

7.5.1 COMPANY B

Company B is a micro company from the Netherlands which operates in the creative industries. Consequently, the company has been using design since its establishment in 2009. Company B has not been awarded a DME Award and scored level 4 on the Design Management Staircase Model. The interview was conducted with the owner/manager.

7.5.2 COMPANY C

Company C is a large manufacturing company from the Netherlands. It was founded in 1970 and has been utilising design from the beginning. The participant was not awarded a DME Award and achieved the Design Management Staircase Model score level 3. The interview was conducted with the company's Design Manager.

7.5.3 COMPANY D

The Spanish large company D was not awarded a DME Award but scored level 4 on the Design Management Staircase Model. The manufacturing company was founded in 1985, and has been using design since 2004. The interview was conducted with the Design Manager.

7.5.4 COMPANY E

The large company E is based in the Netherlands. They operate in the insurance sector and were represented by their brand and reputation director during the interview. Company E has not been awarded the DME Award, but scored level 4 on the Design Management Staircase Model.

7.5.5 COMPANY F

The representative for the Belgian small company was the owner and manager. The manufacturing company was set up in 1979, and has been applying design in various areas since 2006. Their Design Management Staircase Model level score is 2 and the company did not receive a DME Award.

7.5.6 COMPANY G

This Estonian-based small company G received an honourable mention from the DME Award, and achieved level 4 on the Design Management Staircase Model. Company G is operating in the creative sector and has been using design ever since its foundation in 2004. The interview was conducted with one of the company partners.

7.5.7 COMPANY H

The final interview was conducted with the Austrian micro company H. The manufacturing company reached level 3 on the Design Management Staircase Model, and received a DME Award. It was set up in 2002 and design has been used ever since. The interview was carried out with the owner and manager of company H.

7.6 QUESTIONNAIRE

7.6.1 COMPANY I

The first questionnaire was conducted with the Spanish design and manufacturing company I. The micro company was not awarded a DME Award and scored level 3 on the Design Management Staircase Model. It was founded in 1998, and design has been utilised since its establishment. The questionnaire was filled out by the CEO of company I.

7.6.2 COMPANY J

The final portion of the study's data was obtained from a questionnaire from the Spanish service provider company J. The company has utilised design ever since its foundation in 2008. They scored level 4 on the Design Management Staircase Model, but did not win a DME Award. Their leading industrial designer completed the questionnaire.

CHAPTER EIGHT

8. ANALYSES II – CASE STUDIES

This chapter forms the second analysis chapter, the analysis of the semi-structured interviews and questionnaires. The chapter provides the coding structure for the pilot interview and case studies. Furthermore, it presents the results of the individual case studies and a cross-case analysis.

8.1 INTRODUCTION

A systematic literature review on the evolution of new product development process success factor research was performed in Chapter 2 LITERATURE REVIEW. Based on the literature review, 64 research articles on NPD process success factors were reviewed and the most frequently referenced NPD process success factors were excerpted. This resulted in a list of nine NPD process success factors, which are presented in Table 2.2. It is hypothesised that these nine NPD success factors not only promote successful product outcome for the NPD process but can equally be used as success predictors for the concept design management. Yet, it remained uncertain if companies utilising the concept of design management address these factors. Chapter 6 ANALYSES I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS indicates that the majority of companies from the DME Award dataset address the NPD process success factors. However, the analyses were conducted based on the

pre-existing questionnaire from the DME Award. The questions and answer possibilities of the questionnaire offered only limited insight into the application and utilisation of the nine NPD process success factors. Hence, a number of questions remained unaddressed, for example if any other factors apart from the nine NPD process success factors are of major importance. To gain further insight into the application, qualitative interviews and questionnaires were obtained from previous DME Award participants. This chapter sets out to provide an analysis of the qualitative data on the application of the nine NPD process success factors. The development of the coding structure for the pilot interview and the remaining case studies, as well as the success factor ranking, were described in the research design section of the methodology chapter [see 3.7.3 CHAPTER APPROACH – ANALYSES II – CASE STUDIES].

8.2 RESULTS

8.2.1 PILOT INTERVIEW

8.2.1.1 DEFINITION OF DESIGN MANAGEMENT

Company A stated that design management is the management of design. In their case, the term ‘design’ predominantly relates to product design. Translated to their specific case, design management ensures that all different aspects of the company are represented in a coherent way, and that the brand reflects the products of the company. For this purpose, it is necessary to integrate different experts from different disciplines. It is seen as important that an experienced expert in the field of design management fulfils this role.

8.2.1.2 USER INVOLVEMENT AND TESTING

At the time of the interview, Company A had already launched one product and a second product was ready to be launched.

For the first product, Company A undertook self-organised in-house testing utilising a number of friends and family members. All stages of the testing were conducted single-handedly and no specialists were involved, nor was a specific test procedure developed. This test was undertaken with a prototype of the final product, and was initially perceived as a very important step in development. Retrospectively, the testing phase was recognised as inadequate, as no particular methods or metrics were in place to capture any results. The success of the test relied on the subjective view of the Company A owners. However, based on the perceived success of the test, the prototype went into production. Prospectively, Company A stated the intention to conduct iterative user testing for future products. Furthermore, a basic feedback form was provided to all customers after the purchase of the product. The intention of the feedback form was to gather ideas for further improvements.

For the second product, Company A undertook one in-depth study with a prototype. This involved testing the product in a real-life scenario. All interactions with the product were recorded and analysed, but no amendments to the prototype were made. This type of in-depth study was seen as very important and it was proposed to adopt this approach more extensively in future times.

In general, the involvement of users and testing the prototype with users was seen as very important. However, Company A stated that this does not improve the product itself, but simply aids in building a relationship with potential customers.

8.2.1.3 CROSS-FUNCTIONAL PROJECT TEAMS

In the new product development process, Company A involves a number of different external partners. An external design agency is commissioned to develop concepts based on the company's product ideas. Company A decides on the most suitable concept, and then commissions an external engineer to create the technical drawings for the product. Based on the drawings, a prototype is developed externally and then tested internally. Marketing and advertising is also performed internally. The company's two owners undertake all internal work. External specialists provide all other expertise. No communication takes place between the different external parties, and all communication goes through Company A. Building cross-functional teams, or ensuring direct communication between the involved parties, was not seen as very important. It was stated that it is just not practical in such a small company.

8.2.1.4 TOP MANAGEMENT

The support of top management is fundamental to Company A, as the owners of the company are the only employees. By the very nature of the company, the top management is involved in all processes, starting at the identification of ideas up to basic project management and administration tasks. However, Company A states that the top management ideally does not have to be involved in all details as long as it fulfils a supervising role.

8.2.1.5 MARKET RESEARCH

Company A undertakes market research as a standard procedure before the start of the development process in order to identify gaps in the market. This encompasses screening both the market and potential competitors. Different methods of

conducting market research are exploited, including visiting shops, trade shows and gathering customer feedback in addition to professional market research reports. The professional market research report was aided by government funding. The standards for market research were not formalised in any way. In general, market research was highly valued as it is very important to understand the operating market before entering. However, it was acknowledged that the evaluation of the market research must improve.

8.2.1.6 PRELIMINARY TECHNICAL ASSESSMENT

Company A does not undertake a preliminary technical assessment. They work under the assumption that their products are technically feasible, as the focus of the company lies in innovating and redesigning existing products, creating something novel. However, due to the learning experience from one product failure, preliminary technical assessment was seen as the most important factor.

8.2.1.7 PRELIMINARY FINANCIAL ANALYSIS

Company A developed a business plan and analysed the commercial viability of their product before the start of the development process. Though no specific budget was allocated to the development of the products, preliminary financial analysis was seen as imperative to success.

