happen if you volunteer?

If you agree to take part in this research project, the following will happen:

We will describe to you what we are aiming to explore in this study and go through this information sheet with you. We will then ask you to sign a consent form to show you have agreed to take part. You are free to withdraw at any time or you can refuse to answer any question which you feel uncomfortable with, without giving a reason.

depending on what you feel more comfortable with, the conversations during the interviews session will either be recorded using an audio tape recorder or handwritten notes will be made. The purpose of the recording is to allow the researcher to capture all the information discussed during the interview, which is important for them to analyse later.

So, what does the study consist of?

If you agree to participate, you will take part in an interview with the researcher.

During this conversation, you will be asked open questions related to your opinion of and experiences with the current health and safety climate and performance. The interview will take about 20-30 minutes.

Are there any risks?

The interview asks very broad open questions, so it is unlikely that there will be any risks involved. However, if you do feel upset or sensitive about any of the issues discussed, you do not have to talk about them and if you wish, you can withdraw from the interview at any time.

Taking part is not expected to cause any discomfort or distress. If you do experience feelings of upset or distress following the interview, you can access emotional or practical support and advice from the following source:

MindInfoline: 0300 123 3393

https://www.mind.org.uk/information-support/helplines/

What happens to the results?

The results of the interviews will be used to design a questionnaire to explore the current state of BEP workers' engagement as well as health and safety performance and wellbeing. The results will be presented to management and might be published in relevant journals. A summary of the results will be communicated to you.

However, you will not be identified in any report, publications or presentation, all personal information will be anonymised and coded. Direct quotes from the interviews may be used in reports and publications; however, the quotes will be anonymised to ensure that you cannot be identified.

Are there any benefits from taking care?

Yes, you will have the opportunity to actively drive change within BEP and help create a healthier and safer working environment for you and your colleagues.

What happens next?

You will be given a consent form to confirm your permission to take part. If you are willing to take part, we need this form signed before we start. A copy of the consent form as well as of this information sheet will be given to you for your records.

How do we make sure your privacy and data is protected?

Everyone working on this study will respect your privacy. We have taken very careful steps to make sure that you cannot be identified from any of the information that you give us.

In case of recordings, the recorded conversation will be transcribed. Only the interviewer will have access to the audiotape. All information will be coded and anonymised. Once the transcript has been completed and checked by the interviewer for accuracy, the audiotape will be erased. The same applies to handwritten notes.

The information we collect as paper copies will be digitalised and all electronic data can only be accessed with a secure password. Only the researchers, sponsors, regulatory authorities and Research & Development auditors will have access to the data. This means, no employees at BEP will have access to the data or be allowed to read the transcripts to ensure confidentiality

The data we collect will be used only for the purpose of this research. The transcripts will be kept for ten years because we are required to do so by the University.

All information which is collected about you during the course of the research will be kept strictly confidential, and any information about you will have your name, telephone and address removed so that you cannot be recognised.

Further information:

If you have any questions about the research or how we intend to conduct the study, please do not hesitate to contact us either directly when you see us on site, via mail or leave a note in CardiffMet-project box next to the safety office.

Franziska Homann

PhD student at Cardiff Metropolitan University

frhomann@cardiffmet.ac.uk

Dr. Peter Sykes

Associate Dean (Enterprise and Innovation)

PSykes@cardiffmet.ac.uk

X.I.III Participant Consent Form

PARTICIPANT CONSENT FORM

Reference Number: # PGR-57

Title of Project: Engaging workers in health and safety measures: Increased health, safety and well-being performance by worker engagement

Name of Researcher: Franziska Homann

Participant name or Study ID Number:

_____

Participant to complete this section: Please initial each box.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. ☐

3. I agree to take part in the study described in the information sheet. ☐

4. I agree to the study being audio recorded. ☐

5.

6. I agree to the use of anonymised quotes in publications.

_____ _____

Signature of Participant Date

_____ _____

Name of person taking consent Date

_____

Signature of person taking consent

** When completed, 1 copy for participant and 1 copy for researcher site file.*

X.II Interview Study 1: Final Interview Guide

In the end, the following questions and probes/follow-ups were developed:

1. Ramp-up

    1.1. How long have you been working at Bridgend Engine Plant (BEP)?

    1.2. In what line and role are you working?

    1.3. What is your favourite thing about working at BEP?

    - Why?

    1.4. What is your least favourite thing about working at BEP?

    - Why?

2. Health and Safety at BEP

    2.1. H&S in general

    2.1.1. Tell me about Health and Safety (H&S) here at BEP.

    2.1.2. What factors encourage you to engage in H&S practice?

    2.1.3. Why do you think some people don't follow the H&S guidelines?

    - Can you give examples?

    - What in your opinion would benefit their H&S engagement?

    2.1.4. Do you feel safe at BEP?

    2.1.5. Do you feel that BEP is “taking care” of its employees?

    - In what way? Can you give an example?

    - If not, can you give examples?

    2.2. Communication

    2.2.1. When you first started at BEP, how did you learn about all H&S related topics?

2.2.2. In what way are you being informed about H&S policies, etc.?

2.2.3. How does communication at BEP work?

- How are H&S documents used?
- How are H&S documents communicated?

2.2.4. How are H&S documents developed?

- What works very well regarding H&S communication?
- What room for improvement do you see at H&S communication?

3. Safety audits

3.1. For safety engineers/managers:

3.1.1. How do you feel about taking safety walks/audits?

3.1.2. What is your main focus when walking around or inspecting a site?

3.1.3. How do you feel you are being perceived while on a safety walk/audit?

3.1.4. If you had the power, what would you like to change?

- About the approach?
- About the perception and attitudes?

3.2. For shop floor workers:

3.2.1. How does it make you feel when you are being inspected throughout a safety walk/audit?

3.2.2. If you had the power, what would you like to change?

- About the approach?
- About the perception and attitudes?

4. H&S support

4.1. What do you need to make work more safely and take better care of yours and your co-worker's health?

- From management?
- From H&S team?

4.2. If you were in charge of H&S at BEP and your aim was to engage the worker's in H&S and consequently wellbeing, what would you change?

4.3. Is there anything else, you would like to share with me?

- Any recommendations?
- Ideas?
- Relevant anecdotes?

X.III Interview Study 1: Recruitment Details

The participants were recruited as follows:

- Recruiting Management and (tariff and hourly-paid) union: Management as well as (tariff and hourly-paid) union representatives were approached through a presentation about the project in general and the upcoming interviews in particular in the monthly H&S meeting. They were asked to participate themselves and also distribute the information about the interviews to their teams in order to animate them to take part. They were then again contacted through a mail asking for a timeslot to have the interview. When no response was given or the designated interview timeslot was missed, another reminder was sent out by the researcher. Overall, management was happy to take part.
- Recruiting H&S department: The H&S department team members were randomly asked by the researcher if they fancied taking part in the interviews. No more effort was needed, as they were all keen to join.
- Engineers: They were addressed through direct contact with the researcher, who, in a personal conversation, introduced them to the project, process and asked them if they were willing to take part in the research.
- Recruiting shop floor: Shop floor workers were, as aforementioned, firstly addressed through their supervisors. At the same time, posters and screens all over the plant were displayed, giving information about the interviews and the need for participants (see Figure 22).

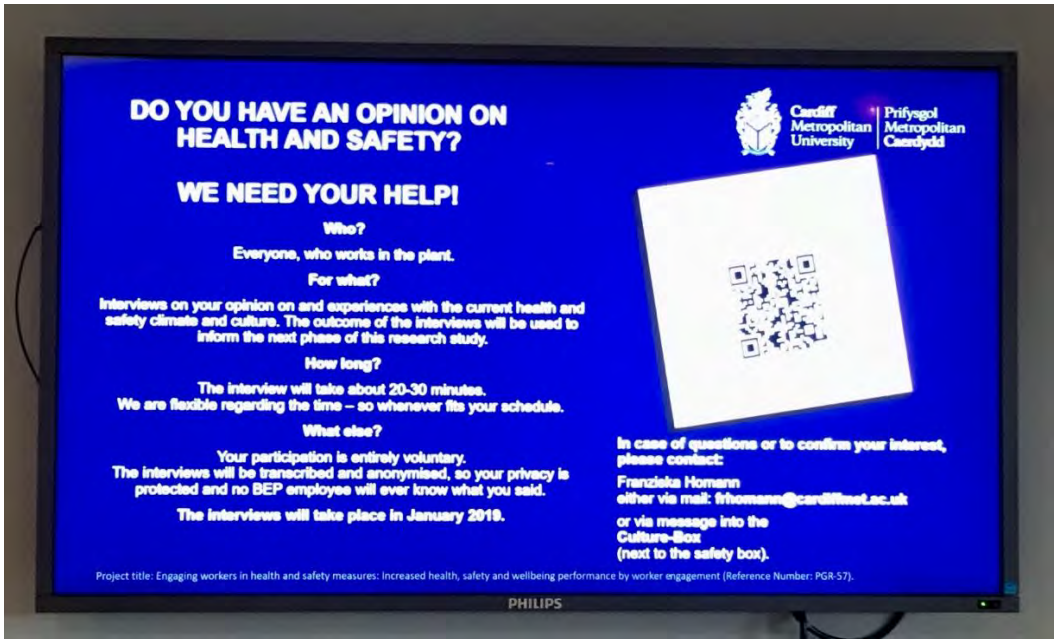


Figure 22: Recruiting Shop Floor Workers for Interviews (Screen)

As this approach proved to be ineffective, the researcher changed to a more personal and hands-on approach with the assistance of an H&S employee. It was considered, that being seen with an H&S employee may lead to the wrong and potentially harmful association. It appears, that the H&S department does not have the best reputation among the workers and is also associated with management. Workers tend to be less willing to join if they feel that the information may be shared with their superiors. Considering this risk, the most well-liked by the workers and seen-as-approachable H&S employee was chosen to accompany the researcher and introduce her to the employees around the plant. First, the supervisors of the area and shift were approached and informed about the project and asked for their support, as they have to give their workers time off to take part in the interviews. Following, at break time, the researcher went to the break areas and introduced herself to the workers, explained her project as well as the need for volunteers and left some cookies as well as information leaflets for the workers (see Figure 23). Through this approach, the awareness was raised for the project, and volunteers came forward either right there and then or afterwards via mail.

Figure 23: Recruiting Shop Floor Workers For Interviews (Cookies)

The challenges experienced with recruiting in a running plant site under the specific circumstances were presented as a poster on the ‘BPS Conference of Qualitative Methods in Psychology & History & Philosophy of Psychology’, 3-5 July 2019 in Cardiff, Wales. The final poster can be seen in Figure 24.

Figure 24: Poster Presented on the BPS Conference

X.IV Interview Study 1: Template Analysis Details Initial Template Participants

After screening all thirty-eight audio records, interviews were picked for transcription that seemed to offer deepest detail on themes and, at to a peripheral degree, give a cross-selection of the overall sample, thus a balanced number of each H&S dimension (i.e. areas and departments as well as hierarchy levels and length of employment to BEP).

This led to the transcription of ten interviews, of which one interview contained a group interview involving three participants. Therefore, the number of transcribed participants is twelve. The detailed demographics of those participants can be seen in Table 32 to Table 35.

Table 32: Interviews - Transcribed - Participants Across Areas

Area	**Count**
PLA	6
PLB	4
general	2
Total	12

Table 33: Interviews - Transcribed - Participants Across Tenure

Tenure	**Count**
1-9	3
10-19	4
20+	5
Total	12

Table 34: Interviews - Transcribed - Participants Across Role Level

Role level	**Count**
Shop floor	8
H&S	2
Management	2
Total	12

Table 35: Interviews - Transcribed - Participants Across the Shop Floor

Shop floor role	**Count**
Machining	4
Assembly	4
Total	8

X.V Interview Study 1: Transcription Guidelines

Transcription means the process of transforming the verbal and non-verbal elements into the written word. This includes writing both, what is spoken but also the non-verbal elements e.g. nervous laughter, coughing or breaks. In order to analyse the interviews effectively, it was imperative to transcribe the interviews accurately.

While in academia there is agreement that no transcription process is neutral (Baker, 2006), different bias may be limited through the systematic use of a transcription system. Nonetheless, with spoken and written language having significant differences, such as no punctuations but pauses, pace and volume only present in spoken, a transcript can only be a 'selective arrangement' (Sandelowski, 1994, p. 311), since it is the product of interaction and translation between participant, recording and researcher (Braun and Clarke, 2013).

All interviews were recorded, and the interviews considered in the initial template transcribed by the researcher, enabling the researcher to become immersed in the data. Already while interviewing or transcribing, certain codes or ideas were noted down, so impulse ideas did not get lost in the process. Nevertheless, in qualitative research, there is always the risk of errors as neither interviewing nor transcription or analysis can ever be neutral (Braun and Clarke, 2013).

In this case, the transcription was done orthographically (Hayes, 2012) using a practical approach. The use of a transcription notation system ensures the transcription of the spoken word into written form is consistent and thorough. In TemA the detail provided by the Jefferson's system (2014) is not needed and the system should be amended to the researcher's needs (King, Brooks and Tabari, 2017). Further, Braun and Clarke (2013) recommended adopting as many of the verbal and non-semantic (i.e. uhm, mm-mh, etc.) properties of the spoken word as possible. This includes errors (.e.g. sentence structure, grammatical, etc.), stutters (e.g. I I I I I wasn't sure) and vernacular/slang terms (e.g. when "can't" was said, not changing it to "cannot"). They emphasise taking care with punctuation, so as to avoid changing meaning to the spoken word. However, this research is focused on the themes, as opposed to emotional reactions, i.e. what was said instead of how it was said. Therefore, a routine transcription (Sparkes and Smith, 2014) was adopted and contextual information as

well as semantic errors, such as stutters, repetitions and filler words/sounds, were only included, if relevant to understanding the meaning of the spoken word. However, recordings of the interviews were archived, therefore independent assessment and analysation of the verbal and non-verbal responses can be conducted for verification purposes (Mays and Pope, 1995).

Consequently, the following transcription guidelines (see Table 36) were used:

Table 36: Used transcription notation system (adapted from Jefferson (2014))

Feature/characteristic	**Explanation and notation in transcript**
Identity of speaker	The speaker's name is signalled at the beginning of each speaking part. Speakers are being introduced as "Px" (i.e. participant x), x stands for the number and the researcher is signalled as "R" (e.g. Participant 5 is signalled by P5). A new line is used for each speaker switch.
Start and end times	At the beginning of each speaking part, in the first line, information was given on where this audio part can be found in the recording, noting the exact start and end time.
Non-sematic utterance	Non-semantic sounds were mostly ignored. This includes affirmational noises or words by the researcher that were made in order to confirm listening or understanding during a monologue of the participant. All relevant non-verbal sounds, interruptions, spoken errors and alike were only signalled, when relevant to understanding the context of the content. The phonetically common non-verbal/non-semantic utterance, such as "uhm", "ahm", "hm-mh", was spelt out trying to capture the phonetic sounds in letters
Interruptions, overlapping speech	When two people were talking at the same time, those interruptions were marked with a "//" at the start of the overlap.

Pauses	When important to understanding the context of the content, pauses in speech (e.g. for thinking or taking notes) were signalled using "((…))". "((…))" for a short pause (i.e. not more than 3 seconds) and "((……))" for long pauses.
Non-verbal sounds	When important to understanding the context of the content, non-verbal sounds, such as laughing, coughing, etc., were signalled using ((laughs)), ((coughs)).
Connotations and explanations	When important to understanding the context of the content, background information on connotation or other background information/explanation are given by the researcher using square brackets (e.g. [sarcastic, sad voice]. This was also used for giving information on when parts of the audio file were not transcribed because for example another person entered the room, and the interview was interrupted.
Unrelated talk	In the case in the recording the conversation drifted into unrelated topics or personal conversations about topics that were deemed irrelevant were not translated. Information about the left-out parts are shown in square brackets (e.g. [chatting about set up of the microphone]. If in the middle of the interview the topic drifted of, e.g. about the researcher's home country and what areas there are worth a trip, those parts were additionally highlighted with three dots in square brackets (e.g. [[…] conversation about researcher's home country]).
Undecipherable words, unclear speaking	In case it could not be understood at all what was said, the part unclear is signalled as "((unclear))". If the researcher was not sure, if she understood right, those words were signalled as "((unclear, maybe "xxx"))".
Irrelevant sounds or words/speech	All other sounds, conversations etc, that are not directly relevant or important to the research, e.g. chitchat before the interview

	or mumbling something to oneself are signalled as e.g. ((chit-chat before the interview)).
Emphasised words	If a word was particularly highlighted and emphasised within speech, this word was written in capital letters (e.g. “I like my job. I REALLY like my job.”).
Reported speech	If an apparent verbatim report of a direct speech that was conducted outside the current conversation was made, this was signalled by quotes around the respective part (e.g. …and then I said, “I think this is ok.”)