8.2.1.8 NEW PRODUCT STRATEGY

Company A distinguishes between company strategy and product strategy. The company strategy sets the general strategic direction, which was to specialise in a particular niche area. The company strategy defined general topics, such as the

product range and the distribution territory. As a subsequent step, the company strategy outlined developing accessories for the first product. A product strategy for each of the products does not exist. It was not perceived as important, and no reason was given to justify developing a product strategy. Consequently, no alignment between the existing company strategy and a product strategy exists in any formalised way.

8.2.1.9 PRODUCT CHAMPION

One of the owners fulfils the role of the product champion in Company A. As the 'lead believer', he strongly identifies with the product. He is responsible for setting the scope of the product and the direction of development. Furthermore, he oversees the logistics of the development project and allocates sufficient resources to it. This includes the responsibility for meeting time and budget constraints and marketing the product. Company A sees the role of a product champion as very important since every project needs an individual who is ultimately responsible and accountable for product development.

8.2.1.10 PRELIMINARY MARKET ANALYSIS

Company A took the view that preliminary market analysis is the same as market research.

8.2.1.11 IDEA GENERATION

Identifying problems with existing products of their competitors' products was the company's main source of idea generation. Furthermore, Company A obtains ideas for new products from external sources such as magazines, TV, family, friends and

customers. Both owners discuss all ideas and assess them regarding their commercial viability.

8.2.1.12 CHALLENGES AND IMPROVEMENTS

The most challenging factors for Company A were preliminary technical assessment and financial and business analysis. Both factors were seen as needing the most improvement.

8.2.1.13 SUCCESS

The owners of Company A stated that the business has had no commercial success up to the date of the interview. However, discovering and successfully using the concept of design management represents a personal success to them. The concept of design management supported the setup of their company in a trust-sensitive and conservative healthcare sector, and enabled the owners to present the company as a fully formed entity rather than a new start-up company. Both considered success as ‘making a difference to someone’s life’ through their products.

8.2.2 CRITICAL REFLECTION

Initial information regarding the utilisation of the nine NPD process success factors was gained from the pilot interview.

Company A addressed all nine previously examined NPD process success factors, except for *preliminary market assessment* and *preliminary technical assessment*. The questions regarding *preliminary market assessment* were dismissed as it was deemed the same as *market research*. Furthermore, Company A does not undertake any *preliminary technical assessment*. Consequently, no insight was given for this factor.

All remaining questions were answered in sufficient detail, fulfilling the objectives of the semi-structured interview.

A second inductive scan of the interview data discovered further reoccurring themes to be included in the presentation of the results. In addition to the nine factors, *testing/prototype testing*, *feedback*, *idea generation*, *company strategy*, *product strategy* and the *alignment of company and product strategy* were emerging themes in the semi-structured interview. Furthermore, two themes unrelated to any factor emerged. These were *success* and *challenges and improvements*. A refinement of the semi-structured interview guide based on the newly emerged themes was considered but dismissed. Specific questions aiming to gain further insight into the newly emerged themes are not included in the semi-structured interview guide. The reason for this is twofold:

1. The main objective of the case studies to gain further insight into the nine NPD process success factors was successfully achieved.
2. The method of conducting semi-structured interviews was deliberately chosen in order to leave room for any additional comments on the part of the interviewee. The amount of eight emerged themes via the inductive coding confirms the functionality of the method.

Furthermore, Company A ranked the importance of each of the nine NPD process success factors on a scale from one to six, as presented in Table 8.1. Six factors were ranked with the highest score and a further two with the second highest score. Only the factor *cross-functional teams* ranked lower, with a three.

Based on the preliminary insight from the pilot study, it can be concluded that the pilot interview helped gain further insight into the activities. Nevertheless, since the results give initial insight that the interaction between the different activities might

be a crucial point, the interview questionnaire was adjusted. Furthermore, the final two questions of the semi-structured interview guide have been excluded. Both questions related to the measurement of success of the interviewee's company. The pilot interview illustrated that success measurements are based largely on the individual's point of view and values, as in the case of Company A.

8.2.3 CROSS-CASE ANALYSIS

8.2.3.1 SUCCESS FACTOR RANKING

Table 8.1 summarises how the ten respondents from the semi-structured interviews and questionnaires ranked the nine NPD process success factors using a Likert-scale. Respondents were asked to rank each of the discussed nine NPD process success factors on a scale from one to six according to their perceived importance or influence, with six being the most important or influential ranking for a factor and one the least. All companies except for Company I ranked almost all factors highly, with a five or six. Only the Companies D and G consistently ranked all factors with a five or six. The Companies A, B, C, E, F, H and J ranked between one and three factors lower than five or six. Furthermore, Companies B, C, F and H stated that certain factors are not applicable as these companies did not undertake the specific factor. Only Company I did not rank any factor with a six, giving users and *top management involvement* the highest score of five. The majority of the remaining factors for Company I rank between one and two. This is reflected in the calculated average scores for each company across all factors. These scores rank from 2.78 for Company I to 5.89 for Company G. The average score for all companies amounts to 5.05.

The calculated average scores for each factor range from 4.8 for *new product strategy* to 5.2 for *top management* and *preliminary financial analysis*. The average score for all factors amounts to 5.03.

Company/ Factor	User involvement and testing	Cross- functional project teams	Top management	Market research	Preliminary technical assessment	Preliminary financial analysis	New product strategy	Product champion	Preliminary market analysis	Average company score
Company A	5	3	6	6	6	6	5	6	6	5.43
Company B	5	N/A	N/A	6	6	6	6	N/A	6	5.82
Company C	5	5	6	6	3	4	4	5	N/A	4.75
Company D	5	6	5	5	6	6	6	6	6	5.67
Company E	5	6	4	6	6	6	6	6	6	5.67
Company F	5	4	5	4	N/A	N/A	6	5	N/A	4.82
Company G	5	6	6	6	6	6	6	6	6	5.89
Company H	5	6	4	6	4	6	5	6	N/A	5.25
Company I	5	4	5	1	3	2	2	1	2	2.78
Company J	5	6	6	3	6	5	2	5	3	4.56
Average	5	5.1	5.2	4.9	5.1	5.2	4.8	5.1	5	5.03

Table 8.1: Case studies – NPD process success factor ranking

8.2.3.1 DESIGN MANAGEMENT

Company	Design Management
Company A	<ul style="list-style-type: none"> Design management is the management of design. The term 'design' predominantly relates to product design in Company A. Design management ensures that all different aspects of the company are represented in a coherent way, and that the brand reflects the products of the company. For this purpose, it is necessary to integrate different experts from different disciplines.
Company B	<ul style="list-style-type: none"> Defined design management as the process of decision-making together with other people. This work relationship has the objective to make a product 'stronger, more robust and easier to deliver'.
Company C	<ul style="list-style-type: none"> The main objective of design management is to aid organisations in benefitting from the use of design. Designers need to understand the business goal better, and simultaneously, businesses need to understand how design can improve their business processes and thinking. Design and the management of design must be integrated into the business structures in order to meet the objectives of the business. A design manager fulfils an educational role by bringing both parties, the business and designers, together and supporting the integration of design into the business structures.
Company D	<ul style="list-style-type: none"> Design management ensures that interactions and experiences with the product have a value to the user. Design management is the management of all involved parties to ensure this objective.
Company E	<ul style="list-style-type: none"> Design management presents a strategic marketing element for each product and for the entire company. Design management is widely applied and has a major impact on the presentation and development of each product. Further areas of design management application are the architectural representation, the creation of working environments for the employees, and the design of customer treatment and experience. Designers are a critical asset and design management is recognised as strategically component.
Company F	<ul style="list-style-type: none"> Design management describes an attitude that looks for constant improvement. Preferred the term 'innovation management', as it was considered wider than design management, as design is only one aspect out of many and is only concerned about the form of a product.
Company G	<p>Differentiation between two different definitions of design management.</p> <ol style="list-style-type: none"> Design management is the management of design. Design management is managing a business using design tools. This approach implies the design of new systems, its testing and implementation as a business model into the company, and benefits from the incorporation of the emotional component of design.
Company H	<ul style="list-style-type: none"> Defined design management as the implementation of design in all company processes. This includes the necessity that all employees are aware of design and its impact on the company.
Company I	<ul style="list-style-type: none"> Design management is the method that leads to the production of the final product.
Company J	<ul style="list-style-type: none"> Defined design management as a multidisciplinary approach that connects different areas of knowledge. Different groups of experts from different disciplines work together.

Table 8.2: Results – Design Management

The personal understandings of design management differ significantly for all participants [see Table 8.2]. It varies from the understanding that design management is a strategic marketing element or a method that leads to the production of the final product up to defining it as a decision-making process. The most common understanding is that design management is simply the management of design. In this function, design management benefits the company by connecting different areas of knowledge in a multidisciplinary approach, with the user at its core.

8.2.3.2 USER INVOLVEMENT AND TESTING – FEEDBACK – TESTING/PROTOTYPE TESTING

Company	User involvement and testing – feedback – testing/prototype testing	Success Factor Ranking
Company A	<p>At the time of the interview, Company A had already launched one product and a second product was ready to be launched.</p> <p>First Product:</p> <ul style="list-style-type: none"> • Self-organised in-house testing utilising a number of friends and family members. • All stages of the testing were conducted single-handedly and no specialists were involved, nor was a specific test procedure developed. • This test was undertaken with a prototype of the final product, and was initially perceived as a very important step in development. Retrospectively, the testing phase was recognised as inadequate, as no particular methods or metrics were in place to capture any results. • The success of the test relied on the subjective view of the Company A owners. However, based on the perceived success of the test, the prototype went into production. • Prospectively, Company A stated the intention to conduct iterative user testing for future products. • A basic feedback form was provided to all customers after the purchase of the product. The intention of the feedback form was to gather ideas for further improvements. <p>Second Product:</p> <ul style="list-style-type: none"> • One in-depth study with a prototype. This involved testing the product in a real-life scenario. • All interactions with the product were recorded and analysed, but no amendments to the prototype were made. It was proposed to adopt this approach more extensively in future times. • In general, the involvement of users and testing the prototype with users was seen as very important. However, Company A stated that this does not improve the product itself, but simply aids in building a relationship with potential customers. 	5
Company B	<ul style="list-style-type: none"> • Customers are primarily involved in the company's NPD process via the social media Facebook. • All products of Company B are displayed on the company's Facebook page. This creates an interactive process with a constant stream of feedback on the existing products. • All customers are encouraged to display how they used the products on the company's Facebook page. • A second stream of feedback derives from fairs and exhibitions, which allow a direct interaction with potential customers. 	5
Company C	<ul style="list-style-type: none"> • Maintains a close relationship with its end users. • Continuously gathering feedback from the end users throughout the entire development process and then incorporating it into the NPD process achieves a close relationship with the end users. • A specific structure for physical meetings with the end users exists. 	5
Company D	<ul style="list-style-type: none"> • Centre the development of each product on the end users. • The testing of the concept before the implementation phase is undertaken internally without the involvement of the users. • At this stage, both the hardware and software undergoes initial testing of similarity to the previously researched user expectations. 	5

	<ul style="list-style-type: none"> The subsequently developed prototype includes both hardware and software. This prototype undergoes rigorous usability testing with the end users. The final user testing is called a beta programme, which involves placing a fully functional prototype with customers for three months in order to gain feedback. 	
Company E	<ul style="list-style-type: none"> Due to the nature of the business, Company E does not directly involve its customers in the product development process. Instead, they involve a network of agents in their development process. These agents form the major target group and function as the major source of information, and as a proxy between the actual customer and Company E. Occasionally, Company E develops a prototype of their product, identifies ten customers through the network of agents and tests the product directly with these ten customers. The product is then refined or approved based on the obtained feedback. 	5
Company F	<ul style="list-style-type: none"> The customers are indirectly involved in the development process, and are represented through the involvement of sales agents. The owner ensures direct contact with the customers through occasional visits of selected customers in order to obtain feedback on their products. Any customer feedback is obtained at the very end of the development process, after the product has been completely developed. 	5
Company G	<ul style="list-style-type: none"> A user-research phase is incorporated before the start of the development process. A user-testing phase takes place after the prototype development stage. Users test the prototype and feedback is obtained to refine the prototype. 	5
Company H	<ul style="list-style-type: none"> Customers are involved at the very beginning of the NPD process. The only source for customer feedback is key account customers (retailers). Their requests for new products or product changes are incorporated. Different prototype testing stages with internal specialists are undertaken. Customers are not integrated in these prototype testing stages. 	5
Company I	<ul style="list-style-type: none"> Customers are involved in the development process. A continuous interaction with the customers at all stages of the development process takes place, including testing the product on the customers. 	5
Company J	<p>The company engages with its customers at two different stages.</p> <ol style="list-style-type: none"> Users are invited to participate during workshops at the beginning of the development process to gather ideas and suggest possible solutions. The users actively participate in a user-testing phase based on the developed prototype. 	5
Average		5

Table 8.3: Results – User involvement and testing – feedback – testing/prototype testing

All companies involve their customers in the development process [see Table 8.3]. The involvement takes place directly or indirectly. Direct involvement is ensured via personal contact, social networking platforms such as Facebook or in-house customer tests. Indirect contact takes place through proxies e.g. retailers and wholesalers, who indirectly provide the companies with end-user feedback. A key aspect in the

involvement of users is their employment in the prototype testing stage, and through obtaining and incorporating their feedback on the prototype. Both are undertaken circular.

8.2.3.3 CROSS-FUNCTIONAL PROJECT TEAMS

Company	Cross-functional project teams	Success Factor Ranking
Company A	<ul style="list-style-type: none"> • An external design agency is commissioned to develop concepts based on the company's product ideas. • Company A decides on the most suitable concept, and then commissions an external engineer to create the technical drawings for the product. • Based on the drawings, a prototype is developed externally and then tested internally. • Marketing and advertising is performed internally. • The company's two owners undertake all internal work. • External specialists provide all other expertise. • No communication takes place between the different external parties, and all communication goes through Company A. • Building cross-functional teams, or ensuring direct communication between the involved parties, was not seen as very important. It was stated that it is just not practical in such a small company. 	3
Company B	<ul style="list-style-type: none"> • The owner of Company B only works with external manufacturing experts to produce the product. 	N/A
Company C	<ul style="list-style-type: none"> • Cross-functional project teams consist of a mixture of external and internal expertise depending on their availability and the needs of the project. • For current project, Company C employed external designers, a film producer, a scenario writer and an independent design manager. 	5
Company D	<ul style="list-style-type: none"> • Cross-functional teams are formed with marketing, R&D, customer experience and operations management experts. • All team members are located in the same building, and a close interaction and cooperation is ensured at all times. 	6
Company E	<ul style="list-style-type: none"> • Fixed project teams with clearly defined policies for the development of each product. • Project teams consist of internal team members from the communications, marketing, legal compliance and finance departments. • External team members from advertising agencies compliment these teams. 	6
Company F	<ul style="list-style-type: none"> • Company F does not form cross-functional teams as part of the development process. • The respondent saw benefits in exploiting this factor and considered it as an important factor. 	4
Company G	<ul style="list-style-type: none"> • Company G consists of eight different departments such as service design, branding, and graphic design. Each department primarily employs staff members from non-design disciplines, such as physiologists and economists. • Cross-functional project teams always consist of representatives from all departments. 	6