An example of transcription can be seen in Figure 25.

02:19.6 - 02:22.1; R:	What do you think why they do that?
02:22.1 - 02:46.9; P1:	((long inhale)) ahm, ((.... ....)) ((talks to herself: "why do I think they don't"))...probably they think they won't have accidents and also, if I'm brutally honest, if people are having an accident, they know they can put a claim in.
02:46.9 - 02:48.1; R:	Okay.
02:48.1 - 02:51.0; P1:	And you see, you receive a pay-out.

Figure 25: Example Excerpt for Transcription

Each transcript was checked three times and, if necessary, edited for accuracy purposes, with randomised spot tests for quality assessment.

X.VI Interview Study 1: Quality of the Study

In order to demonstrate and ensure the quality of the study, the criteria recommended by Sullivan and Forrester (2019) was followed.

X.VI.IVReflexivity

Being personally involved in the research and the main instrument, the researcher's past experiences, mindset and personal skills does have an impact on the study. As such it is important to be aware of these impacts and reflect on them to minimalise potential impacts.

Overall ethnographic vignettes were reflected upon and naturally apply to this study.

During the interview process, the researcher kept a sporadic reflective diary, in which she noted down all feelings or thoughts related to the interviews (Houghton *et al.*, 2013). On two occasions, strong feelings and personal beliefs which clashed with a participants' mindset were identified.

While these situations challenged the researcher, it also promoted personal growth and learning, with increased self-awareness. Consequently, greater care was taken in interviews to manage the extent of emotion displayed to maintain the relaxed environment without being perceived as judged. Moreover, this increased criticality of judgement to the analysation and interpretation process, through questioning and discussing insights and implications of own perceptions and values in supervision sessions.

X.VI.V Transparency

In order to ensure the quality of the study, a systematic and consistent approach was followed and transparently outlined in this chapter. This includes an explanation of all steps taken and any changes made to traditional procedure with the potential impacts they may have on this research.

To enhance the quality of the data, during the transcription, coding and theme development, the results from each step were discussed detail with the supervisory team to identify blind-spots or inconsistencies. Independent coding or respondent feedback were considered but avoided, as they would have broken the ethical contract made with the participants. Instead, the researcher herself critically and repetitively sample checked the work results at each stage in a test-retest format (i.e. allowing one to two days between tests in order to overcome

memory effect). As discussed previously, while it may not have eliminated all errors and risked researcher bias, internal consistency in error can be assumed. Additionally, detailed information on the undertaken steps and a change history of the codes and themes as well as the coding template was saved and can be seen on request.

Due to ethical considerations, consent forms including personal information of the participants, audio records and detailed transcripts were saved on a secure drive and can only be provided to sponsors, regulatory authorities and Research & Development auditors on request. However, anonymised examples are given within the chapter where appropriate.

X.VI.VICoherence

Internal consistency, i.e. did the research study achieve what it aimed to look at and answer the research question, had to be achieved through coherence (Yardley, 2007).

Closely linked to the aforementioned sub-section 'Transparency and audit trails', throughout the whole research process, a systematic approach was followed and the reasoning for all steps including process adjustments and handling of challenges including the impacts of decisions on the research were critically considered and discussed with the supervisory team and then documented. Thus, coherency was ensured through a reflective and structured study process.

X.VI.VII Trustworthiness and Rigour

To ensure trustworthiness and rigour, it is important to demonstrate a thorough, coherent, transparent and systematic study process, in addition to a critical evaluation of decisions with respect to the study design, conduction, and interpretation of results (Sullivan and Forrester, 2019).

Considering the above, the researcher applied a critical balancing method. This approach required considering both critical and opposing cases in the data when presenting a theme or a view. This challenged the researcher's mindset and focus, since it was ensured that not only cases that fit the researcher's thinking found their way into the report and a critical discussion could emerge.

In addition, the audit trail provided reliability by demonstrating the process and key decisions as well as the underlying reasoning and considered implications. Thus, external researchers can reconstruct and evaluate all decisions made, with the outlined study being critically and systematically conducted, while maintaining the quality of the research.

X.VI.VIII Contribution

This study offers a unique view of the H&S climate and H&S engagement including the relevant motivating factors and consequences within BEP. So far, BEP solemnly worked with quantitative surveys or technical audits in order to gauge H&S climate or performance issues. For the first time, qualitative data was gathered, systematically analysed and interpreted to understand workers' motivations, perceptions, meaning-making as well as explore factors that currently or potentially can benefit or hamper positive H&S engagement and climate.

Additionally, this study provides unique insights into how the BEP H&S climate influenced H&S engagement in workers. The study has also highlighted the challenges that exist within the plant with respect to the difference in perception of H&S compliance and behaviour between managers and shopfloor. It also demonstrated the strong influence that the leader-follower relationship had on climate as well as engagement.

Therefore, this study added to the literature by confirming the factors influencing engagement and climate. However, it identified the leader-follower relationship as the strongest moderator of factors in the context of BEP.

X.VII Interview Study 1: Reflection Examples

Occasion 1: Within one of the first management interviews, the researcher got a strong feeling that the participant just told her what he thought she wanted to hear. While social desirability bias was acknowledged to be a general threat in research and particular in qualitative research where the topic might be personally challenging (i.e. admitting rule-breaking or personal shortcomings), in this particular case the researcher felt strongly that this was the case. The manager reported how very positive and compliant everything runs in his department. Through prompts and examples from other lines, the researcher then tried to motivate the participant to open up, as the researcher knew from observation and experience, that the department did not run as smoothly as the manager displayed it. The researcher realised then, that she felt annoyed by the dialogue and almost a little betrayed as if the participant was purposefully lying to her, which made it harder for her to keep a friendly and casual atmosphere. Luckily, being able to recognise the emotions within the interview and due to her experience in challenging emotional situations, she was able to keep a professional and friendly dialogue (presumably; no reactions to the mood swing could be detected). Later, upon reflection, the researcher had to admit that her reaction was not fair to the participant. Perhaps, he did not feel comfortable enough to share the challenges in his department or other fears kept him from opening up. Therefore, maybe the researcher could have done more to address or ease those fears. Another reason could be that the participant was simply very positive by character and rather sees the positive and likes to ignore the negative. This means that he did not feel that anything in his department may not be up to standard. The researcher made a note to herself to be more accepting of different characters in the future and valuing their insights as accounts on the positives in the plant.

Occasion 2: In another management interview, the researcher was confronted with a manager that showed a very positivist view of the world. He criticised the workers for being lazy and disloyal and showed no understanding of why the workers do not comply with all rules at all times since they are being paid for it and not always follow his orders as a manager. This view strongly clashed with the researcher's mindset that workers are independent-thinking individuals who have positive intentions and generally come to work to make a good job, yet still follow their own values and beliefs which may not always are congruent

with this managers' values and beliefs. To the researcher, it appeared that this manager expected the workers to be life robots who when charged (through salary) just do their job while following the processes without asking questions or having individual emotions. The researcher was surprised to still find this kind of mindset and perceived it as a lack of social intelligence since she generally got to know this manager as a sharp and caring being. On reflection, the researcher again acknowledged that she has to be more open to different mindsets and value the insights considering that this manager was probably not the only one sharing these kinds of beliefs, and thus, might reflect on the culture and climate in the plant.

X.VIII Interview Study 2: Ethics Application

X.VIII.IX Application Form (incl. Amendments)

When undertaking a research or innovation project, Cardiff Met staff and students are obliged to complete this form in order that the ethics implications of that project may be considered.

The document ***Ethics application guidance notes*** will help you complete this form and is available from the Ethics Governance Section of the Cardiff Met website. The School or Unit in which you are based may also have produced some guidance documents which you can access via your supervisor or School Ethics Coordinator.

PLEASE NOTE:

Participant recruitment or data collection MUST NOT commence until ethics approval has been obtained.

This is an addition to the former ethics application. For easier navigation, changes are highlighted in yellow.

PART ONE

1A: GENERAL INFORMATION	
Name of applicant:	Franziska Homann
Supervisor (if student project):	Dr. Peter Sykes, Dr. Caroline Limbert
School /Unit:	School of Sport and Health Sciences
Student number (if applicable):	ST20144610
Programme enrolled on (if applicable):	10870 MPhil/PhD
Project Title:	Engaging workers in health and safety measures: Increased health, safety and wellbeing performance by worker engagement (working title)
Expected start date of data collection:	15/06/2020

Approximate duration of data collection:	3 months
Funding Body (if applicable):	KESS (http://kess2.ac.uk/)
Other researcher(s) working on the project:	none
Will the study involve NHS patients or staff?	No
Will the study involve human samples and/or human cell lines?	No

1B: Does your project fall entirely within one of the following categories:	
Desk based, involving only documents and not involving the collection of data from participants	No
Laboratory based, not involving human participants, human samples, animals or animal derived material	No
Practice based not involving human participants (eg curatorial, practice audit)	No
Answering **YES** to any of these questions indicates that the project does not include any participants and you will not therefore be collecting participant data. If this is the case, please provide a short (150 words) non-technical summary of the project, complete the Declaration at the bottom of the form and forward this form to your School Ethics Committee (or equivalent). No further information regarding your project is required and you do not need to complete any more sections of this form. If you have answered **NO** to all of these questions, please proceed to 1C.	
Non-technical summary of the project:	

Click here to enter text.

1C: Does your project fall entirely within one of the following categories:	
Compulsory projects in professional practice (eg Initial Teacher Education)	No
A project for which NHS approval has been obtained NB If this is the case, please ensure that you submit copies of the following with this form: • any questionnaires to be used • participant consent /asset form and withdrawal form • participant information sheets	No
A project which is not compulsory in professional practice and has gained external ethics approval from a body other than the NHS. NB If this is the case, please ensure that you submit a copy of the approved ethics application with this form.	No
If you have answered **YES** to any of these questions, please provide a short (150 words) non-technical summary of the project and **complete the rest of Part One of this form**. You do not need to complete Part Two. Forward your completed form, along with any additional documents required (as indicated above) to your School Ethics Committee (or equivalent). If you have answered **NO** to all of these questions, please complete the rest of this form including Part Two.	

Non-technical summary of the project:
Click here to enter text.

1D: DATA COLLECTION AND STORAGE
What types of data will you collect or create?
Data will be qualitative and created and collected using video conference call-based interviews
How will you manage access to and security of the data?
All data will be stored in accordance with the Data Protection Act and GDPR. All electronic data will be stored in secure online University OneDrive cloud storage. Only the researchers, sponsors, regulatory authorities and Research & Development auditors will have access to the data. No employees at BEP will have access to the data or be allowed to read the transcripts to ensure confidentiality. The transcribed data will be filed in a different folder to the consent forms. Participants will be informed that they will have the opportunity to change their responses to the interview questions or withdraw from the study at any stage during the interview or up to two weeks following data collection, data will be kept for 10 years, participants will be allowed access to their data up to this time, anonymity will be maintained as names will be coded, with information relating names to codes only held by the lead researcher, and names will not be included in any publication or write up.
Will the data collected be subject to the data retention protocols of any of the following bodies? • Human Tissue Authority (HTA) • Health and Care Research Wales (HCRW) • Applications involving the NHS which will be submitted via IRAS
Yes ☐

For any project which is subject to the data retention protocols of an external body listed, you must develop a data storage plan to be submitted alongside this document for consideration by your School or Unit Ethics Panel.	
No ☒ Please confirm that the data collected will be stored in a manner which complies with Cardiff Met requirements via one of the following statements.	
STATEMENT 1: FOR STUDENTS ON TAUGHT COURSES I confirm that any non-anonymised data related to research participants will only be stored on OneDrive and that all data held elsewhere will be deleted, unless it is anonymised.	☐
STATEMENT 2: FOR STAFF APPLYING ON BEHALF OF STUDENTS ON TAUGHT COURSES I confirm that all students covered by this application are aware of their obligation to ensure that non-anonymised data related to research participants must only be stored on their Cardiff Met student OneDrive account and that all data held elsewhere must be deleted, unless it is anonymised.	☐
STATEMENT 3: FOR RESEARCH STUDENTS AND STAFF I confirm that any non-anonymised data related to research participants will be stored in a secure manner (using a platform such as OneDrive or FigShare) and that all data held elsewhere will be deleted unless it is anonymised.	☒

Signature of the applicant:	Date: 30/05/2020
FOR STUDENT PROJECTS ONLY	
Name of supervisor:	Date: 03/06/2020
Signature of supervisor:	

Research Ethics Committee use only	
Decision reached: Click here to enter text.	
Project reference number: Click here to enter text.	
Name: Click here to enter text.	Date: Click here to enter a date.
Details of any conditions upon which approval is dependant: Click here to enter text.	

PART TWO

If you haven't already done so elsewhere on this form, in the box below, provide a short (150 words), non-technical summary of the project.
Over the past decade, safety research focused mainly on the prevention of safety errors (i.e. Safety-I), and only recently changed to taking humans as proactive resources into account (i.e. Safety-II; Hollnagel, Wears, & Braithwaite, 2015). A positively perceived safety culture is found to be positively related to cognitively and emotionally engaged workers, who consequently show increased safety performance outcome (Nahrgang, Morgeson, & Hofmann, 2011; Wachter & Yorio, 2014). In a previous study, factors that influence health and safety (H&S) engagement in workers in the Ford Bridgend Engine plant were identified. Following, based on the findings and the relevant literature, an intervention idea in the form of a participatory action research ap-

proach was designed. This preliminary study aims to gather feedback from relevant employees on the proposed intervention idea in order to develop the intervention recommendation further. However, implementation is not in scope of this project.

References:

Health and Safety Executive (HSE) (2017) Health and safety at work - Summary statistics for Great Britain 2017. Available at: http://www.hse.gov.uk/statistics/overall/hssh1617.pdf (Accessed: 22 June 2018).

Hollnagel, E., Wears, R. L. and Braithwaite, J. (2015) 'From Safety-I to Safety-II: A White Paper', The resilient health care net: published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia. Available at: https://www.england.nhs.uk/signuptosafety/wp-content/uploads/sites/16/2015/10/safety-1-safety-2-whte-papr.pdf (Accessed: 2 July 2018).

Nahrgang, J. D., Morgeson, F. P. and Hofmann, D. A. (2011) 'Safety at Work: A Meta-Analytic Investigation of the Link Between Job Demands, Job Resources, Burnout, Engagement, and Safety Outcomes', Journal of Applied Psychology, 96(1), pp. 71–94. doi: 10.1037/a0021484.

Wachter, J. K. and Yorio, P. L. (2014) 'A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation', Accident Analysis and Prevention, 68, pp. 117–130. doi: 10.1016/j.aap.2013.07.029.

A RESEARCH DESIGN	
A1 Will you be using an approved protocol in your project?	No
A2 If yes, please state the name and code of the approved protocol to be used[1]	
Click here to enter text.	
A3 Describe the research design to be used in your project	

Summary:

The preliminary study will be conducted to gather feedback from potential participants on the intervention idea with respect to its practicability, acceptability and feasibility. Hereby, the focus is on the proposed intervention idea and its possible implementation. Feedback will be collected through semi-structured interviews via video conferencing call and face-to-face.

Research aim:

Gathering and analysing feedback on the intervention idea with respect to acceptability, practicability and feasibility of the proposed intervention recommendation from the target group to ensure effectiveness of the intervention. Further, gaining insights about possible shortcomings that affect the target group's acceptability of the intervention are aimed to be identified.