	<ul style="list-style-type: none"> Customers, sales agents and top management are typically part of the project teams in order to include knowledge directly from the people involved. 	
Company H	<ul style="list-style-type: none"> Teams consist of a design, development and production group. The design team includes external and internal designers. All other team members are internal staff members. The teams are built at the very beginning of product development. 	6
Company I	<ul style="list-style-type: none"> Formation of cross-functional teams for the development process. Teams consist of members from the research and development, and sales departments. The research and development department is located in China. Hence, those represent virtual teams. The communication between the different team members is conducted via email and video conferences. 	4
Company J	<p>Company J builds cross-functional teams on two levels.</p> <ol style="list-style-type: none"> The heads of each company section meet and develop a roadmap for product development, define the responsibilities in the development process, and allocate resources. Cross-functional teams, consisting of commercial, hardware and software specialists are set up. It is an essential feature for these teams to work together. To further improve the internal communication, they have implemented chat software and ensure regular team breaks for lunch. 	6
Average		5.1

Table 8.4: Results – Cross-functional project teams

The building of *cross-functional project teams* varies depending on the characterisation of the individual businesses [see Table 8.4]. The two micro Companies A and B completely rely on external expertise, which is solely coordinated through the company owners. There is no direct contact or interaction between the different involved external parties. Similarly, Company F relies completely on existing in-house capabilities, but does not form any specific teams within the development process. The different parties who are involved in particular tasks work side by side and are coordinated by the *top management* of the company. Direct interaction between individual parties does not take place. All remaining companies build *cross-functional teams* for the entire duration of the development process. These *cross-functional teams* consist mainly of internal specialists from different areas, and are supplemented with external specialists as needed. The composition of the *cross-*

functional teams depends on the particular needs for the project and specific company characteristics.

8.2.3.4 TOP MANAGEMENT

Company	Top management	Success Factor Ranking
Company A	<ul style="list-style-type: none"> The support of top management is fundamental to Company A, as the owners of the company are the only employees. By the very nature of the company, the top management is involved in all processes, starting at the identification of ideas up to basic project management and administration tasks. Company A states that the top management ideally does not have to be involved in all details as long as it fulfils a supervising role. 	6
Company B	<ul style="list-style-type: none"> Company B has no employees apart from the owner/manager. Hence, the top management is involved in all business areas. 	N/A
Company C	<ul style="list-style-type: none"> Company C ensures direct contact between the responsible design manager and top management by locating the office of the design manager adjacent to top management's office. The interviewee described top management as very committed and directly involved in the current project, which not only benefits the project, but also sets a good example for the entire company for the integration of design. 	6
Company D	<ul style="list-style-type: none"> The top management has limited involvement in the development process. It is only involved in the decision-making and problem-solving processes. 	5
Company E	<ul style="list-style-type: none"> Company E is organised into different business units. The development of new products typically takes place in one of these business units. Each unit is led by one business unit leader who is responsible for all work undertaken in the unit, and is also a member of the board of directors. 	4
Company F	<ul style="list-style-type: none"> The top management is directly responsible for the product development, and leads the process. The top management follows a 'hands-on' approach and is directly involved in every aspect of the development process. 	5
Company G	<ul style="list-style-type: none"> The top management is directly involved in the development process. The company structure and hierarchies are very flat, and this tends to ensure the daily involvement of the top management. 	6
Company H	<ul style="list-style-type: none"> The top management is directly involved in the development process by supervising the project teams. 	4
Company I	<ul style="list-style-type: none"> The top management of the company is directly involved in the product development process. The top management works as a designer in the development team. 	5
Company J	<ul style="list-style-type: none"> The top management is directly involved in important strategic or financial decisions. 	6
Average		5.2

Table 8.5: Results – Top management

All ten companies involve *top management* in their development processes [see Table 8.5]. Three different structures emerged regarding the involvement of *top management*. The micro and small companies naturally have heavily involved *top management*. In these companies, the owners are the only employees, and thus are involved in all aspects. In the micro and small companies with more than one employee, the owners or *top management* are the leaders in the development process. Their involvement is characterised by a 'hands-on' approach, through being the responsible person for all aspects in the development process, from idea generation to the distribution and marketing of the product.

In particular, Company G established a flat hierarchically company structure with no *top management* as such, as all staff members are seen as equal. This results in the deep involvement of the *top management* in all aspects of the company.

On the contrary, the large companies employ project leaders who are responsible for the delivery of the new product. Direct involvement of the *top management* occurs only in the actual decision-making process, or if problems arise such as those reported by Company D.

8.2.3.5 MARKET RESEARCH

Company	Market research	Success Factor Ranking
Company A	<ul style="list-style-type: none"> Market research is undertaken as a standard procedure before the start of the development process in order to identify gaps in the market. This encompasses screening both the market and potential competitors. Different methods of conducting market research are exploited, including visiting shops, trade shows and gathering customer feedback in addition to professional market research reports. The professional market research report was aided by government funding. The standards for market research were not formalised in any way. In general, market research was highly valued as it is very important to understand the operating market before entering. It was acknowledged that the evaluation of the market research must improve. 	6
Company B	<ul style="list-style-type: none"> A limited amount of market research regarding potential sales prices and production costs is undertaken before the production of the products. 	6
Company C	<ul style="list-style-type: none"> Design management is primarily utilised for internal projects. No external market research specialists are employed. A close relationship to all local branches is maintained, and necessary information on strategies, ideas and instruments are gathered from the branches. 	6
Company D	<ul style="list-style-type: none"> Typical market research consists of ethnographic and trend research. The focus lies on customer research. 	5
Company E	<ul style="list-style-type: none"> Company E conducts different market research stages throughout the entire development process. Every stage of the development process is accompanied by market research. The agent network represents the major source for the market research. This factor is very important to Company E. 	6
Company F	<ul style="list-style-type: none"> All market research is conducted through a network of wholesalers. These wholesalers provide Company F with their own market observations, and provide feedback from their customers. 	4
Company G	<ul style="list-style-type: none"> As part of each development process, the company undertakes quantitative and customer research. The actual design and development phase is delayed as much as possible in order to ensure that all necessary information has been obtained. Only after a clear solution has emerged do they start the design and development phase. 	6
Company H	<ul style="list-style-type: none"> All market research activities are undertaken internally. Company H undertakes market research in the art and design market and monitors direct competitors. The market research does not follow any defined structure or methods. 	6
Company I	<ul style="list-style-type: none"> Company I does not undertake any form of market research. It solely relies on customer requests and develops products according to these requests. 	1
Company J	<ul style="list-style-type: none"> Company J undertakes market research in the form of competitor analysis and client conversations. 	3

	<ul style="list-style-type: none"> • This takes place at the beginning of the development process, whilst defining the product requirements. 	
Average		4.9

Table 8.6: Results – Market research

Company I does not undertake any form of *market research*, due to their specific business model of producing custom-made products according to their customers' requests [see Table 8.6]. All other companies undertake *market research*. The quality and quantity of the conducted *market research* varies, and is mainly undertaken by in-house expertise, either at the very beginning of the development process, or as a continuous circle throughout the entire process. Tools and methods for the *market research* include:

- Fairs and exhibitions
- Manufacturer feedback
- Employee feedback
- Ethnographic research
- Customer research/feedback
- Test markets
- Feedback from sales agents/retailers
- Professional market reports
- Intuition
- Competitor analysis.

8.2.3.6 PRELIMINARY TECHNICAL ASSESSMENT

Company	Preliminary technical assessment	Success Factor Ranking
Company A	<ul style="list-style-type: none"> Company A does not undertake a preliminary technical assessment. They work under the assumption that their products are technically feasible, as the focus of the company lies on innovating and redesigning existing products, creating something novel. Due to the learning experience from one product failure, preliminary technical assessment was seen as the most important factor. 	6
Company B	<ul style="list-style-type: none"> Preliminary technical assessment is undertaken to a limited extent, as it is not a necessity for the products, according to Company B. It is considered as part of the development process. 	6
Company C	<ul style="list-style-type: none"> Preliminary technical assessment is an inherent part of the development process. It is not recognised as part of a design management process within the company. 	3
Company D	<ul style="list-style-type: none"> Preliminary technical assessment is of major importance, as all technology for the products is developed by Company D. 	6
Company E	<ul style="list-style-type: none"> Company E undertakes a preliminary technical assessment. The technical assessment is limited to an IT assessment, evaluating how to integrate and coordinate the new product in the existing IT system. 	6
Company F	<ul style="list-style-type: none"> The factor preliminary technical assessment does not apply to Company F. All products are not technically complex and can be developed and produced without any assessment. 	N/A
Company G	<ul style="list-style-type: none"> Company G concentrates primarily on the development of services. Naturally, a preliminary technical assessment is required to a limited extent. 	6
Company H	<ul style="list-style-type: none"> Company H does not produce their products in-house. They rely on different suppliers for production, and choose the supplier according to their expertise. A preliminary technical assessment is not necessary. 	4
Company I	<ul style="list-style-type: none"> The company undertakes preliminary technical assessment. Different sample tools based on different technologies are tested before the development. 	3
Company J	<ul style="list-style-type: none"> Company J undertakes preliminary technical assessment to test required mechanical applications, and to evaluate what technical components are needed for the new product. 	6
Average		5.1

Table 8.7: Results – Preliminary technical assessment

Six companies undertake a *preliminary technical assessment* of the requirements for the product development process, and in the case of Company E, for the integration of the new product in their existing systems [see Table 8.7]. Companies F and G

typically do not undertake a *preliminary technical assessment*. Company G specialises in services, which makes this factor redundant, and Company F produces relatively simple products that do not require a *preliminary technical assessment*. Furthermore, it is not necessary for Company H to address this factor as they solely rely on external manufacturers for production. Company A assumes the technical feasibility of their products – hence, this factor is not addressed.

8.2.3.7 PRELIMINARY FINANCIAL ANALYSIS

Company	Preliminary financial analysis	Success Factor Ranking
Company A	<ul style="list-style-type: none"> Company A developed a business plan and analysed the commercial viability of their product before the start of the development process. No specific budget was allocated to the development of the products. 	6
Company B	<ul style="list-style-type: none"> Company B analyses the potential sales prices and production costs as part of their market research. Before the set-up of the business, Company B developed a general business plan. 	6
Company C	<ul style="list-style-type: none"> Preliminary financial analysis is an integral part of any development project undertaken by Company C. It is moderately important for the current project regarding work safety as safety outweighs any monetary aspects. 	4
Company D	<ul style="list-style-type: none"> Preliminary financial analysis is one of the most important factors. Every product undergoes a detailed analysis regarding its potential return on investment. Development will only be considered if this analysis indicates that the product will be financially viable. 	6
Company E	<ul style="list-style-type: none"> Company E assesses each product regarding its financial viability prior to the development. 	6
Company F	<ul style="list-style-type: none"> Company F does not undertake a financial analysis of their products at any given time. 	N/A
Company G	<ul style="list-style-type: none"> Company G always establishes a business model that evaluates the financial viability and feasibility of all new products. This includes an assessment of the existing business model, as well as the implications of the new product on this business model. 	6
Company H	<ul style="list-style-type: none"> Company H assesses the developing costs, material costs and production costs against the potential sales price. 	6
Company I	<ul style="list-style-type: none"> Preliminary financial analysis is performed before product development in order to ensure that the customer's request can be satisfied at the given price. 	2
Company J	<ul style="list-style-type: none"> Company J undertakes financial analysis before and after product development. 	5
Average		5.2

Table 8.8: Results – Preliminary financial analysis

Company F is the only company out of the cohort of interview partners that does not undertake any kind of *financial analysis* [see Table 8.8]. The remaining nine companies all undertake a *financial analysis* of the new product. Determining the expected or possible return on investment is the key aspect of all *financial analysis*. Hence, the financial viability is a fundamental aspect in the decision-making process.

The decision to take a new product into the development phase is based on the expected financial return on investment. The degree and rigorousness of the *financial analysis* varies from undertaking *financial analysis* parallel to the development process for costs monitoring to determining the return of investment before the start of the development process and establishing a business model and plan for the new product. Hence, a *financial analysis* is an integral part of the product development process.

8.2.3.8 COMPANY STRATEGY – PRODUCT STRATEGY – ALIGNMENT OF COMPANY AND PRODUCT STRATEGY

Company	Company strategy – product strategy – alignment of company and product strategy	Success Factor Ranking
Company A	<p>Company A distinguishes between company strategy and product strategy.</p> <p>Company Strategy:</p> <ul style="list-style-type: none"> The company strategy sets the general strategic direction, which was to specialise in a particular niche area. The company strategy defined general topics, such as the product range and the distribution territory. As a subsequent step, the company strategy outlined developing accessories for the first product. <p>Product Strategy:</p> <ul style="list-style-type: none"> A product strategy for each of the products does not exist. It was not perceived as important, and no reason was given to justify developing a product strategy. No alignment between the existing company strategy and a product strategy exists in any formalised way. 	5
Company B	<ul style="list-style-type: none"> The strategic plan for Company B is to run a completely self-funded business. All products are sustainable and produced from waste materials. A formalised strategy does not exist. Company B claims that a strategy has deliberately not been developed in order to be able to react to specific current needs. 	6
Company C	<ul style="list-style-type: none"> A product strategy exists for all products of Company C. Company strategies for all different brands of Company C exist. 	4
Company D	<ul style="list-style-type: none"> The company strategy is developed as a roadmap setting out clear goals and objectives. An essential feature of the company strategy is to centre everything around the user. Company D develops a separate product strategy for each product. This product strategy is aligned to the overall company strategy. Setting both a company and product strategy, and aligning these to each other, is considered a very important factor. 	6

Company E	<ul style="list-style-type: none"> Company E has a very clear company strategy, with customer focus at the core. A market, communication and design strategy was developed. All strategies tie into each other, aiming at the common goal to instil confidence in the provided service products, understand the customers and provide a friendly and customer-oriented service. All strategies form an essential feature of Company E. 	6
Company F	<ul style="list-style-type: none"> Company F recognised that they communicated a confused image to both customers and staff members regarding its objectives and strategic placement in the market. With the support of an external consultancy, they identified a number of internal and external shortcomings. Company F addressed the improvement of the internal culture through new communication channels and structures. Externally, they identified a problem in their existing market, and changed the strategic positioning of the company, aiming to add value to new and existing customers. This included a new strategy for the packaging of the company in order to ensure higher visibility and the use of sustainable resources, leading to a more attractive and appealing company image. Further aspects in the communication and presentation of Company F were addressed, aiming to present a very clear and contemporary company image. All new product ranges reflect this new style, and are aligned to the company strategy. 	6
Company G	<ul style="list-style-type: none"> Company G developed a ten-year company strategy. This company strategy is called a 'vision plan', and includes what the company and the market environment will look like in ten years' time. Based on the 'vision plan', they defined a set of goals and objectives for the current situation. The product strategies of Company G are not aligned to the company strategy, but are derived from it. This includes separate strategies for each of the eight company departments and is of major importance. 	6
Company H	<ul style="list-style-type: none"> Company H developed a strategy for the brand. They carefully develop strategies for each new product, and ensure that the new product strategies fall in line with the brand strategy. 	5
Company I	<ul style="list-style-type: none"> Company I has no company strategy. The respondent stated that a specific strategy is not necessary because of the size of the company and its operation in a niche market. 	2
Company J	<ul style="list-style-type: none"> Both a company strategy and a product strategy exist. The strategy for each new product aligns to the company strategy. Having a synced company and product strategy is of minor importance to Company J. 	2
Average		4.8