Research method and process:

Semi-structured interviews via video conferencing call (i.e. Teams) and fact-to-face will be conducted as it allows the researcher to gather the participants' perceptions and opinions on the whole intervention idea as well as particular parts of it. Furthermore, it allowed the

needed flexibility to adapt to the challenging situation because of the limited availability of participants due to the COVID-19 pandemic as well as the timeframe of the PhD.
Each interview will take 30-40 minutes. The flexibility will allow to go deeper into topics that seem significant and also give the participant an opportunity to share whatever he/she perceives as relevant.
At least a week before the interview, participants will be provided with the following:
a) A participation sheet: The participant will get a participant information sheet with all necessary information before starting the interview (see Appendix). In case of questions, they have the researcher's mail address. It will be highlighted that, after the interview, the participant will be able to request to have the transcript sent to him/her for review and that he/she can withdraw any statement made within 2 weeks of the interview.
b) An intervention idea information handout: Participants will be asked to read the intervention idea information handout before the interview. This document provides the participant, along the participation sheet, with information on how the study will be conducted as well as with the main questions that will be asked during the interview. However, the main part of the document is the detailed description of the intervention idea (see Appendix). The aim is here to give the participant the chance to immerse him-/herself in the topic in his/her own time and therefore, potentially reduce the time of the interviews. The participant therefore has the chance to think about the feasibility and practicability of the intervention up front and note down questions and comments.
c) Link to consent form: After having read the participation sheet (and possibly the intervention idea information handout), so that they can make an informed decision, they are asked to consent to taking part in the study by signing an online consent form (see Appendix B; https://tinyurl.com/interventioninterviewconsent).
After the participant has consented to taking part in the research, a date for the interview will be set.
In the video call session, a brief introduction to the study, the ethical background and the intervention idea will be given to the participant. The depths of the information concerning the intervention idea is dependent on the participants understanding of the handout (i.e. if he/she understood everything, the overview will be more concise then for someone, who reports understanding problems). As an aid, a presentation was prepared (see Appendix)
In case of online interviews, interviews will be recorded using the software within Teams and using an additional audio recorder as backup. In case of face-to-face interviews, recordings will be conducted using an audio recorder. The purpose of the recording is to allow the researcher to capture all the information discussed during the interview, which is important to analyse them later. The recordings will later be transcribed, with all personal information being coded and anonymised. Once the transcription has been completed and checked by the interviewer for accuracy, the videotapes will be erased. The resulting transcription files will be uploaded to a password secure cloud storage.
To ensure the effectivity and efficiency of the interviews in meeting the research aims, two pilot interviews will be conducted in order to test the understandability of the supporting documents as well as the question guide. The feedback from these interviews will be used to improve the supporting materials as well as the question guide before further participants will be recruited.

Interview guide:
The questions in the interview guide were developed based on the seven components of the theoretical framework of acceptability (TFA) by Sekhon et al. (2017) which was developed

following an extensive literature review (n=43) of acceptability interventions in a healthcare setting. While some of the categories reflect on concurrent and retrospective evaluation of intervention acceptability, these were adapted to fit the evaluation of the intervention idea instead of an implemented pilot. In addition, areas that were already mentioned in the literature as challenging (e.g. time for working group sessions during tide production-line schedules as mentioned by Jeschke et al. (2017)) were addressed. The complete chronological order of the questions as well as additional questions concerning the intervention implementation can be found in the interview guide (see Appendix).
On top of that, out of actuality, two questions were added that reflect on the influence of the COVID-19 pandemic on the participants' mindset towards H&S. In the last interviews, many workers expressed that they do not feel cared for by the company. Due to the COVID pandemic, the plant implemented several measures and invested a sustainable amount of money in different measures (e.g. temperature scanners at all entrances) to keep their workers safe from the virus and adhere to the government guidelines. Therefore, it begs the question, if the general view of the workers with respect of 'feeling cared for' has changed or if there is a difference on how they perceive the COVID measures in comparison to the general H&S measures. While these questions are not directly related to the intervention idea, they give valuable insights on how the plant employees perceive different H&S measures, how they change their perception of the company and what makes intervention more accepted than others. Hence, the following two questions were added to the questionnaire:
Tell me about the changes in safe working in the plant since the COVID pandemic?
How do the pandemic related measures make you act or think differently about health and safety?

Sample and sampling:
The research is in cooperation with the Bridgend Engine Plant (BEP). Since all participants will be employees of the plant, this can be considered a purposive sample. In order to gain a comprehensive view and insights from all angles, special attention will be paid to recruiting a broad sample of participants across hierarchical levels, product lines and departments. Therefore, the aim is to recruit 12-15 participants to have a representative sample of the plant (i.e. 1-2 managers, 1 safety professional, 1-2 supervisors, 2-4 assembly line workers, 2-4 machining workers, 1-2 speciality area workers).
Safety professionals within the plant will be used as "study champions" who will talk to workers. These will be briefed in depth beforehand, so they know all details about the study and can answer questions.
In order to still keep anonymity of participants, the "research champions" will be provided with flyer (see Appendix), that entail the most important information about the study as well as the researcher's email. This way, the workers who are interested can contact the researcher directly.
Furthermore, posters (see Appendix) will be hung up in public places throughout the plant to catch the workers attention.
Further, workers attending safety training will be approached by the researcher and asked if they were interested to take part in the study.
As an incentive, a token of their voluntary participation and a recognition of their time invested in the study (i.e. reading the about 3.500 word intervention idea information handout and taking part in the interviews), a £15 amazon voucher by KESS will be given to each participant who completes the interview. After the very limited amount of volunteers in the first few weeks, the plant agreed on offering an additional £25 voucher (that they can spend

on the Terryberry recognition catalogue: https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.terryberry.com%2Fproducts-and-services%2Frecognition-awards%2F&data=02%7C01%7Cfrhomann%40cardiff-met.ac.uk%7C3cc20dad5d984ce48ff508d8272cc9dd%7C189dc61c769b40488b0f6de074bba26c%7C0%7C0%7C637302420599638517&sdata=WVq17WxL919VDK2LfQO8C3AgzRa%2Fkan90nlwYyjkleE%3D&reserved=0) as well as a Reward & Recognition (R&R) certificate for participation in order to promote and encourage participation in the study (see Appendix H).
To triangulate the replies from the plant workers' with other sets of experiences, professionals with extensive experiences in implementing interventions in a production-line setting are to be interviewed. The potential participants of this study part will be identified via professional magazines and recommendations.

Data analysis:
Interviews will be audio recorded and transcribed verbatim. A thematic analysis approach will be adopted to categorise participant responses into themes. Thematic analysis has been chosen, as the study aims to understand the opinions and attitudes of participants with respect to feasibility, practicability and acceptability of the proposed intervention idea, hence thematic analysis of responses is appropriate.

Further information:
The plant agreed on offering each participant 3 hours off the assembly line, so they have time to read the handout and conduct the interview on work hours (see Appendix). Furthermore, BEP will provide meeting rooms with computers for the participants to take part in the interviews in a safe and undisturbed environment (see Appendix). Of course, participants are also free to choose to conduct the videocall from their home in case they have access to a sufficient computer there. Hence, each participant can choose where he/she feels most comfortable to conduct the interview and the researcher will try to comply. Workers can also have the interview face-to-face in a safe and clean meeting room provided by BEP. During the face-to-face interviews, masks must be worn and at least 2m distance must be kept at all times.
The safety office will offer to provide printed versions of the intervention idea information handout and the participation sheet for those participants that prefer to read from paper than a screen.
Three participants were already interviewed under the original ethics agreement. To keep the benefits in participating fair, these will be asked if they would be interested in the additional incentives and if so, if they were willing to re-submit the consent form accordingly (i.e. the added question: agreeing to sharing their name with the safety department and receiving the incentives).

A4 Will the project involve deceptive or covert research?	No
A5 If yes, give a rationale for the use of deceptive or covert research	
Click here to enter text.	
A6 Will the project have security sensitive implications?	No
A7 If yes, please explain what they are and the measures that are proposed to address them	
Click here to enter text.	

B PREVIOUS EXPERIENCE

B1 What previous experience of research involving human participants relevant to this project do you have?
As a PhD student, the researcher has conducted 38 interviews in a former study with BEP employees. This has provided her with in-depth experiences and an understanding of the challenges surrounding interviewing in general and of this particular population. Moreover, the researcher attended several workshops and lectures with respect to qualitative research and in her role as an Hourly Paid Lecturer even lectured Bachelor students in qualitative research methods with a focus on Thematic Analysis. Furthermore, the researcher has conducted a Masters projects (2010-2011) using implicit (i.e. IAT) and explicit (i.e. questionnaire) measures and during the masters programme she also conducted research within a project consisting of questionnaires and focus groups. Although, the studies' topics are different to the PhD, it provided the researcher with skills and confidence to conduct the interviews.
B2 **Student project only** What previous experience of research involving human participants relevant to this project does your supervisor have?
The supervisory team has extensive experience of supervising students undertaking this type of research at masters and PhD level. They have also conducted their own research with human participants as part of their own research activities using interview methodology in a workplace environment.

C POTENTIAL RISKS
C1 What potential risks do you foresee?
1. Risk to participants' rights related to personal information: Personal data as well as (potentially) commercially sensitive information will be handled. The security and privacy for personal data and sensitive information has to be secured. Yet, the risk of breaches of confidentiality may arise. 2. Risk of misrepresentation of participant data: Participants may feel uncomfortable with certain questions or afterwards with answers they provided. 3. Risk of participant fear of repercussion if they choose to not participate in the study: Participants may feel obliged to take part when addressed by the "Research Champion". 4. Similarly, due to the use of "Research Champions", the likelihood of selection bias might be raised, as they might (implicitly or explicitly) select certain participants to talk to. 5. Interviewees feeling uncomfortable/underprepared for the interviews: Participants may develop feelings of distress or upset before or during the interview. Further, they may get offensive or violent to the researcher. 6. Due to the incentives, that BEP provides, the H&S office as well as the respective supervisor need to be informed about who took part in the study in order to issue the voucher and certificate as well as to release the respective employee from the line. This may intimidate certain employees as they fear of repercussion in being known to have taken part in the study. Furthermore, the confidentiality of participation cannot be ensured anymore, since certain individuals within BEP need to know the names of the participants in order to issue the rewards. 7. Bias due to incentives: The use of incentives may alter the participants interest in the study and their motive to take part. 8. Covid-19: Participants and interviewer spreading infection during interviews. 9. Covid-19: Infection from disease while walking on plant site.
C2 How will you deal with the potential risks?

1. To ensure participants' rights of confidentiality is maintained, this research will comply with the Data Protection Act/GDPR (2018) and the Cardiff Metropolitan University research data management policy. Before taking part in the study, participants will be informed in detail about factors relevant to the study through the participation sheet and the handout. This will enable them to give informed consent to participate and be aware of their risks and rights. Further, each participant will be given the opportunity to request review of the transcript of their interview and can redact any statement in it or withdraw from the study at that point.

Regarding the security of data, the recorded conversation will be transcribed. All information will be coded and anonymised. Once the transcription has been completed and checked by the interviewer for accuracy, the audiotape will be erased. All electronic data will be filed on a secure cloud storage and can only be accessed with a secure password. Only the researchers, sponsors, regulatory authorities and Research & Development auditors will have access to the data. This means, no employees at BEP will have access to the data or be allowed to read the transcripts to ensure confidentiality, besides the participant his/her own data.

2. The risk of misrepresenting participant data is low, however, giving participants the opportunity to withdraw their data and allowing participants to change their responses to the questions of the interviews within two weeks following completion will reduce the risk of the misinterpretation of data. Participants will be informed through the participant information sheet that they can request a copy of their transcript for them to review their responses to the questions.

3. Being approached by a "Research Champion" might put (unintendedly) pressure on the individual and it may feel obliged to participate. In order to avoid this, the "Research Champions" were briefed in-depth about how to approach individuals and were sensitised about the pressure they may insert. Furthermore, they were provided with Flyer (Appendix), so that the individuals can contact the researcher directly. This way, the "Research Champions" do not know who ended up taking part in the study and confidentiality can be ensured to a certain degree (exception see risk 6).

4. The "Research Champions" were repeatedly briefed by the researcher. During those briefings, they were sensitised for the matter of selection bias and it was highlighted, that all workers need to be addressed. However, since the nature of the sampling is purposive anyway, a certain selection is necessary. Further, it was decided, that poster will be hung up in popular places in the plant to catch the workers attention, and therefore, increase the likelihood of reaching all workers (Appendix).

5. This risk is unlikely, since the questions asked are designed to be neither personal nor offensive. To ensure the participants of the research feel prepared for the interview, the interview guide, participation form and the handout will be provided to participants alongside the participant consent form at least a week before the interviews. This gives participants the opportunity to ask any questions via email and help them prepare for the interview. Further, the participant information form will contain a link to a helpline in case the participant will feel upset during or after the interview. Participants will be made aware that they can withdraw from taking part in the interview at any time and there will be no pressure to talk about anything they are not comfortable discussing.

6. The likelihood for this risk is very slim, as the study does not tackle a sensitive subject and therefore is unlikely to trigger mockery by other employees. However, the researcher will try to keep the circle of knowing people to as small as possible (namely, the managers, Reece Adams & Neil Davis (for R&R certificate sign-off) and the three safety department

employees (for submitting and giving out R&R certificate) as well as the respective supervisor of the participants (to let him/her off line). Yet, it will be highlighted to them how important it is to guarantee the participants' welfare through confidentiality. While confidentiality of participation cannot be completely granted anymore by the researcher (i.e. the name of the participants will be shared between researcher, safety department in the plant and potentially top-management, university, the confidentiality and anonymity of input (i.e. what the participant shares with the researcher) is still ensured. Additionally, in the consent form, the participant can indicate, that he/she prefers to have his/her data shared with the plant, however then he/she needs to agree to give the £25 voucher, the certificate and the 3 hours time off line a miss and only receive the £15 voucher by KESS.
7. While this risk is likely, the negative consequences are limited. Due to the incentives, individuals who may not have considered taken part might be interested now. This may lead to participants not taking part based on their personal motivation to aid the project but more based on their interest in receiving the incentives. While this might be true, on the positive side, this may open up the sample to more inclusivity as the participants do offer up their time and input. Furthermore, the insights of any individual are valuable, regardless of their motivation.
8. Meeting duration will be kept to a minimum. Eating during the interview is prohibited. Only two people together in a room – 2 m minimum apart. Mask must be worn by both parties. Desk fan use prohibited. Disinfection clean of table, chair, door handle etc. after each session.
9. 2m distance to be kept at all times. Everyone entering the plant to attest that they understand their personal responsibilities.
Number of workers entering the plant at one time reduced by staggered shift start times. Only business essential contractors and visitors are permitted on-site. All employees to be issued with a personal care kit, inclusive of face masks, hand sanitiser and personal thermometer. All people entering the plant to complete a daily health questionnaire. Any failures will not be issued with a badge and will be denied access into plant. Vulnerable categorised or registered employees will be pre-screened by OHD.
All workers to be temperature screened within the carpark or Main Security Lodge - Any person with an elevated temperature to be refused entry into plant. Information & instruction on identified hazards & control measures to be given to workers. Widespread deep cleaning of the plant has occurred to include turnstiles, doors, handles etc. Floor markings in place to define 2m intervals at high footfall areas.

When submitting your application you **MUST** attach a copy of the following:

- All information sheets
- Consent/assent form(s)
- Withdrawal of consent form

An exemplar information sheet, exemplar participant consent form and exemplar participant withdrawal form are available via the research section of the Cardiff Met website (see section on Ethics Governance). These are based on good practice and will be useful in the majority of cases. However, it is recognised that in some cases a project will be subject to requirements from an external body. Use of these exemplars is therefore not obligatory.

X.VIII.X Participant Information Sheet

Participant Information Sheet

Reference Number: PGR-2855

Engaging workers in health and safety measures: Increased health, safety and wellbeing performance by worker engagement

Information Sheet

Thank you for considering taking part in this study.

This study aims to gather feedback from you on an intervention idea that aims to improve the health and safety engagement in the plant. We need your input with respect to its practicability, acceptability and feasibility. Hereby, the focus is on the proposed intervention idea and how it would work in a full-running plant, similar to BEP. Your feedback will be collected through a semi-structured interviews in a video conferencing call or face-to-face.

We would like to ask for a small amount of your time (30-40 min) and invite you to take part in this exciting research study. Before you decide to take part, however, it is important that you understand what the research is for, and what it will involve for you. Please read the following information and do not hesitate to ask any questions about anything that might not be clear to you by contacting the researcher - contact information can be found at the end of this information sheet. Make sure that you are happy before you decide what to do. Thank you for taking the time to consider this invitation to participate in this new study.

What is this all about?

The last interviews in the plant revealed that in order to improve the health and safety engagement in the plant, a future intervention should aim for the workers to feel:

- heard and properly listened as well as taken serious to by management,
- appreciated and recognized for their expertise by management,
- involved and part of decision, as well as genuinely fared for by the company and management.

Thus, the next question in the research was: What exactly do we need to do to improve this? This is where you come in and where I need your help.

Based on the interview findings and the scientific literature an intervention idea was designed. In this study, we would like to present this intervention idea to you and ask for your feedback on it.

The results of the interviews will then be used to improve the intervention idea.

Why were you asked to participate?

You are invited to take part in this research project because the aim of this intervention is to improve the health and safety engagement of workers, hence the intervention should be tailor-made for you as a worker and a plant. Taking part in an interview will give you an opportunity to have your opinions heard and taken into account.

Your participation is entirely voluntary and it is up to you to decide whether or not to take part. If you decide not to take part, there will be no penalty and nobody at the plant will know who has taken part and who has not.

What will happen if you volunteer?

If you agree to take part in this research project, the following will happen:

After reading this participation sheet and answering all your questions, we will ask you to sign a consent form to show that you understood the participation sheet and that you have agreed to take part.

If you choose to take part, you can change your mind at any time and withdraw from the study without need to provide a reason. You can also withdraw any data you have provided for up to two weeks after participation. You can also request a copy of your interview transcript and amend or withdraw any responses you make up to two weeks following the completion of the interview.