Table 8.9: Results – Company strategy – product strategy – alignment of company and product strategy

All case studies, except for Company I, exhibited a developed *company strategy* [see Table 8.9]. These strategies vary largely from each other, and cover different areas depending on the company. This includes a market strategy, communication strategy, strategy to acquire skills, expanding strategies and long- versus short-term

strategies. The *company strategy* sets the focus, and is important for refining what the company represents. This is usually supplemented by a separate strategy for each product. Companies A, D, G, H and J gave further information about the *alignment of the company and product strategy*. All five companies align their *product strategy* to the existing *company strategy* in order to ensure coherent presentation of the brand image.

8.2.3.9 PRODUCT CHAMPION

Company	Product champion	Success Factor Ranking
Company A	<ul style="list-style-type: none"> One of the owners fulfils the role of the product champion in Company A. As the 'lead believer', he strongly identifies with the product. He is responsible for setting the scope of the product and the direction of development. He oversees the logistics of the development project and allocates sufficient resources to it. This includes the responsibility for meeting time and budget constraints and marketing the product. Company A sees the role of a product champion as very important since every project needs an individual who is ultimately responsible and accountable for product development. 	6
Company B	<ul style="list-style-type: none"> N/A 	N/A
Company C	<ul style="list-style-type: none"> The direct line manager of Company C's design manager acts as the product champion. This person possesses strong knowledge about all facets of the project and has a deep emotional involvement. The product champion has the authority to decide the allocation of resources and funds to specific projects, as well as to set up new projects without prior approval. 	5
Company D	<ul style="list-style-type: none"> Each product has one dedicated and responsible product manager. This person ensures that the product is delivered on time, and that it includes the exact features as agreed upon at the beginning of the development phase. 	6
Company E	<ul style="list-style-type: none"> A marketing specialist always functions as the product champion for each new product. This person is dedicated and responsible for new product development. 	6
Company F	<ul style="list-style-type: none"> Top management of Company F is directly involved and leads product development. Hence, top management is the product champion. 	5
Company G	<ul style="list-style-type: none"> A product champion is always leading the development process. This person is responsible for delivering the product according to the previously agreed brief and timescale. This person makes sure that all other team members can work under the best possible conditions. 	6
Company H	<ul style="list-style-type: none"> The top management fulfils the role of the product champion in Company H. The owner is responsible for the entire product development process, including the marketing of the new product and its distribution. 	6
Company I	<ul style="list-style-type: none"> The company installs a product champion for each product development. 	1
Company J	<ul style="list-style-type: none"> Company J assigns a product champion for each project. This person is responsible for the coordination of the project. 	5
Average		5.1

Table 8.10: Results – Product champion

The business nature of the micro and small companies enabled the *top management* to be closely involved in the development process [see Table 8.10]. The medium-sized and large companies employed a *product champion* with the responsibility for product development. Their responsibilities encompassed meeting deadlines, ensuring compliance with previously agreed briefs, allocating resources, and managing the development of budget and logistics. Furthermore, the *product champion* ensures that the team is provided with the best possible working conditions. The *product champion* is the ‘lead believer’ and ‘lives and breathes’ the product.

8.2.3.10 PRELIMINARY MARKET ANALYSIS

Company	Preliminary market analysis	Success Factor Ranking
Company A	<ul style="list-style-type: none"> Company A took the view that preliminary market analysis is the same as market research. 	6
Company B	<ul style="list-style-type: none"> The respondent from Company B considers preliminary market analysis as congruent with market research. 	6
Company C	<ul style="list-style-type: none"> N/A 	N/A
Company D	<ul style="list-style-type: none"> The marketing department undertakes the preliminary market analysis. This includes the assessment of trends, market changes, competitors, market development and the market size for the new product. 	6
Company E	<ul style="list-style-type: none"> The respondent of Company E considered the factor preliminary market analysis the same as market research. 	6
Company F	<ul style="list-style-type: none"> N/A 	N/A
Company G	<ul style="list-style-type: none"> The client undertakes the market assessment before the start of the project. 	6
Company H	<ul style="list-style-type: none"> N/A 	N/A
Company I	<ul style="list-style-type: none"> Company I does not undertake any preliminary market analysis. All products are custom-made products for single customers. 	2
Company J	<ul style="list-style-type: none"> Preliminary market analysis is undertaken. 	3
Average		5

Table 8.11: Results – Preliminary market analysis

Four of the interviewed companies undertake *preliminary market analysis*. However, a common perception was that *preliminary market analysis* ‘is the same as market research’, as for instance stated by Company E [see Table 8.11]. As part of this factor, the companies undertake an analysis of market trends, market changes, the competition in the market, the market size and existing products in the market.

8.2.3.11 IDEA GENERATION

Company	Idea generation
Company A	<ul style="list-style-type: none"> Identifying problems with existing products of their competitors’ products was the company’s main source of idea generation. Company A obtains ideas for new products from external sources such as magazines, TV, family, friends and customers. Both owners discuss all ideas and assess them regarding their commercial viability.
Company B	<ul style="list-style-type: none"> N/A
Company C	<ul style="list-style-type: none"> N/A
Company D	<ul style="list-style-type: none"> N/A
Company E	<ul style="list-style-type: none"> N/A
Company F	<ul style="list-style-type: none"> N/A
Company G	<ul style="list-style-type: none"> N/A
Company H	<ul style="list-style-type: none"> The retailers are the main source of idea generation for new products. This includes potential customer requests that are brought up through the retailers.
Company I	<ul style="list-style-type: none"> All products are derived from customer ideas as Company I specialises in designing and manufacturing custom-made products.
Company J	<ul style="list-style-type: none"> The idea generation derives from market research, with the objective to identify gaps in the market. Company J relies on ideas for new products from their customers.

Table 8.12: Results – Idea generation

The key aspect for the generation of ideas is identifying a gap in the market [see Table 8.12]. These gaps are identified either internally by the *top management*, or through external sources, such as customers, friends and family, external experts, retailers and *market research*.

8.2.3.12 CHALLENGES AND IMPROVEMENTS

Company	Challenges and improvements
Company A	<ul style="list-style-type: none"> The most challenging factors for Company A were preliminary technical assessment and financial and business analysis. Both factors were seen as needing the most improvement.
Company B	<ul style="list-style-type: none"> N/A
Company C	<ul style="list-style-type: none"> N/A
Company D	<ul style="list-style-type: none"> N/A
Company E	<ul style="list-style-type: none"> N/A
Company F	<ul style="list-style-type: none"> N/A
Company G	<ul style="list-style-type: none"> The biggest company challenge is to work strictly to the established plan, and to go through every single factor in a high-quality fashion.
Company H	<ul style="list-style-type: none"> N/A
Company I	<ul style="list-style-type: none"> The most challenging factor for Company I is user involvement and testing. All testing and customised tools for the production are free of charge to the customer.
Company J	<ul style="list-style-type: none"> Company J states that market research, cross-functional teams and developing a product strategy are the most challenging factors. This is mainly due to a lack of experience since this company has been in operation for only three years.