For consenting to the research please visit https://tinyurl.com/interventioninterviewconsent and check the required boxes or fill out the paper consent form. As a little thank you for your time, you will also be offered a £15 Amazon voucher after the successful interview conduction for which you can provide your information in the consent sheet. Furthermore, if you agree that your name is shared with the BEP Safety department, then BEP like to offer you as an additional token of gratitude a £25 voucher for the Terryberry Recognition catalogue (https://www.terryberry.com/products-and-services/recognition-awards/) and a Reward and Recognition (R&R) certificate that confirms your participation in this culture project can may enrich your personal CV. In addition, to prepare for and conduct the interview, you can take up to 3 hours off the line in agreement with your supervisor.

After that, the researcher and you will agree on a date for the interview.

To prepare for the interview, please take a quiet moment to read the *Intervention Idea Information Handout*. This will be sent to you by the researcher. It will describe the intervention idea in-depth to you. In case you prefer a paper copy, the safety office can provide you with one. This will be the base for our interview, so please make sure you understand it in detail and potentially make notes on comments. In this document you can also see what questions you will be asked in the interview. If you have any questions regarding the intervention, the study or anything else, please do not hesitate to contact the researcher.

In the interview, the conversations will be recorded using the build-in software or an audio recorder. The purpose of the recording is to allow the researcher to capture all the information discussed during the interview, which is important for her to analyse later.

We foresee interviews taking no longer than 30-40 minutes. If you decide to participate, as said before, you will be given a copy of the questions before the interview, so that you can prepare if you wish to do so.

You can choose where you would feel comfortable to conduct the interview. In case you prefer an online conversation/video call, BEP will provide a meeting room with a computer for you to take part in the interviews in a safe and undisturbed environment. Of course, you are also free to choose to conduct the video call from the comfort of your own home, provided that you have access to a sufficient computer there and a quiet place. If you rather have the interview in person, BEP will provide us with a clean and quite meeting room in which we can talk face-to-face, of course while adhering to the Covid-19 safety measures (e.g. wearing a mask, keeping 2m distance).

Are there any risks?

The interview asks very broad open questions, so it is unlikely that there will be any risks involved. However, if you do feel upset or sensitive about any of the issues discussed, you do not have to talk about them and if you wish, you can withdraw from the interview at any time.

In terms of Covid-19, the risk of infection during the meeting exists. However, all possible measures to keep you and the researcher safe will be adhered to (e.g. wearing masks, keeping 2m distance, cleaning all touched surfaces between participants and providing disinfection spray/gel, etc.).

Taking part is not expected to cause any discomfort or distress. If you do experience feelings of upset or distress following the interview, you can access emotional or practical support and advice from the following source:

MindInfoline: 0300 123 3393

https://www.mind.org.uk/information-support/helplines/

What happens to the results?

The results of the interviews will be used to improve the intervention idea.

Following completion of the study, your responses will be stored securely. The research team will analyse the data and identify overall themes. This will then be written-up as part of a doctoral (PhD) report, and will likely be published in the form of, at least one, if not

more academic journal articles. If you have any questions or queries regarding the study, either before its start, during or after the study has been completed, or if you are interested in learning about the outcomes of the study, then do not hesitate to ask the researchers involved.

However, you will not be identified in any report, publications or presentation, all personal information will be anonymised and coded. Direct quotes from the interviews may be used in reports and publications; however, the quotes will be anonymised to ensure that you cannot be identified.

Are there any benefits from taking part?

Yes, you will have the opportunity to actively drive change within Ford plants as well as help create a healthier and safer working environment for you and your colleagues and potentially in other sectors and plans. Furthermore, you actively help forming this research.

As our way of saying thank you for initially signing-up to the walking project, as well as your support with this new study, we would like to offer all participants a £15 amazon voucher for you to spend as you wish for successfully participating. Furthermore, as mentioned above, if you agree that your name is shared with the BEP Safety department, then BEP like to offer you as an additional token of gratitude a £25 voucher for the Terryberry Recognition catalogue (https://www.terryberry.com/products-and-services/recognition-awards/) and a Reward and Recognition (R&R) certificate that confirms your participation in this culture project can may enrich your personal CV. In addition, to prepare for and conduct the interview, you can take up to 3 hours off the line in agreement with your supervisor.

What happens next?

To consent to the research please visit https://tinyurl.com/interventioninterviewconsent or fill out the paper-based version and check the required boxes to confirm your permission to take part. If you are willing to take part, we need this form confirmed before we start. You can print a copy of the consent form as well as of this information sheet for your records.

How do we make sure your privacy and data are protected?

Everyone working on this study will respect your privacy. We have taken very careful steps to make sure that you cannot be identified from any of the information that you give us.

In case of recordings, the recorded conversation will be transcribed. Only the interviewer will have access to the tape. All information will be coded and anonymised. Once the transcript has been completed and checked by the interviewer for accuracy, the tape will be erased. The same applies to handwritten notes.

The information we collect and all electronic data can only be accessed with a secure password. Only the researchers, sponsors, regulatory authorities and Research and Development auditors will have access to the data. This means, no employees at BEP will have access to the data or be allowed to read the transcripts to ensure confidentiality.

The data we collect will be used only for the purpose of this research project. The transcripts will be kept for ten years because we are required to do so by the University.

All information which is collected about you during the course of the research will be kept strictly anonymous, and any information about you will have your name, telephone and address removed so that you cannot be recognised. The only exception to this is, that in order to receive the £25 voucher and the certificate as well as the 3 hours off line by Ford, we need to share your name with the Safety department. Therefore, the three safety department employees (for submitting and giving out your R&R certificate and the voucher) and the managers, Reece Adams and Neil Davis (for R&R certificate sign-off), as well as the respective supervisor of the participants (to let you off line) will know that you have taken part in the study. However, it can be guaranteed that your confidentiality will be ensured when it comes to anything that will be said during the interviews or that is shared with the researcher in confidence. This information will be anonymised as described above.

If you do not feel comfortable with your name being shared with BEP, you can indicate so on the consent form. However, unfortunately, you cannot receive the £25 catalogue voucher, the certificate and the 3 hours time off line by BEP and instead only receive the £15 voucher by KESS.

This study has been reviewed by the Cardiff Metropolitan University's Research Ethics Committee; all proposed processes and procedures are considered appropriate and granted ethical approval.

Further information:

If you have any questions about the research or how we intend to conduct the study, please do not hesitate to contact us via mail.

Franziska Homann

PhD student at Cardiff Metropolitan University

frhomann@cardiffmet.ac.uk

Dr. Peter Sykes

Associate Dean (Enterprise and Innovation)

PSykes@cardiffmet.ac.uk

Alternatively, if you would like to speak to someone whom is independent of this research study/sport science support service, please email: CSHSRESOFFICE@cardiffmet.ac.uk

X.VIII.XI Consent form

This was provided online using *Qualtrix* (including the voucher details)

PARTICIPANT CONSENT FORM

Reference Number: PGR-2855

Many thanks for participating in this study.

We plan to use your input from the interview to understand how we can better improve our intervention idea aiming to improve the health and safety performance in production plants through worker engagement.

Before taking part, however, it is important that you understand what is involved. Please read the information sheet *by clicking here*. Once you have read the information sheet, please click next below and complete the short survey. If you have any question, please do not hesitate to ask by emailing Franzi Homann (the researcher) via *frhomann@cardiffmet.ac.uk*.

Participant to complete this section: Please check each box

1) I confirm that I have read and understand the information sheet for
the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2) I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

3) I agree to take part in the study.

4) I agree to the interview being recorded.

5) I agree to the use of anonymised quotes in publications.

The following personal information will be kept confidential (see participation sheet for more information).

Please provide us with the following information:

Full name:

I would like to receive a £15 amazon voucher after participation: yes/no

If you would like to receive the voucher, to what mail address should it be sent?

I agree that my name is being shared with the relevant employees within the Ford Bridgend Engine Plant in order to prepare my R&R certificate, £25 catalogue voucher and for me to be released from my job for up to 3 hours in order to prepare for and conduct the interview. Please note, that "yes" means, that you agree to share your name in exchange for the rewards. If you do not feel comfortable with the plant's representatives knowing, choose "no". Then, you can still receive the £15 amazon voucher and the researcher will not share your name with the plant: yes/no

What is your role?

- ○ Assembly line worker
- ○ Machining worker
- ○ Team Leader - Assembly
- ○ Team Leader - Machining
- ○ Supervisor - Assembly
- ○ Supervisor Machining
- ○ Manager
- ○ H&S professional
- ○ Other (please specify)

For what department do you work: Dragon/AJ/Sigma /Other (please specify)

For how long have you worked for Ford?

X.VIII.XII Flyer/Poster for Recruitment/Information for Potential BEP Participants

Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd

WE NEED YOUR HELP!

Who?

Everyone, who works in the plant.

For what?

Interviews on your opinion on an intervention idea to improve the health and safety engagement in a plant like BEP.

How long?

The interview will take about 30-40 minutes.
We are flexible regarding the time - so whenever fits your schedule.

What else?

Your participation is entirely voluntary.
The interviews will be transcribed and anonymized, so your privacy is protected and no BEP employee will ever know what you said.

You need to prepare for the interviews by reading an information handout upfront (about 3.500 words).

The interviews will be held via video conferencing tool on a computer, so physical distancing will be ensured. Ford can provide you with the equipment.

As our way of saying thank, we would like to offer all participants a £15 amazon voucher for you to spend as you wish for successfully participating in this study.

The interviews will take place as soon as possible.

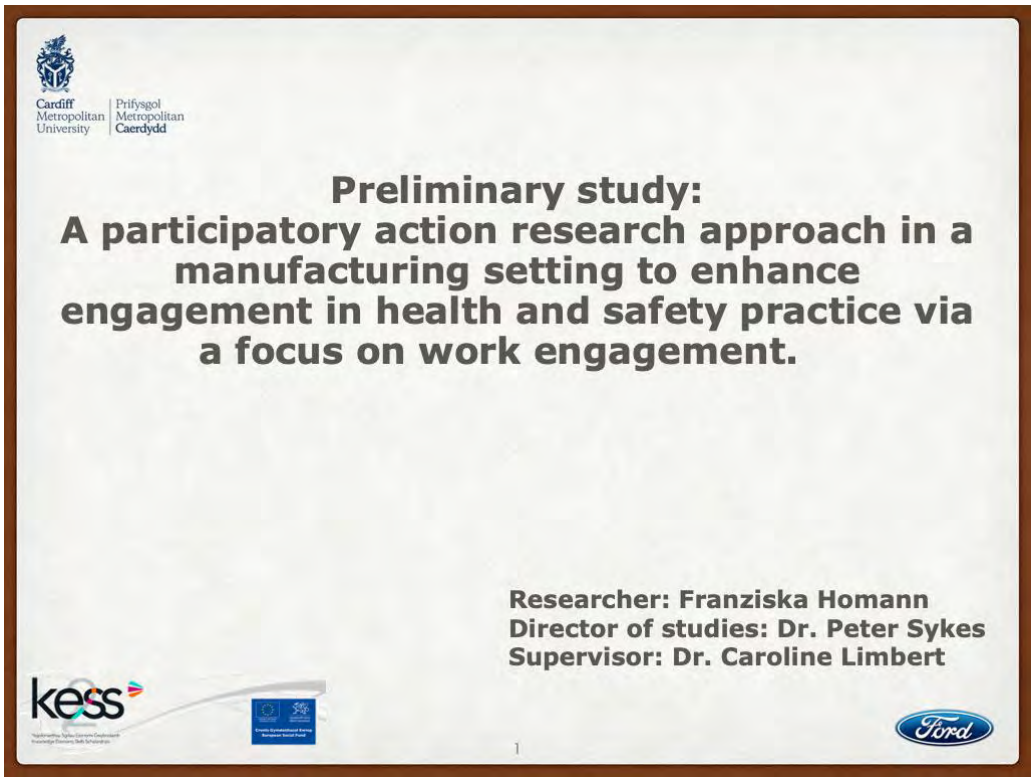
In case of questions or to confirm your interest, please contact:

Franziska Homann
frhomann@cardiffmet.ac.uk

SCAN ME

Project title: Engaging workers in health and safety measures: Increased health, safety and wellbeing performance by worker engagement (Reference Number: PGR-2889).

X.IX Interview Study 2: Intervention Idea Information Handout for the BEP Workers



Welcome, and thank you for participating in this study to collect feedback on my initiative idea.

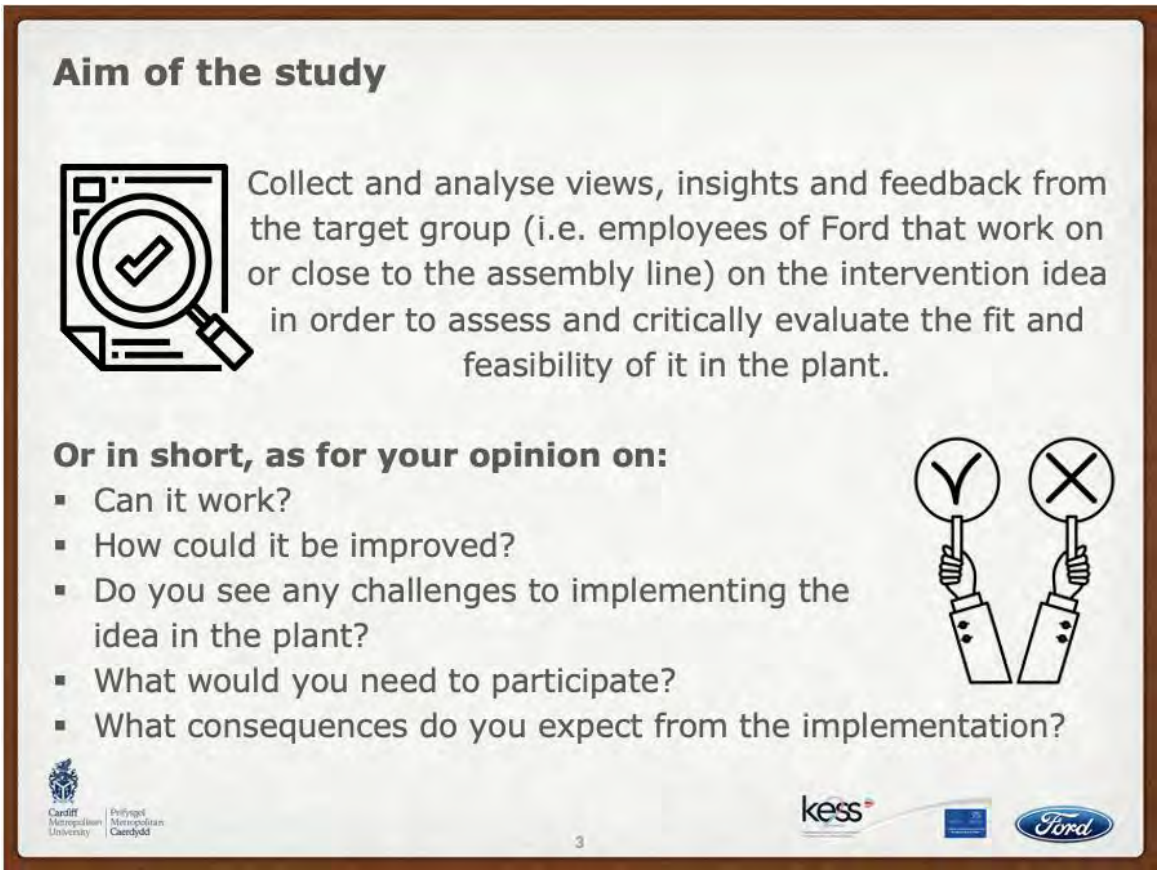
As you may remember, between November 2018 and February 2019, I conducted several interviews asking workers and managers from different areas about their opinions on the health and safety climate and the workers' engagement in this context in the plant. In these interviews, I found that overall, workers generally thought of themselves as safe, but did not always agree with the different health and safety rules in the plant. In particular, some rules or procedures were thought of as "tick-box exercises" or impractical.