Table 8.13: Results – Challenges and improvements

Companies I, A, J and G indicated that their major *challenges* are in the development process [see Table 8.13]. All four companies mentioned different factors in this process. The most challenging factor for Company I is *user involvement and testing*. The pilot interview indicated that the factors *technical assessment* and *financial business analysis* are the biggest *challenges*, and were seen as needing the most *improvement*. Conducting *market research*, building *cross-functional teams*, and developing a *product strategy* represent the biggest challenges for Company J. Company G did not perceive any specific factor as particularly challenging, but rather perceived the conduction of all factors in a high-quality fashion as the biggest *challenge*.

8.2.3.13 ITERATIVE PROCESS

Company	Iterative process
Company A	<ul style="list-style-type: none"> • N/A
Company B	<ul style="list-style-type: none"> • Company B undertakes an iterative process for the concept development. • Developed concepts are revised based on gathered feedback.
Company C	<ul style="list-style-type: none"> • Company C employs an iterative feedback and testing process. • The feedback-gathering process follows a set structure. • All gathered feedback is incorporated into the revision of the project and subsequently tested, and new feedback is obtained.
Company D	<ul style="list-style-type: none"> • N/A
Company E	<ul style="list-style-type: none"> • Company E undertakes iterative market research. • Every step in the development process includes a new execution of market research.
Company F	<ul style="list-style-type: none"> • N/A
Company G	<ul style="list-style-type: none"> • Company G conducts iterative prototype testing on users. • Once a prototype is developed, it is tested on a set of users. • The feedback thus obtained is used to refine the prototype and further user-testing stages follow until the prototype is approved.
Company H	<ul style="list-style-type: none"> • Company H undertakes iterative prototype development starting with a very rough version to a detailed final prototype. • They obtain iterative feedback on each prototype from internal specialists.
Company I	<ul style="list-style-type: none"> • Company I is in continuous contact with its customers and iteratively tests the product with their customers.
Company J	<ul style="list-style-type: none"> • An iterative process is applied for prototype testing with users, and for further prototype refinement.

Table 8.14: Results – Iterative process

Seven of the interviewed companies employ an *iterative process* for different aspects of their development process [see Table 8.14]. Most dominant are the *involvement of their users*, obtaining *feedback* from their users and *prototype testing*, or a combination of all three. Only Company E employs an *iterative process* for the factor *market research* throughout the entire development process.

8.2.3.14 INTERACTION OF FACTORS

Company	Interaction of factors
Company A	<ul style="list-style-type: none"> N/A
Company B	<ul style="list-style-type: none"> The owner of Company B stated that all factors are equally important. All factors must work together to successfully market a product.
Company C	<ul style="list-style-type: none"> The representative of Company C considers the interaction and completeness of the entire set of factors as more important than any one single factor.
Company D	<ul style="list-style-type: none"> The interviewee stated that any product could not be conceived without going through the full set of factors discussed in the semi-structured interview. It is important to carry out all factors in high quality and ensure a steady interaction between all involved specialists. As a large multinational company, Company D possesses specialists in all required areas, and it is vital to their success to combine all available expertise to a common effort.
Company E	<ul style="list-style-type: none"> The respondent of Company E stated that all discussed factors are interrelated. It is not possible to skip or miss any single factor, and every factor has to be carried out in high quality. 'You need to do everything right in order to get it right.'
Company F	<ul style="list-style-type: none"> N/A
Company G	<ul style="list-style-type: none"> It is very important to carry out all factors in high detail and quality. Company G stated that it is always unknown what the exact problem or solution might be, unless all factors discussed in the semi-structured interview are adequately addressed. Having a functional and comprehensive process is the most vital point for Company G.
Company H	<ul style="list-style-type: none"> The interview respondent stated that it is very important to have a complete process covering all previously discussed factors. Missing a single factor or executing it in low quality might lead to unpredicted results. The interaction between the different factors and having a complete set of factors is very important.
Company I	<ul style="list-style-type: none"> The interaction of the factors and having a complete process is not important to Company I.
Company J	<ul style="list-style-type: none"> N/A

Table 8.15: Results – Interaction of factors

Seven respondents provided insight regarding the *interaction of the factors* and its importance [see Table 8.15]. Except for Company I, all companies considered the entire set of factors as crucial for the development process. None of the factors can be bypassed in order to identify the problem and solution. Hence, the *interaction between these factors* is crucial, and it needs to be ensured that all factors are carried

out in high quality. Therefore, it is important to have established a clear and defined process that is led by one responsible individual, and is supported by the *top management*.

8.2.3.15 CULTURE

Company	Culture
Company A	<ul style="list-style-type: none"> • N/A
Company B	<ul style="list-style-type: none"> • N/A
Company C	<ul style="list-style-type: none"> • N/A
Company D	<ul style="list-style-type: none"> • N/A
Company E	<ul style="list-style-type: none"> • N/A
Company F	<ul style="list-style-type: none"> • The respondent of Company F highlighted the importance of the right internal company culture in order to ensure success. • Following a top-down approach, top management needs to be fully convinced of the benefits of design management, and to inspire all other staff members. • It is essential to keep all staff members closely informed about current operations, along with future goals and objectives. • It is necessary to create a sense of community to retain staff members, e.g. daily visits of all works, organising company activities, and giving the staff members the freedom and security to develop their own ideas.
Company G	<ul style="list-style-type: none"> • N/A
Company H	<ul style="list-style-type: none"> • According to Company H, it is essential to create a specific company culture to run a successful business and to exploit the full potential of design management. • Every employee must be aware of design and its benefits to the company, what the company stands for and what the company's goals and objectives are.
Company I	<ul style="list-style-type: none"> • N/A
Company J	<ul style="list-style-type: none"> • N/A

Table 8.16: Results – Culture

Companies F and H highlight the need for a specific *culture* in the company in order to promote success [see Table 8.16]. This *culture* centres around design management awareness and the company's specific aims and objectives. This is instilled amongst all staff members by the *top management*. Only such awareness ensures the exploitation of the full potential of design management. Furthermore, Company F

implements further methods to improve the internal *culture* by organising company activities, and giving all employees the freedom to explore their own ideas. The remaining eight companies did not comment on the topic *culture*.

8.3 CONCLUSION/SUMMARY

The primary purpose of undertaking case studies was to examine the utilisation of the nine NPD process success factors in ten European companies. The method for the case studies consisted of the development of a semi-structured interview guide based on the nine NPD process success factors from a literature review. The semi-structured interview guide was successfully tested on a pilot interview with Company A. A deductive coding of all interviews based on the nine success factors and an inductive coding of further reoccurring themes was conducted [see 3.7.3 CHAPTER APPROACH – ANALYSES II – CASE STUDIES]. This methodology ensured that all information about the nine success factors and additional insight were captured, and allowed a cross-case analysis of all case studies.

All participating companies provided valuable insight into the utilisation of the nine NPD process success factors. The methodology choice of conducting semi-structured interviews allowed the capture of information beyond the nine factors. All interviewed companies addressed the majority of all nine factors in their business operations. This demonstrates that the nine factors are of great importance when developing new products under design management principles. However, all companies show significant differences in the scope and rigor of using the different factors, adjusting for their specific industry and sector necessities. In particular, the

cohort of micro and small companies within the case studies do not employ the nine factors to the same extent as do the large companies.

In addition, the results suggest that the majority of the companies consider all nine factors as equally important. This implies that employing a whole set of factors and developing a functional process is more important than executing any individual factor. Additional factors are recognised as emerging themes throughout all interviews. These encompass particular factors such as *feedback* and *prototype testing*.