Furthermore, a clear trust gap between workers and management was found due to workers' perception of not feeling heard and appreciated enough for their expertise and opinions by management. This trust gap was found to lead to workers not feeling motivated to "go the extra mile" for health and safety. Hence, to improve this situation future measures should aim for the workers to feel:

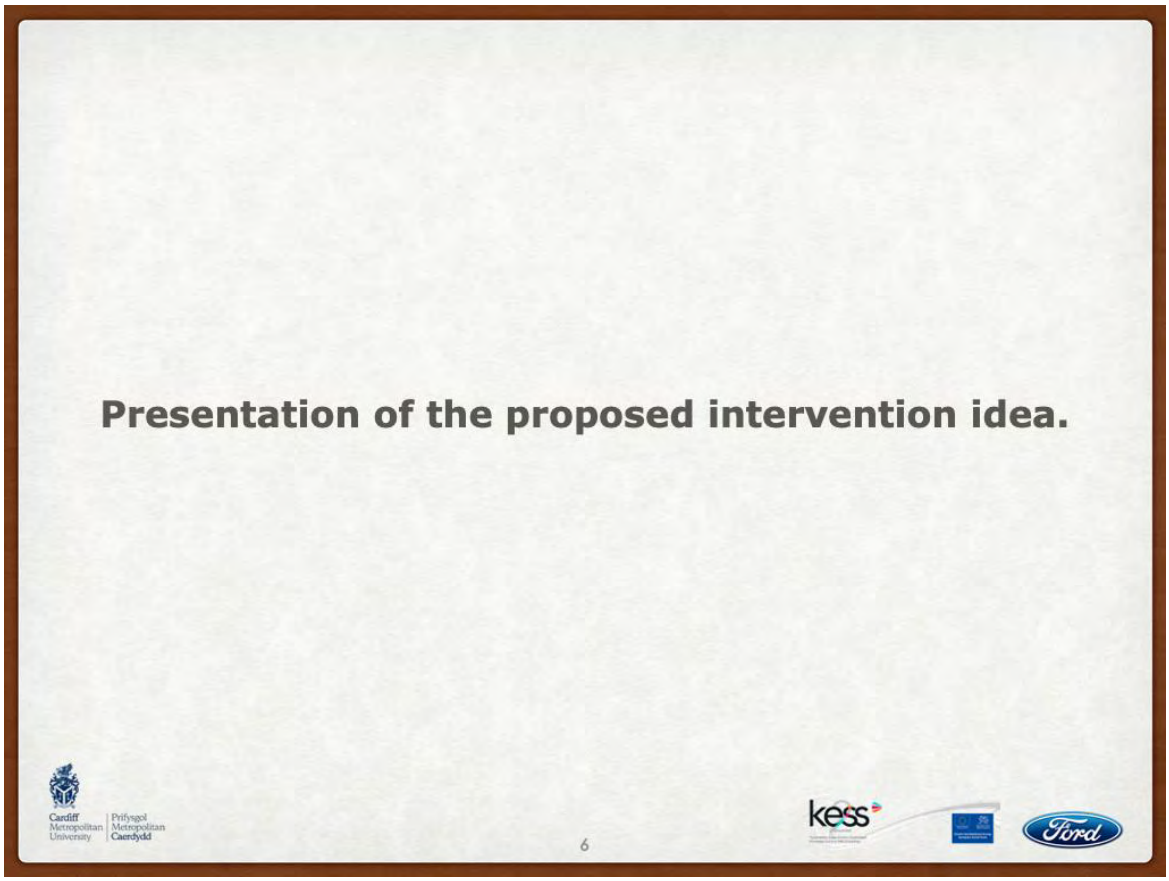
- heard and properly listened to as well as taken serious by management,
- appreciated and recognized for their expertise by management,
- involved and part of decisions, as well as
- genuinely cared for by the company and management.

Thus, the next question in my research was: What exactly do we need to do to improve this?

This is where you come in and where I need your help.



Since, at the moment, the whole intervention is just an idea made up based on the interview findings in the plant and research, we need your input to see, if this idea could work in reality or what needs to be changed to improve it. So, we need you to imagine what it would be like, if such an initiative would be implemented in a similar plant like BEP in the future that works on full capacity. I have prepared a few questions to go through in the interview, but they will just be used as a guide, so we will not miss any important factors to look at. You can see them later, on page 36, in this handout.


Presentation of the proposed intervention idea.
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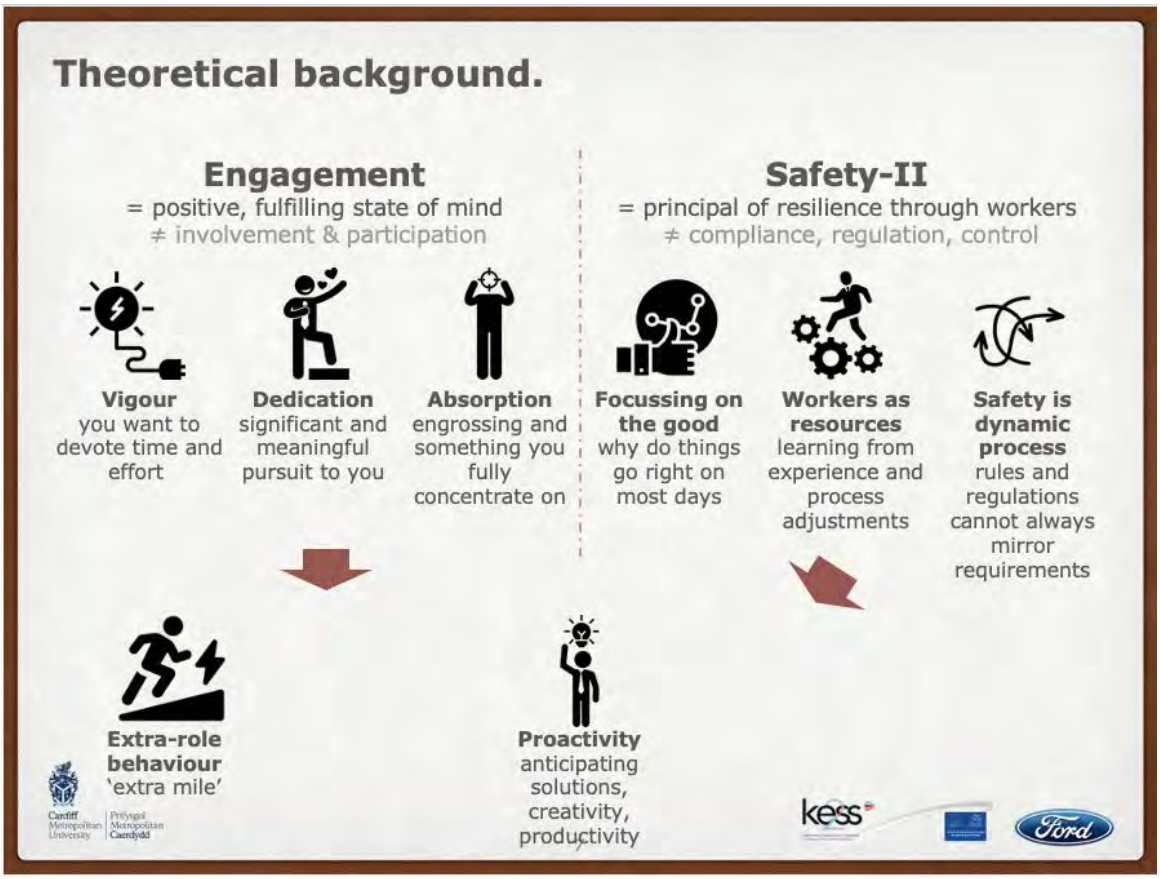
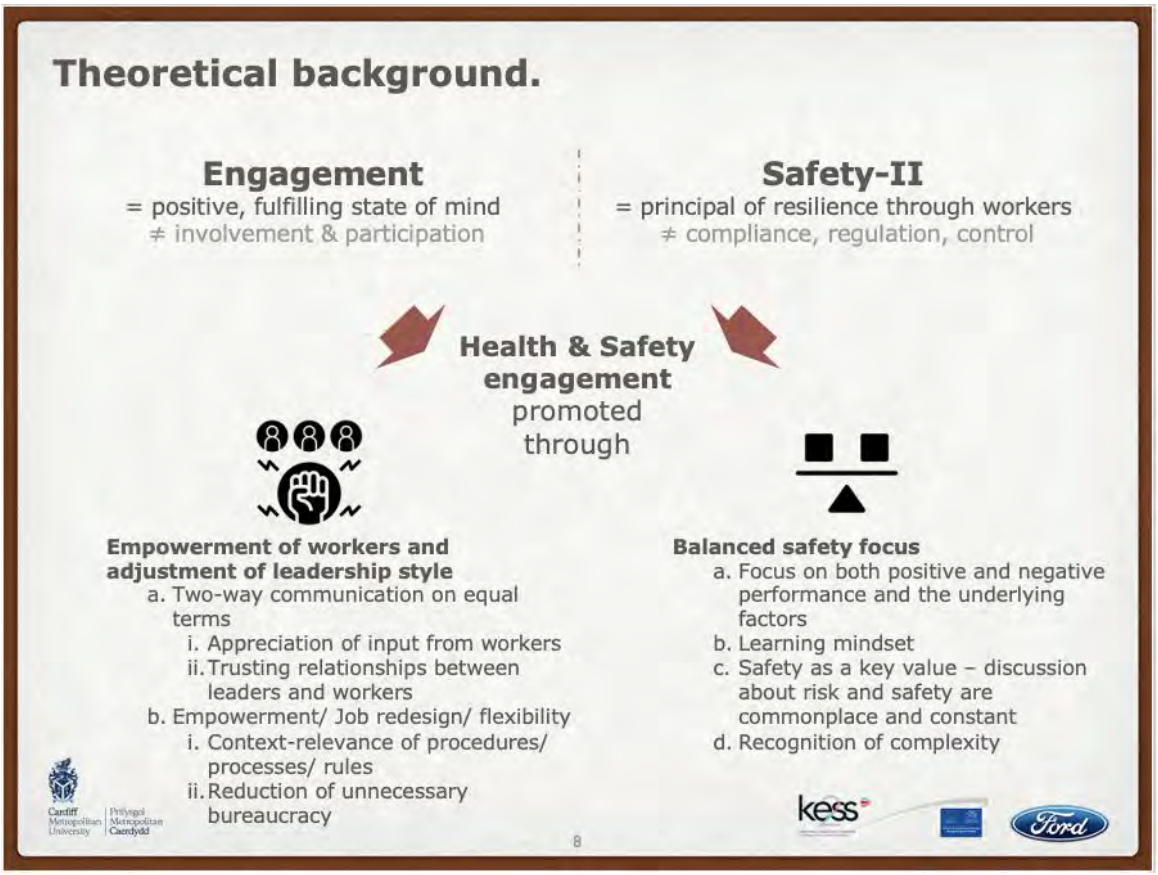


Just to give you a bit of background information, I propose that workers will be most happy to "go the extra mile" when they are engaged. What engagement means to me? With engagement I do not only mean involvement or participation. I mean a positive and fulfilled state of mind that is defined by the workers feeling dedicated and motivated. This was found in research (among many other positive things) to be linked to workers being happy to go the 'extra-mile' as well as them being more proactive and creative, since they enjoy challenges and proactively come up with creative solutions to solve them. Do you see how it makes a difference to you as a worker if you felt like that in work (more often)?

Similarly, safety science is changing. For a long time, the focus was more on 'controlling safety' through predicting every possible negative safety event and anticipating those through rules and procedures. Thus, humans in the process were mostly seen as potential error sources that need to be managed and therefore must comply to the rules to keep everyone safe. This approach is often referred to as Safety-I. However, now the focus is turning towards Safety-II: With a Safety-II mindset, organisations acknowledge, that safety is dynamic and that you cannot predict everything. Therefore, you need the workers to step up

and be part of the solution. Meanwhile, on a daily basis, things usually go more often right than wrong, and when it comes to an accident, it is often a (sad) exception. Therefore, in Safety-II it is believed that it is important to understand, why things usually go right. So, the difference between work-as-planned (i.e. how it is being written down in the rules) and work-as-done (i.e. how it is actually being done on the shopfloor including the workarounds of the workers) needs to be understood and learned from. Yet, it does not mean that Safety-I and Safety-II are mutually exclusive rather they complement each other.

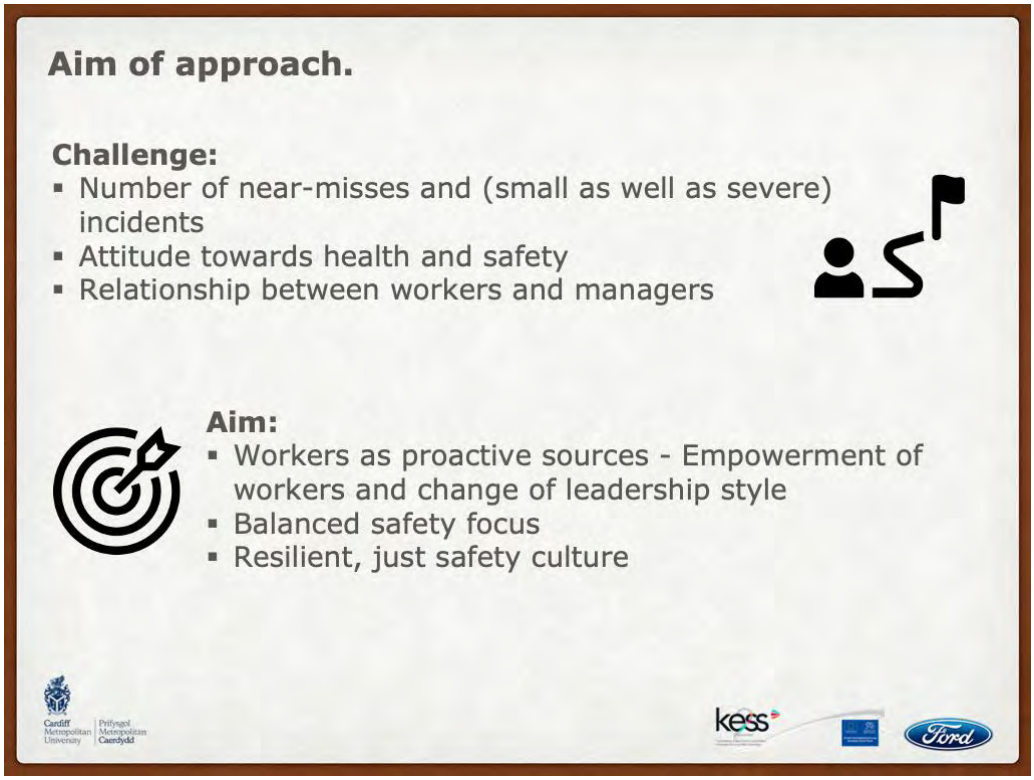
As you can already see, when workers are actually in in charge of health and safety, that means they need to step up and be proactive. Do you see how that fits with what I mentioned before about engagement?



The proposed initiative is aimed to bring those two concepts together and define measures, or what in research we call “interventions”, to create an environment in which health and safety engagement is promoted. For this, workers need to be empowered so they can take responsibility over their work and safety. Further, the safety focus needs to change and look at negative things but also on the positives, as the Safety-II approach suggests.

Empowering the workers means, that the leadership style needs some adjustment. A so-called two-way communication has to be created. That means that communication between workers and managers need to be on equal terms and not only in one direction. Managers need to appreciate the input from workers and actively listen to their suggestions. However, for an honest, constructive conversation, a positive relationship between both parties need to be established, otherwise, workers may feel like they do not want to share anything, because they feel that they would not be taken seriously. Hence, that needs to change. Similarly, workers need the freedom and opportunity to be empowered and take responsibility. Therefore, the workers need to be allowed to propose changes to processes and rules to make them fit their working situation as well as reduce unnecessary paperwork.

Equally, a balanced safety focus has to be implemented – that means that the focus is not only on negative events and when something goes or is being done wrong, but also positive things, thus when things go right and things are being done well. This is meant in the context of giving feedback, hence being approached for positive and negative behaviour, as well as in the context of analysis and risk management. Efforts need to be made by everyone to understand why things usually go right (i.e. understanding workers' workarounds), and not only focus on understanding why things sometimes go wrong. In order to create such a culture, safety needs to be established as a key value – by this I do not mean have it written on the wall everywhere, but it needs to be a consideration in every aspect of work – so, risks and safety need be become part of each conversation and commonplace. Furthermore, failure or errors need to be seen and handled/appreciated as learning opportunities. For example, in terms of non-compliance, it needs to be understood, why the person did not comply to the rules and what risk arose from that and how to support the person in doing their work safer.



Looking at BEP, when this project started, they faced the challenge that there were a significant number of near-misses and (small as well as severe) incidents; mostly small cuts, hand hygiene issues with gloves that lead to skin diseases. Furthermore, it was observed as well as communicated in the interviews that the attitude towards health and safety was problematic. This was being linked to factors such as:

- non-compliance of workers (e.g. headphones, short-cuts),
- production focus of managers, and
- inconvenient/non-practical rules.

On top of that, as reason for the challenging attitude as well as behaviour, the interviews revealed a problematic relationship between workers and managers, which is being based on:

- mutual distrust between managers and workers,
- communication issues between both parties, as well as
- workers' lack of feeling appreciated and listened to.

Consulting the academic literature and taking into account the insights from the interviews, two main dimensions for improvement were identified:

Empowerment of workers and adjustment of leadership style

- Two-way communication on equal terms
  - Appreciation of input from workers
  - Trusting relationships between leaders and workers
- Empowerment/Job redesign
  - Context-relevance of procedures/processes/rules
  - Reduction of unnecessary bureaucracy

Balanced safety focus

- Focus on both positive and negative performance and the underlying factors
  - Learning mindset
  - Safety as a key value – discussion about risk and safety are commonplace and constant
  - Recognition of complexity

Consequently, the literature suggested, when these factors will be improved, the relationship and trust issues are likely to be solved as well.

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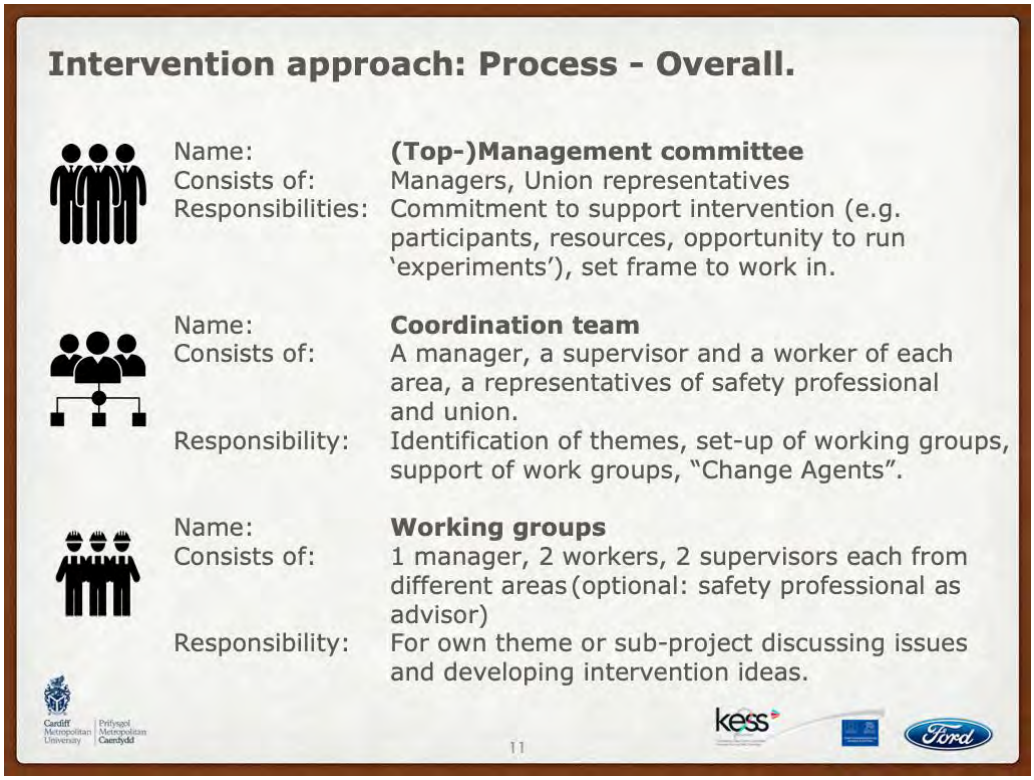
Here is the idea: A one-size-fits all solution will not be the answer here, neither will a single initiative. Therefore, based on the literature and to create an environment in which all levels in the company talk on equal terms and find solutions together, I propose establishing a participatory action research approach.

That basically means, that in working groups that include all hierarchical levels and departments (i.e. participatory), the group members discuss the problems and challenges in the plant together to come up with individual solutions (i.e. action). To make sure that these solutions are practical and effective, every member of the working group acts as a representative of their area. While drawing on the individual experience and knowledge of the group members, they are also encouraged to discuss the identified challenges and problems as well as the designed solution ideas with their peers to get their feedback and input. This could be done just by simply telling them about the ideas and asking them what they think about it, or, when it comes to the solution idea, to actually test it as a little pilot in the area (i.e. like an experiment) to see if it works as planned with the expected effect and is practical. Therefore, workers and managers would be together responsible to drive the change in the plant and come up with solutions, that are tailor-made for the different working areas in the plant.



How should this work and how do we get this running?

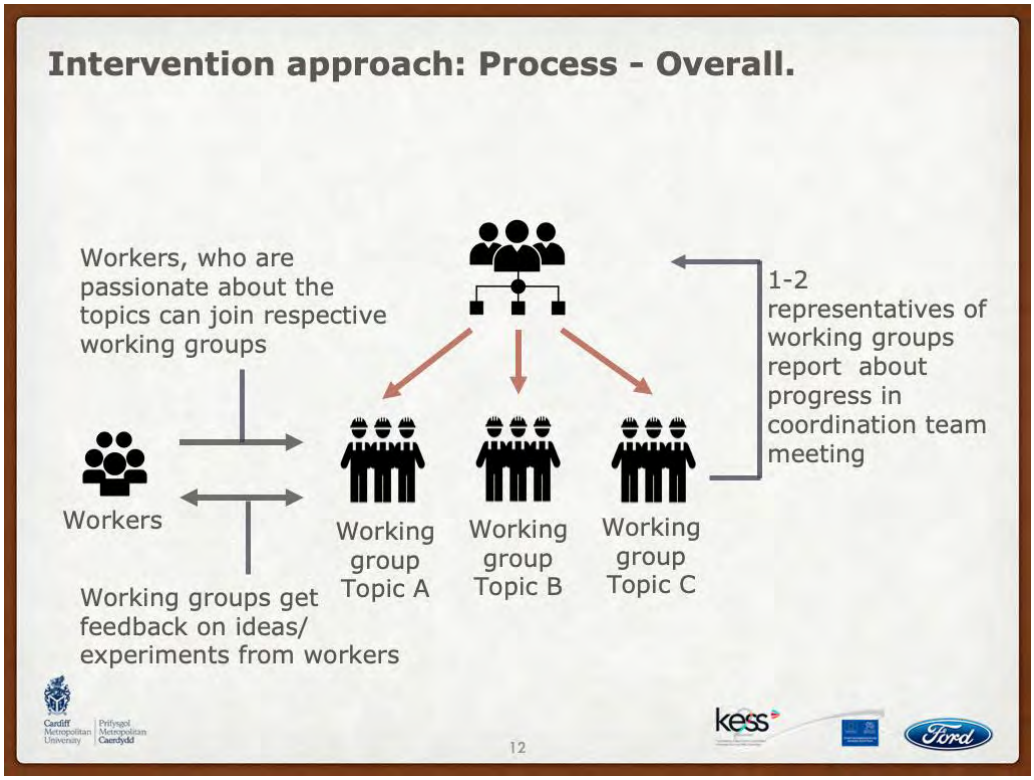
Of course, we need top management on board and their approval first: After all, this approach will change quite a bit in the old structure within the plant and naturally everyone involved needs the necessary time to take part in the group meetings and the freedom to "experiment" in their areas. Also, there are probably certain rules and procedures that are linked to law and therefore should not be changed. Hence, it needs to be defined what can be changed by the working groups and what must stay untouched. Plus, we need their commitment that they support this project and give all employees the time to take part and the freedom to realise their ideas.

Through the management approval, the overall responsibility in terms of coordination and economic decisions will be handed over to the coordination team which has to be set up. This will oversee the coordinating of the working groups. Within the coordination team every area of the plant should be represented by a manager, a supervisor, and a worker. Furthermore, a safety professional and a union representative should complete the group. However, within the coordination group there are no hierarchies, and all group members should be treated on equal terms, with no single person being able to "pull rank" – every member and their respective experience, opinion and insights are equally valuable.

Within the coordination team the topics and issues within the plant that need to be addressed within the working groups are being defined. That means that for each issue a working group will be established. To identify issues that need working on, the reoccurring topics from safety audits, topics identified from safety climate assessments or simply topics that the participants feel strongly about can be addressed (also, the health and safety engagement matrix in Appendix A see page 41 might be of help here). Within the steering committee these identified issues will then be prioritised and working groups will be established, to take the work from there.

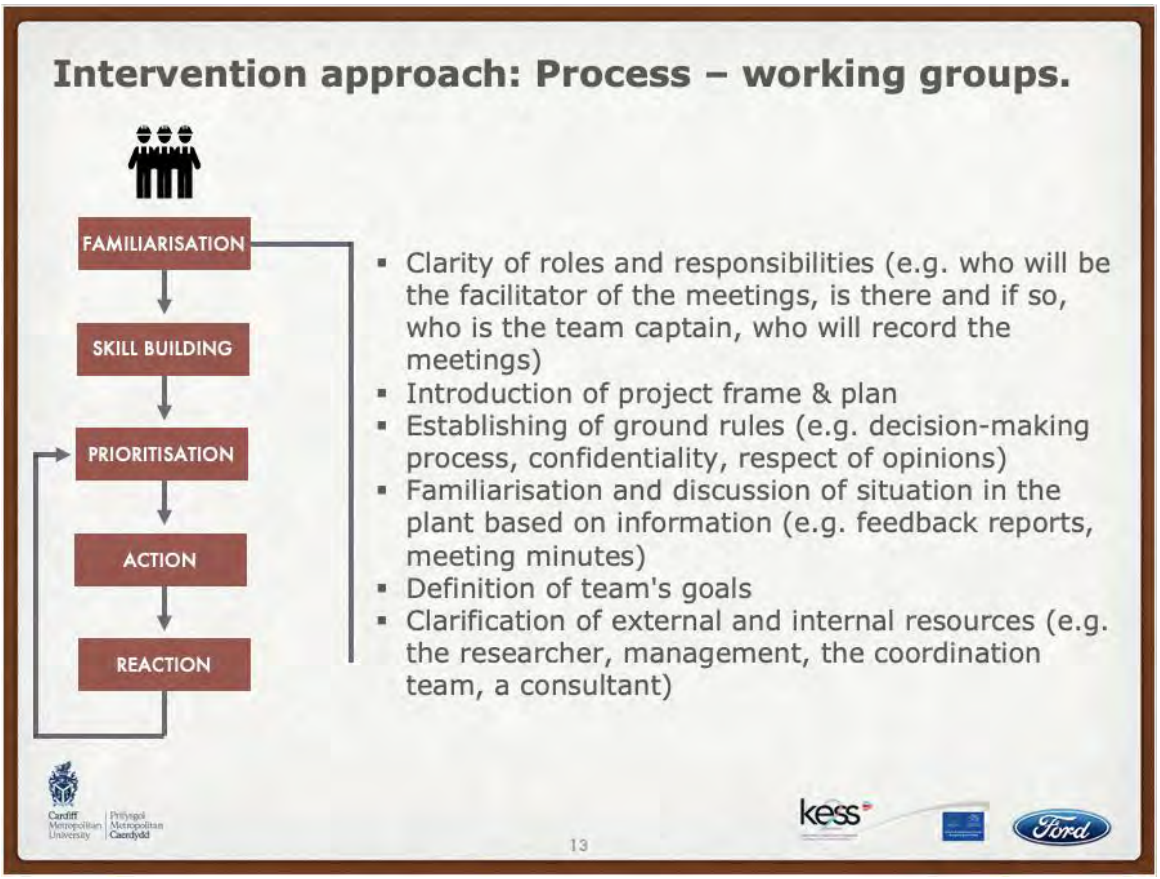
The members of the coordination group can also act as so-called “Change Agents“. That means they are responsible of communicating the progress of the coordination group but also the individual working groups into their own working areas and to their peers. So, you can see, how this aims to include as many employees of the company as possible, and even if they are not directly involved in any of the groups, they still get regular updates about the progress from their peers.

As already mentioned, the working groups will be built based on a particular topic. Here, everyone in the organisation, who is interested, is welcome to work on the topic within the group. Initially, just certain representative from the coordination team that took over the respective topic are part of the working group. However, it is their responsibility to recruit the right people for the working group in order to work on the topic and come up with solutions. In the best-case scenario, a mixed group of 8-12 people consisting of manager, workers, and supervisors from the relevant areas (depending on the size of the area) should take part in the working group. Yet, it is important to also have “a fresh pair of eye” on the topics, so recruiting workers that may not be directly affected by the topic could provide valuable insights, too. Firstly, the aim of the working group is to understand the topic in depth. Only when they understand the different factors that impact the topic, they can come up with solution ideas, that they can then pilot/test as little “experiments” in one area to gather feedback on their solution. When they have enough feedback and “polished” their solution idea according to the feedback, their detailed plan for action can be taken to the coordination team or the management team for overall implementation approval. Therefore, the working team should also prepare a business case to justify their solution idea.



Thus, you can see, that each working group is in charge of its own topic. 1- 2 representatives of the working group should regularly report in the coordination team meetings about their current progress or also challenges they may face. The members of the coordination team can also support or give feedback on the working groups' work.

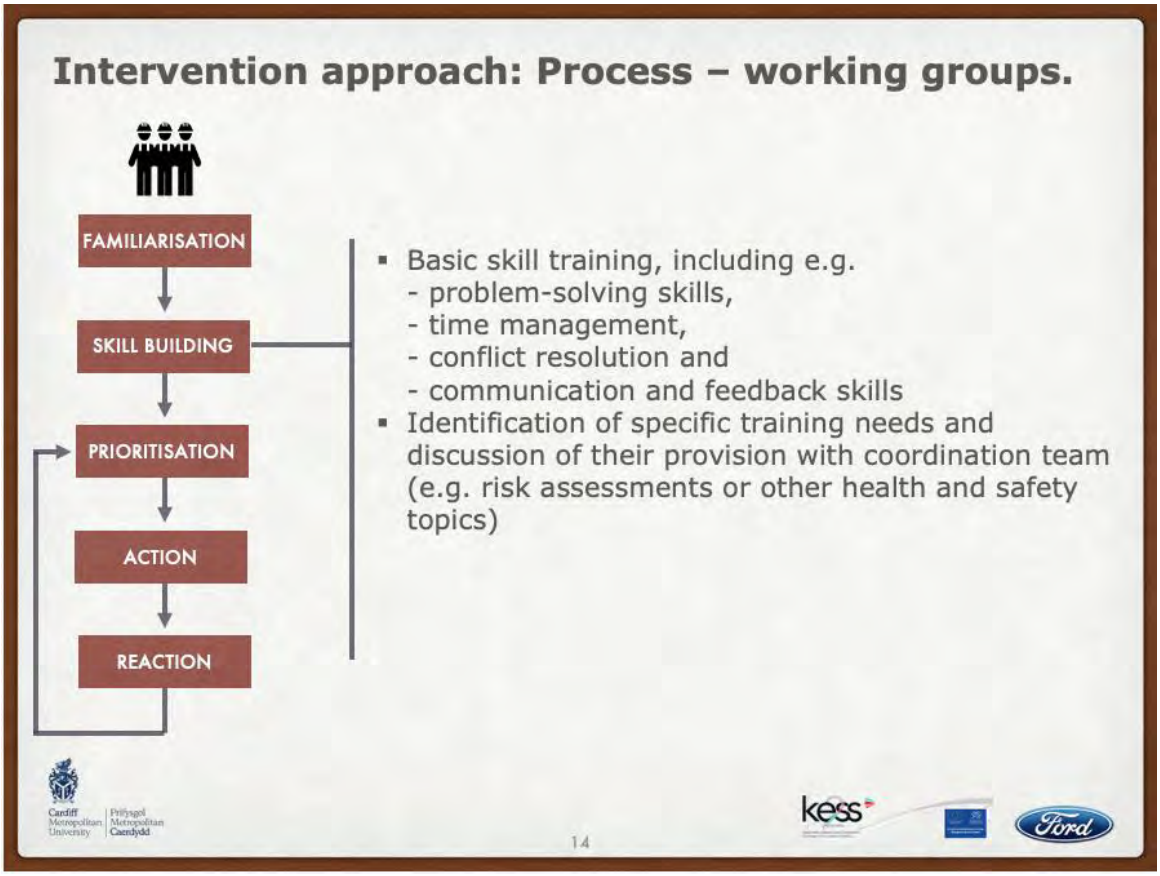
Furthermore, it is important for the working group members to stay in constant contact with their peers outside the working groups. This means, working group members are encouraged to talk to their co-workers about the progress and ideas from the working groups and so gather feedback and new insights as well as bounce off ideas, that they can then bring back to the working groups. This will not only improve the solutions designed in the working groups, but also may attract other workers to take part in the working groups or at least keep them up-to-date on what is being done.



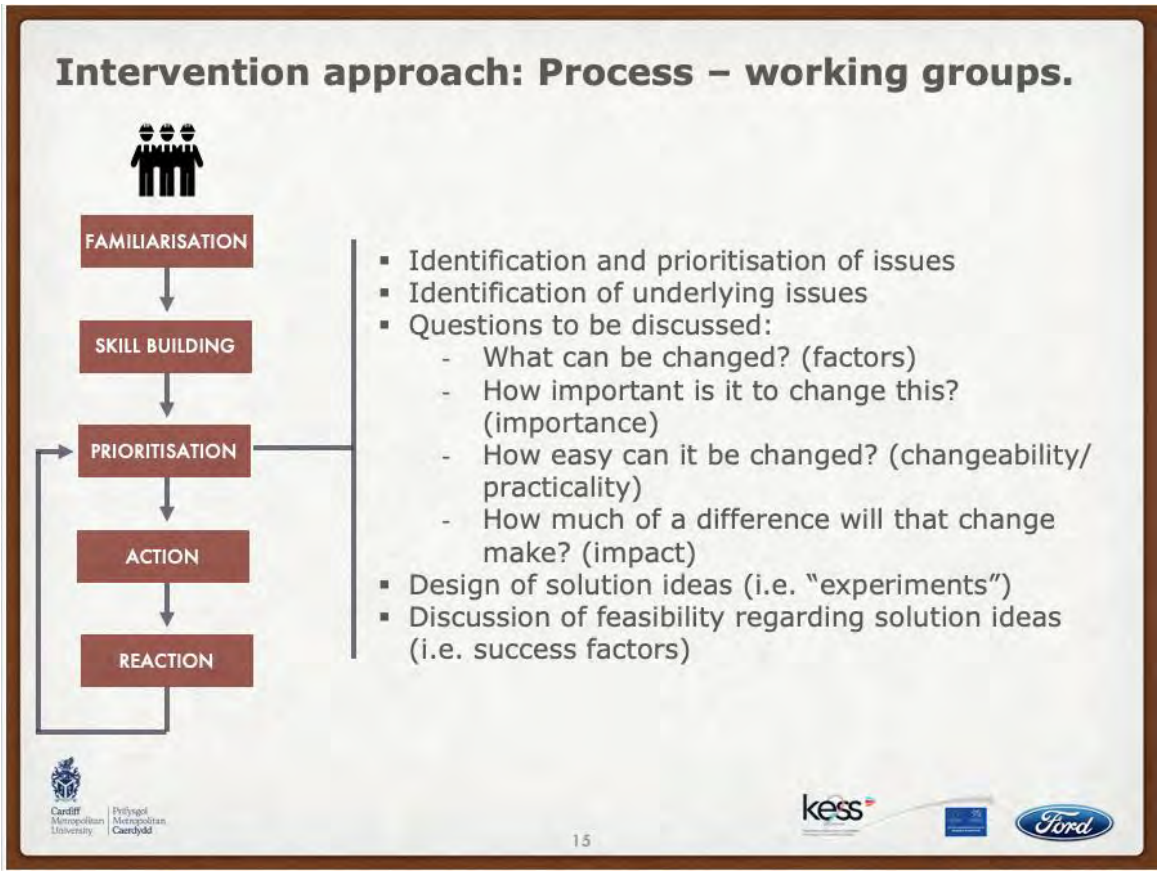
Following, the different phases of the working groups will be explained. Here, you can find most information in the pictures, the text underneath just adds additional information.

Please keep in mind, that one phase does not necessarily equals one meeting. For some phases, several meetings are necessary to achieve all necessary steps.

Starting with the “familiarisation phase”, this is basically the first meeting of the working group. In this phase all members have to get to know each other. In this phase, if necessary, it should be discussed if further members for the group are needed and how to approach them.

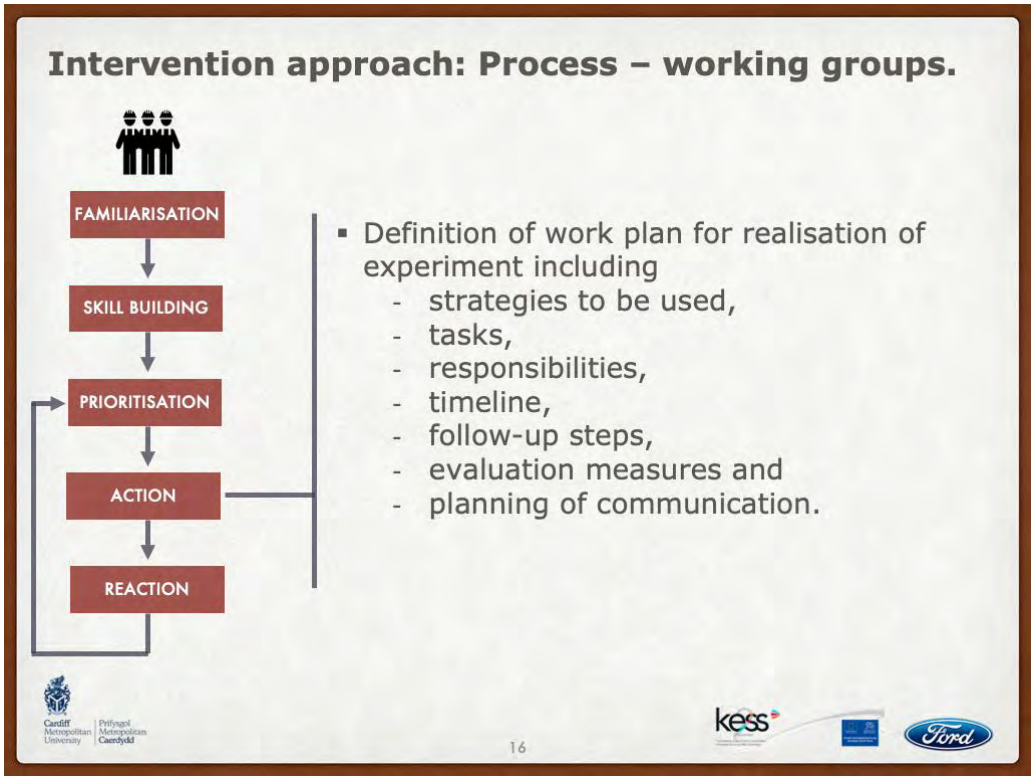


In the second phase, the so-called “skill building phase”, it is all about enabling the participants of the working group to do their jobs. Consequently, participants of all the working groups get a thorough basic skill set that will not only support their personal development, but also enhance their CVs.



After setting up the group and giving them the necessary skills in the first two process steps, in the third step the focus is on the issue at hand. As I said before, each working group is in charge of one specific topic. This topic could be a general problem or issue in the plant or in a specific area, or simply an overall theme that needs attention.

In the first instance, it is important for all members of the working group to get a good understanding of the topic. That means to investigate, for example by reading the relevant documents (e.g. reports, meeting minutes) or by talking to co-workers that are affected by the topic. Then, the working group members brainstorm/come up with ideas for solutions.



In the "action step", the group members come up with a detailed work plan to meet the team goals and to address the identified priority issues.

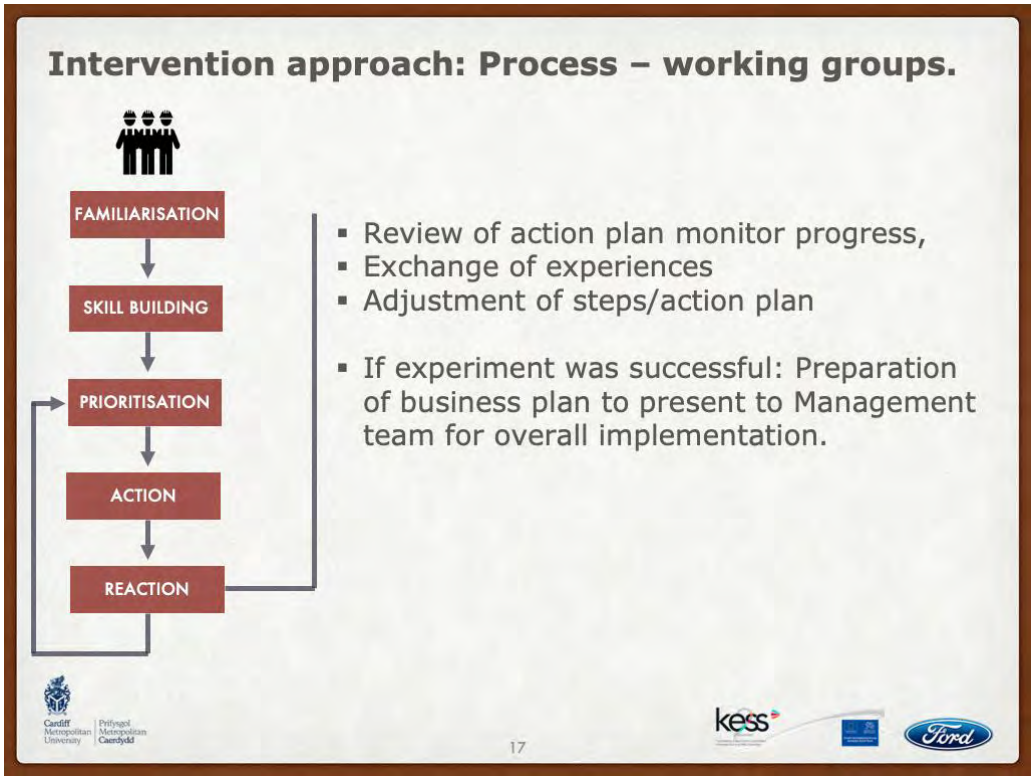
In order to test their prioritised solution ideas, so called "mini-experiments" need to be set up. A mini-experiment is meant as a pilot on a smaller scale where, for example, only the participants of the team test the action experiment idea (or parts of it, as a 'light' version) for a few days in their daily work routine.

Definition of action experiment:

- What is being changed?
- For whom?
- How can success be measured?
- When should the success of the experiment be re-evaluated?
- What are the costs and benefits associated with the experiment/with the whole change?

Furthermore, the relevant success factors need to be identified and considered in the experiment as well as the later solution idea presentation:

- Stakeholder involvement – Who needs to be informed/involved? What changes do result to them (that need to be agreed on)?
- Changes in responsibilities – What will change to the role description and who gains/loses which responsibility?
- Necessary resources – How much time is needed to implement the change? What investment must be made? Are new tools/materials etc. needed?
- Changes in procedures – What documentations and procedures are impacted by the change? How are they being documents?
- Supporting tools – What will help the stakeholders to stick to the proposed change?



The experiments provide the working group with real-live feedback on their solution idea on a small scale. Through their own experience, but also the feedback from their colleagues being affected by the experiment, the working group can gather valuable experiences and insights on the effectiveness and practicability of their solution idea. Afterwards, this feed-back should be used to improve the solution idea. This process can be repeated until the working group members are happy with their solution. Then, they should prepare to present their solution to the coordination group, and potentially, the management group.

Before final implementation, a business case must be prepared for the solution implementation and presented to the coordination group, and potentially, the management group, who will then confirm the implementation. The business case as well as the presentation should be conducted by members of the working group.

After successful solution design, all members of the working group get a certificate that acknowledges their active participation in the group and their solution development skills presented by a member of the top-management team. Again, this can be a valuable enhancement for the individual CV. Moreover, the success of the working team members and the solution idea will be celebrated in the plant' quarterly safety newsletter.

What do you think, could this work and bring the plant towards an improved health and safety engagement? If anything did not make sense to you or if you have any questions, please do not hesitate to contact me.

Page Break

Figure 1: Questions

Feedback on the intervention idea

- Does this idea make sense to you? Do you have questions about the idea/ how something is supposed to work?
- What are your initial thoughts on the idea?
- What suggestions do you have, if any, that could help improve the likelihood of this idea being a success?
- What would make the participation more attractive to you/ your peers?

Consequences of intervention

- What positive or negative consequences to yourself/ other workers/ the organisation could the realisation of this idea have?

  Possible probes:

  In terms of

  - personal and job resources (i.e. what could you learn? What would you gain? What would be improved in your day-today tasks and interactions?)
  - taking responsibility for H&S
  - involvement with H&S decisions
  - perceived meaningfulness (i.e. purpose/ value) of your job
  - workers' engagement in H&S behaviour and decision-making
  - Safety-II and aid workers to create resilience within the organisation
  - a balanced feedback culture and 'just' culture in which positive behaviour and performance is being acknowledged
  - Reflection and learning within the organisation with respect to present and past (negative and positive) events

Implementation I

- In terms of implementation, what suggestions do you have, if any, that would help to facilitate the implementation?

  Possible probes:

  - Timeframe of intervention (e.g. how often should the working groups meet?)
  - Duration of working group sessions (e.g. how long?)
  - Delivery of the intervention (e.g. facilitation of all workshop sessions or empowerment to self-facilitation, group as well as individual sessions)
  - Themes of proposed sessions/ theme identification

Implementation II

- Do you see any problems that might arise when implementing/ during the intervention? How could they be avoided/ addressed?

  Possible probes:

  - Participation or approval of certain groups?
  - Commitment/ Effort?
- (If you think about past new processes' or tools' implementation efforts) What resources are needed to implement and maintain the idea?
- How do you think would be the best way of getting the right people on board to take part in the working groups?

Communication of outputs

- What do you think, how could the outputs and the progress of the sessions be made transparent to the whole organisation?

Conduction of the intervention:

- Would you see any problems in hierarchically mixed groups (i.e. managers and workers together)? How could the problems be addressed/ avoided?
- How much of your personal time per months would you be willing to invest to take part in an initiative like this?
- Do you feel you could successfully take part in the working groups right now? If not, what would you need? Would your colleagues feel similarly?

  Possible probes:

  - Training?
  - Resources?
  - Motivation/ incentives?

COVID-19 measures

- Tell me about the changes in safe working in the plant since the COVID pandemic?
- How do the pandemic related measures make you act or think differently about health and safety?

Ramp-down and closing

- Is there anything left that you would like to add or that you think I should be aware of?
  - Any recommendations or ideas?
  - Relevant anecdotes?

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These are the questions that I would like to discuss with you during our interview. Please have a look, and if you like, already make notes and write down comments or questions with respect to the intervention idea presented.

Closure.

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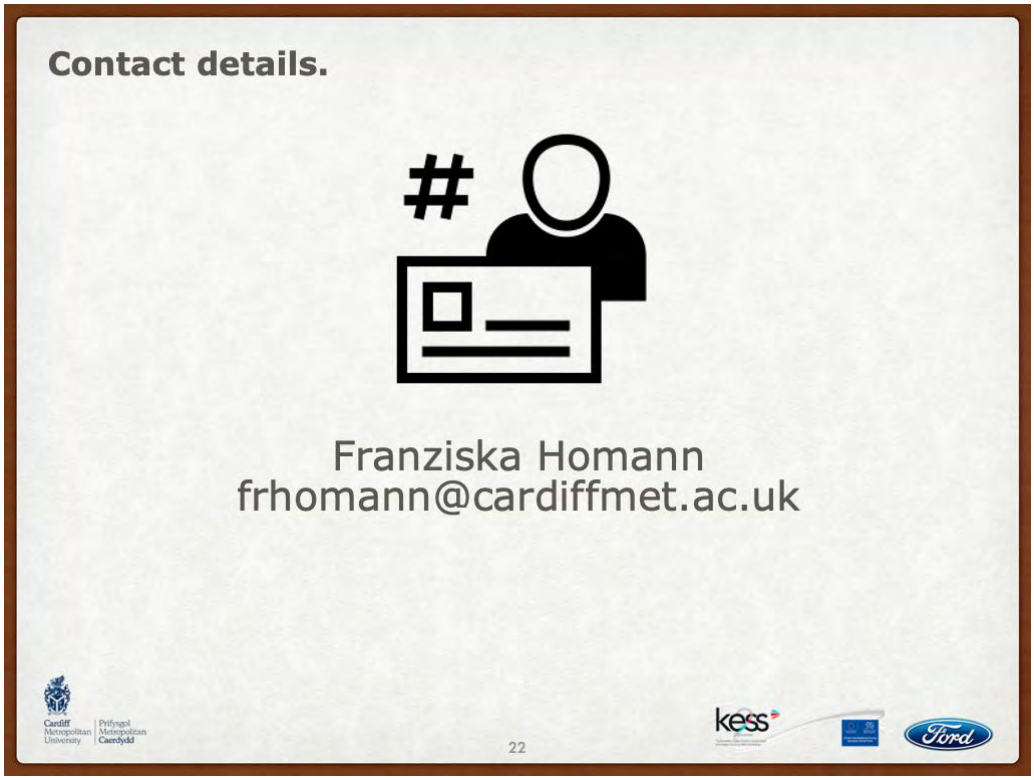
Have I missed to ask you anything? Is there anything left you think I should have asked you or that you think I should know or take into account? Please let me know!Page Break



In case you have any questions left or any ideas outside of our interview, please do not hesitate to contact me.

If there is nothing more you want to add, it leaves me to thank you very much for taking part in my study. I highly appreciate you taking the time and value your input.

My next step will be to analyse and consolidate all the feedback I've gathered from the interviews and adjust the intervention idea accordingly. Afterwards, I will prepare a manual for Ford on how to implement this approach, taking into account your feedback.

Thank you again, this all would not be possible without your help!

X.X Interview Study 2: Question Development

Table 37: Question Development (based on TAF by Sekhon, Cartwright and Francis, 2017)

#	TFA dimension	First Draft: Derived question for interviews	Final: Derived question for interviews (after discussion with other researchers)
1	Affective Attitude	What are your initial thoughts on the intervention approach? What suggestions do you have, if any, that could help improve the realisability of this intervention design and implementation? Timeframe of intervention (e.g. how often should the work groups meet?) Duration of work group sessions (e.g. how long?) Delivery of the intervention (e.g. Facilitation of all workshop sessions or empowerment to self-facilitation, group as well as individual sessions) Themes of proposed sessions/theme identification	What are your initial thoughts on the idea? What suggestions do you have, if any, that could help improve the realisability of this idea and its implementation? Timeframe of intervention (e.g. how often should the working groups meet?) Duration of working group sessions (e.g. how long?) Delivery of the intervention (e.g. facilitation of all workshop sessions or empowerment to self-facilitation, group as well as individual sessions) Themes of proposed sessions/theme identification
2	Burden	Do you have any concerns about the effort or commitment that workers have to make to participate? What do you think: What persons or groups within the organisation would approve or disapprove of the presented intervention approach? Why? If they disapprove, what could make them change their mind/what strategies would counter these barriers or facilitate implementation? Have you seen similar approaches (or components of it) being implemented in the plant before? If so, what were they? what went well and should be adapted? what did not go well and should be avoided? Do you see any challenges that might be encountered when implementing/during	Do you see any problems that might arise when implementing/during the intervention? How could they be avoided/addressed? Participation or approval of certain groups? Commitment/Effort? (If you think about past new processes' or tools' implementation efforts) What resources are needed to implement and maintain the idea? What do you think, how could the outputs and the progress of the sessions be made transparent to the whole organisation effectively?

		the intervention? How could they be avoided/addressed? What resources are needed to implement and maintain the intervention? What do you think, how could the outputs and the progress of the sessions be made transparent to the whole organisation effectively?	
3	Ethicality	In your opinion, do you feel this intervention approach would make you feel - more involved with H&S decisions? - listened to your suggestions? - like your job has more meaning? - more secure in your job? Do you think this approach could increase your personal and job resources? How do you think would be the best way of recruiting appropriate people into the working groups? Do you think of yourself as someone who would want to actively form the H&S efforts in your organisation? Do you think your peers/colleagues would feel similarly? Do you see H&S in the organisation as something that you should be personally responsible for? Would you see any challenges in hierarchically mixed groups (i.e. managers and workers together)? How could the challenges be addressed/avoided?	What positive or negative consequences to yourself/other workers/the organisation could the realisation of this idea have? In terms of - personal and job resources (i.e. what could you learn? What would you gain? What would be improved in your day-today tasks and interactions?) - taking responsibility for H&S - involvement with H&S decisions - perceived meaningfulness (i.e. purpose/value) of your job - workers' engagement in H&S behaviour and decision-making - Safety-II and aid workers to create resilience within the organisation - a balanced feedback culture and 'just' culture in which positive behaviour and performance is being acknowledged - Reflection and learning within the organisation with respect to present and past (negative and positive) events Would you see any problems in hierarchically mixed groups (i.e. managers and workers together)? How could the problems be addressed/avoided? How do you think would be the best way of getting the right people on board to take part in the working groups?

5	Intervention coherence	Does this intervention make sense to you? Do you have questions about the intervention/how something is supposed to work?	Does this idea make sense to you? Do you have questions about the idea/how something is supposed to work?
6	Opportunity costs	In your opinion, do you think that the time and commitment effort related to the intervention is worth the possible benefits and outcomes? What measures could improve this? How much of your personal time per months would you be willing to invest to take part in an intervention like this? What would make the participation more attractive to you?/What changes could be made/what needs to be added to make participating in the intervention more attractive to others? What variables do you think should be considered when analysing the cost effectiveness of the intervention?	How much of your personal time per months would you be willing to invest to take part in an initiative like this? What would make the participation more attractive to you/your peers?
7	Perceived effectiveness	How do you think this intervention could be used to support the safety, health and wellbeing of the organisation? What positive consequences can you see? Do you feel, if this approach was implemented in your organisation, it would promote - workers' engagement in H&S behaviour and decision-making? - Safety-II and aid workers to create resilience within the organisation? - a balanced feedback culture and 'just' culture in which positive behaviour and performance is being acknowledged? - reflection and learning within the organisation with respect to present and past (negative and positive) events?	In terms of implementation, what suggestions do you have, if any, that would help to facilitate the implementation? How do you think this intervention could be used to support the safety, health and wellbeing of the organisation? What positive consequences can you see?

		What positive or negative consequences can you see arising through this intervention approach? In terms of implementation, what suggestions do you have, if any, that would help to facilitate the implementation?	
8	Self-efficacy	If you imagined you were asked to take part in the working groups, … what skills or knowledge would you/your colleagues/supervisors/managers need/prefer to acquire upfront? what skills or knowledge do you/your colleagues/supervisors/managers already have that you think could make a valuable contribution? what skills or knowledge would you/your colleagues/supervisors/managers gain over the course of the intervention?	Do you feel you could successfully take part in the working groups right now? If not, what would you need? Training? Resources? Motivation/incentives? Would your colleagues feel similarly?

X.XI Interview Study 2: Final Question/Interview Guide

Interview Guideline

Reference Number: PGR-2855

Engaging workers in health and safety measures: Increased health, safety and wellbeing performance by worker engagement

Preliminary study on intervention idea

Warm-up

Presentation of study background information (aid: presentation on intervention)

- Welcome the participant
- Introduction to the interview:
  - Objective
  - Length
  - topics
- Participation Information Sheet: Explaining all relevant points and giving the participant time to ask questions.
- Participant Consent Sheet: Making sure that participant understands what he/she is signing.
- Special highlight on recording and right to withdraw at any time.

Ramp-up

Presentation of background information (aid: presentation on intervention)

- How long have you been working at Bridgend Engine Plant (BEP)?
- In what line and role are you working?

Feedback on the intervention idea

- Does this idea make sense to you? Do you have questions about the idea/how something is supposed to work?
- What are your initial thoughts on the idea?
- What suggestions do you have, if any, that could help improve the likelihood of this idea being a success?
- What would make the participation more attractive to you/your peers?

Consequences of intervention

- What positive or negative consequences to yourself/other workers/the organisation could the realisation of this idea have?

  Possible probes:

  In terms of

  - personal and job resources (i.e. what could you learn? What would you gain? What would be improved in your day-today tasks and interactions?)
  - taking responsibility for H&S
  - involvement with H&S decisions
  - perceived meaningfulness (i.e. purpose/value) of your job
  - workers' engagement in H&S behaviour and decision-making
  - Safety-II and aid workers to create resilience within the organisation

- a balanced feedback culture and ‘just’ culture in which positive behaviour and performance is being acknowledged
- Reflection and learning within the organisation with respect to present and past (negative and positive) events

Implementation

- In terms of implementation, what suggestions do you have, if any, that would help to facilitate the implementation?

  Possible probes:

  - Timeframe of intervention (e.g. how often should the working groups meet?)
  - Duration of working group sessions (e.g. how long?)
  - Delivery of the intervention (e.g. facilitation of all workshop sessions or empowerment to self-facilitation, group as well as individual sessions)
  - Themes of proposed sessions/theme identification
- Do you see any problems that might arise when implementing/during the intervention? How could they be avoided/addressed?

  Possible probes:

  - Participation or approval of certain groups?
  - Commitment/Effort?
- (If you think about past new processes’ or tools’ implementation efforts) What resources are needed to implement and maintain the idea?
- How do you think would be the best way of getting the right people on board to take part in the working groups?

Communication of outputs

- What do you think, how could the outputs and the progress of the sessions be made transparent to the whole organisation?

Conduction of the intervention:

- Would you see any problems in hierarchically mixed groups (i.e. managers and workers together)? How could the problems be addressed/avoided?
- How much of your personal time per months would you be willing to invest to take part in an initiative like this?
- Do you feel you could successfully take part in the working groups right now? If not, what would you need? Would your colleagues feel similarly?

  Possible probes:

  - Training?
  - Resources?
  - Motivation/incentives?

Ramp-down and closing

Ramp-down: Summary of the topics discussed

- Is there anything left that you would like to add or that you think I should be aware of?
  - Any recommendations or ideas?
  - Relevant anecdotes?

Closing: “Thank you very much for your time and your valuable input – it’s highly appreciated. If any other things come to mind, please do not hesitate to contact me. I hope you will have a nice day.”

X.XII Interview Study 2: Recruitment Details

X.XII.XIII Recruitment Mail to Individuals Identified Through Publications

Good day xxx,

I reach out because I read your publication “xxx”. //[when by snowball recommendation:] I reach out because xxx recommended you and your research group to me as a potential point of contact for my study inquiry.

I'm currently in the third-year of my PhD at Cardiff Metropolitan University in Wales, UK. Within my project, I aim to develop an intervention to increase the psychological state of work engagement in automotive production-line workers to enhance their health and safety performance.

After careful consideration of the literature and my own research, I decided, that establishing PAR structures within my partner company would allow them to achieve an increased worker engagement with health and safety through allowing the workers to support the design of their work. I would like to ask you and/or your colleagues, if you were willing to take part in an interview with me as part of my feasibility study to improve my intervention idea.

In more detail, I have prepared an intervention idea, and would like to present it to you and hear your opinion and improvement recommendations on it in order to test the feasibility and practicality of the intervention idea and gather learnings for the implementations. I’m sure, from your own experience you will have many lessons learned to share when implementing PAR with assembly/production-line workers.

Hence, your input will be used to improve the intervention idea. This will be done in the form of a semi-structured interview online (most likely via teams; in English or German). After I have conducted all interviews and have analysed and consolidate all information (hopefully by May this year), I’m happy to share a brief summary of the learnings with you.

Timewise, the interview will take about 30 minutes, and you need to schedule another about 30 minutes beforehand for the preparation for the interview (i.e. reading the intervention idea document).

If you want to take part and share your experience and knowledge with me, please let me know. I would highly appreciate your input.

Of course, I totally understand if you do not have the time currently to take part. However, in that case, I would appreciate it, if you could please share this with anyone you may know who would be interested (and fitting) to participate. Thank you very much.

Best wishes,

Franziska

X.XII.XIV Post in Relevant LinkedIn Groups

Good day everyone,

I'm a third-year PhD student developing an intervention to increase the psychological state of work engagement in automotive production-line workers to enhance their health and safety performance. To test the feasibility and acceptability of my intervention idea and improve on it, I need your help!

If you are someone, who successfully implemented interventions, new processes, change programmes and initiatives etc. involving engaging workers directly with production-line workers before and have extensive hands-on experience on how to bring interventions "on the street", I would love to have you as a participant in my research. By successful I mean interventions that survived long-term and not only until the next busier production period, since I want to learn exactly form that: What made the intervention implementation successful and what should I avoid to not have a "flavour of the month"-intervention, that is forgotten of after it gets a bit more hectic.

If you want to take part and share your experience and knowledge with me, please contact me via Messaging.

Best wishes and I hope to hear from you soon,

Franziska

X.XII.XV Message Sent to Direct Professional Network

#research #automotive #production #engagement

+++ Looking for participants +++

Good day everyone,

I'm currently in the third-year of my PhD. Within my project, I aim to develop an intervention to increase the psychological state of work engagement in automotive production-line workers to enhance their health and safety performance.

If you are someone, who has successfully implemented, or have knowledge of, interventions, new processes, change programmes and initiatives etc. that involved engaging production-line/assembly workers directly then I would love to have you as a participant in my research.

I have prepared an intervention idea and would like to present it to you and hear your opinion and improvement recommendations on it.

Timewise, the interview will take about 30 minutes, and you need to schedule another about 30 minutes beforehand for the preparation for the interview (i.e. reading the intervention idea document).

If you want to take part and share your experience and knowledge with me, please contact me via mail:

frhomann@cardiffmet.ac.uk.

Please share with anyone you may know who would be interested. Thank you very much.

X.XII.XVI Message Sent to Indirect Network

Good day,

I hope you had a great start into the New Year. I'm a third-year PhD student developing an intervention to increase the psychological state of work engagement in automotive production-line workers to enhance their health and safety performance. To test the feasibility and acceptability of my intervention idea and improve on it, I need your help!

If you are someone, who has successfully implemented, or have knowledge of, interventions, new processes, change programmes and initiatives etc. that involved engaging production-line/assembly workers directly then I would love to have you as a participant in my research. I want to learn exactly from those factors that made the intervention implementation successful and what should I avoid to not have a "flavour of the month"-intervention, that is not sustainable. I have prepared an intervention idea and would like to present it to you and hear your opinion and improvement recommendations on it. Timewise, the interview will take about 30 minutes, and you need to schedule another about 30 minutes beforehand for the preparation for the interview (reading the intervention idea document again depending on personal speed).

If you want to take part and share your experience and knowledge with me, please contact me via mail: frhomann@cardiffmet.ac.uk.

Best wishes and I hope to hear from you soon,

Franziska

X.XIII Interview Study 2: Quality of the Study

In order to demonstrate and ensure the quality of the study, the criteria recommended by Sullivan and Forrester (2019) was followed.

X.XIII.XVII Reflexivity

Being personally involved in the research and the main instrument, the researcher's past experiences, mindset and personal skills does have an impact on the study. As such it is important to be aware of these impacts and reflect on them to minimalise potential impacts.

Overall ethnographic vignettes were reflected upon and naturally apply to this study.

During the interview process, the researcher kept a sporadic reflective diary, in which she noted down all feelings or thoughts related to the interviews (Houghton *et al.*, 2013). Several times throughout the interview process, the researcher was emotionally challenged when participants drifted off with their discussions and the researcher struggled to get them back on topic.

Consequently, the researcher discussed those occasion with her supervisors and together they reflected upon the situation and derived strategies to handle the situation when it happens again. Thus, the researcher became more self-aware throughout the interviews and managed to use the techniques developed to avoid further diversions. Hence, the researcher's practice was improved.

X.XIII.XVIII Transparency

As the transparency process and measures applied in the first interview study showed fitting to the research as well as the researcher's way of working, similar measures were applied in this study.

In order to ensure the quality of the study, a systematic and consistent approach was followed and transparently outlined in this chapter. This includes an explanation of all steps taken and any changes made to traditional procedure with the potential impacts they may have on this research.

To enhance the quality of the data, during the transcription, coding and theme development, the results from each step were discussed detail with the supervisory team to identify blind-

spots or inconsistencies. Independent coding or respondent feedback were considered but avoided, as they would have broken the ethical contract made with the participants. Instead, the researcher herself critically and repetitively sample checked the work results at each stage in a test-retest format (i.e. allowing one to two days between tests in order to overcome memory effect). As discussed previously, while it may not have eliminated all errors and risked researcher bias, internal consistency in error can be assumed. Additionally, detailed information on the undertaken steps and a change history of the codes and themes as well as the coding template was saved and can be seen on request.

Due to ethical considerations, consent forms including personal information of the participants, audio records and detailed transcripts were saved on a secure drive and can only be provided to sponsors, regulatory authorities and Research and Development auditors on request. However, anonymised examples are given within the chapter where appropriate.

X.XIII.XIX Coherence

Internal consistency, i.e. did the research study achieve what it aimed to look at and answer the research question, had to be achieved through coherence (Yardley, 2007).

Closely linked to the aforementioned sub-section ‘Transparency and audit trails’, again, the same approach as in the first interview study was taken: Throughout the whole research process, a systematic approach was followed and the reasoning for all steps including process adjustments and handling of challenges including the impacts of decisions on the research were critically considered and discussed with the supervisory team and then documented. Thus, coherency was ensured through a reflective and structured study process.

X.XIII.XX Trustworthiness and Rigour

To ensure trustworthiness and rigour, it is important to demonstrate a thorough, coherent, transparent and systematic study process, in addition to a critical evaluation of decisions with respect to the study design, conduction, and interpretation of results (Sullivan and Forrester, 2019).

In addition, the audit trail provided reliability by demonstrating the process and key decisions as well as the underlying reasoning and considered implications. Thus, external researchers can reconstruct and evaluate all decisions made, with the outlined study being critically and systematically conducted, while maintaining the quality of the research.

X.XIII.XXI Contribution

This study offered unique, qualitative insights into BEP employees' and external practitioners evaluation of the feasibility and practicability of the proposed intervention framework. Through the study a so far novel approach to H&S management was evaluated and could be improved upon. Furthermore, general guidelines for practitioners could be derived, that deviate from the current standards in the industry.