Hence, analysis of the case studies presents three main conclusions:

- The majority of the case studies utilise all nine NPD process success factors; however, the extent and scope of the utilisation varies depending on the different circumstances.
- The majority of the case studies consider all nine NPD process success factors of similar importance, suggesting that a complete process containing all factors is important.
- In addition to the nine factors, most of the case studies highlighted the particular factors of *feedback* and *prototype testing* as important factors for design management.

CHAPTER NINE

9. ANALYSES III – THE DESIGN MANAGEMENT STAIRCASE MODEL

This chapter builds the basis for a comparison between the analysis of the Design Management Staircase Model scores and the effective utilisation of the NPD process success factors. It aims to provide insight into the design management capabilities of companies described by the dataset based on the Design Management Staircase Model and analyses the functionality of the model itself. Furthermore, the chapter investigates which factors are of greatest importance for design management capability assessment.

9.1 INTRODUCTION

The third part of the analysis concentrates on two major aspects:

1. On the practical application of the Design Management Staircase Model to the dataset from the Design Management Europe Award.
2. On gaining further insight into which factors are of greatest importance for the assessment of design management capabilities.

The contextual review revealed that the Design Management Staircase Model fundamentally follows the same principles, structures, factors and underlying questionnaire as the Design Ladder, the Design Atlas and the Design Process Audit (Kootstra, 2009, Moultrie and Fraser, 2004, Preddy and Conte, 2000, Ramlau and

Melander, 2004, Summers, 2000). However, it remains unclear if the theoretical perspective offered by the Design Management Staircase Model is reflected in its practical application to actual business data. The practical application of the Design Management Staircase Model to the dataset derived from the Design Management Europe Award presents the final step in the investigation regarding the validation of the Design Management Staircase Model. Of particular importance to this PhD, this chapter seeks to gain further insight into which factors of the Design Management Staircase Model are of greatest importance for the assessment of design management capabilities. Expanding the understanding of the importance of the different Design Management Staircase Model factors offers valuable insight into how improved design management capability assessment methods might be developed. Both, testing the validity of the Design Management Staircase Model and the investigation of the relative importance of its factors, provides the basis for further analysis regarding the relationship between the Design Management Staircase Model and the examined NPD process success factors as assessment methods for design management.

9.2 OBJECTIVES

Particular attention for the analysis was given to the trend of the design management capabilities of European businesses reflected in the Design Management Staircase Model level scores 2009-2012 based on different parameters. Each of the parameters relates back to the parameters for the analysis of the utilisation of the NPD process success factors in Chapter 6 ANALYSES I – DEPLOYMENT OF THE NPD PROCESS

SUCCESS FACTORS. The relationship between both analyses is further discussed in Chapter 10 DISCUSSION.

The functionality of the Design Management Staircase Model is examined based on an analysis of the performance of businesses recognising design and design management as an important tool for innovation.

In addition, the interdependencies of the five underlying Design Management Staircase Model factors were analysed based on the question of how far the different factors influence each other, and which of the factors is of greatest importance.

In order to mitigate potential bias, it was assessed if the position of the person who submitted the questionnaire influences the Design Management Staircase Model level score.

The analytical approaches for this analysis chapter were described in the research design section of the methodology chapter [see 3.7.5 CHAPTER APPROACH – ANALYSIS III – THE DESIGN MANAGEMENT STAIRCASE MODEL].

The objectives for this analysis chapter are:

1. Application of the Design Management Staircase Model to the DME Award datasets of European businesses gathered from the years 2009-2012.
2. Analysing the trend of the design management capabilities of European businesses reflected in the Staircase scores 2009-2012 based on different parameters.
3. Analysing the influence of the position of the person who submitted the questionnaire on the Design Management Staircase Model level scores.
4. Analysing the performance of businesses recognizing design and design management as an important tool for innovation reflected in the Staircase scores.

5. Analysing the interdependencies of the five underlying Staircase factors.

A further three hypotheses were derived from the presented objectives.

1. The position of the person who submitted the DME Award questionnaire does not influence the Design Management Staircase Model level score.
2. All DME Award entrants that indicated the recognition of design as a tool for innovation obtain the Design Management Staircase Model level score three or four, and conversely all others are limited to level one or two.
3. The Design Management Staircase Model factor *awareness of benefits* has the highest impact on the Design Management Staircase Model level score.

9.3 RESULTS

9.3.1 DATA SAMPLE

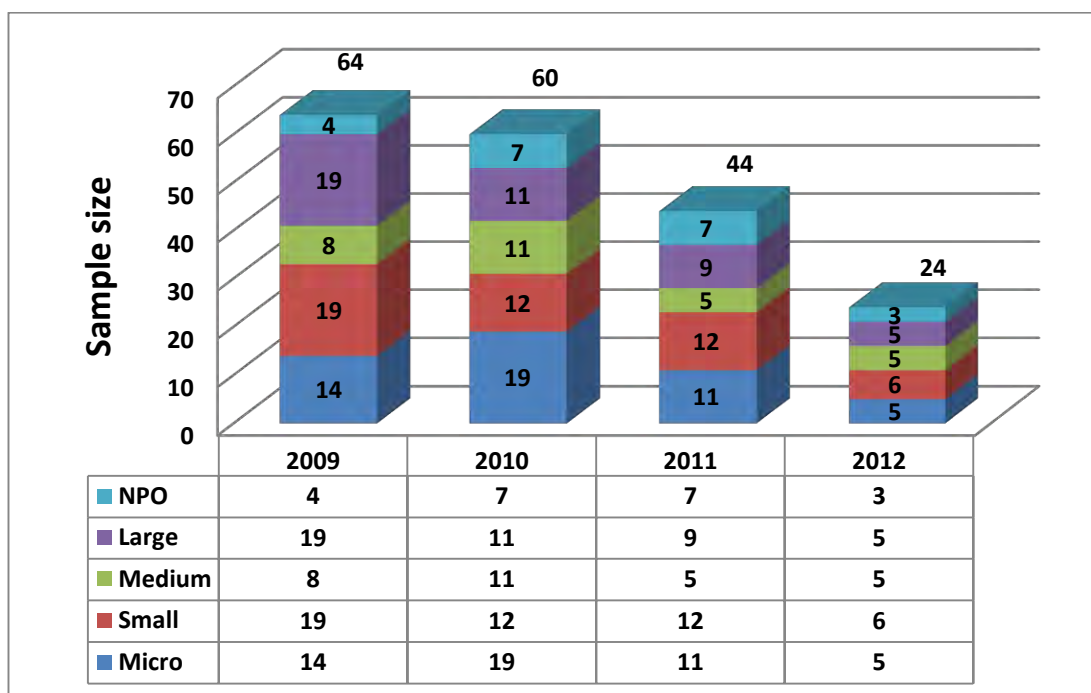


Figure 9.1: Sample size according to the DME Award entry categories for 2009-2012

The entry categories are defined according to the guide of the European Commission (European Commission) and are further explained in Chapter 5 DATA GATHERING I – DME AWARD DATA. The entire data sample encompasses 192 DME Award entrants over the four-year period. In 2009, the DME Award had the highest number of entrants, with 64 entries. Thereafter, the entrants' number steadily declined to 24 entrants in 2012. Equally, the numbers in all five entry categories declined from 2009 to 2012. The majority of the entrants lie in the micro and small category with 49 entrants each, followed by the large category with 44 entrants.

9.3.2 DESIGN MANAGEMENT CAPABILITY TRENDS

9.3.2.1 DEVELOPMENT OF THE DESIGN MANAGEMENT STAIRCASE MODEL FACTOR AND LEVEL SCORES 2009-2012

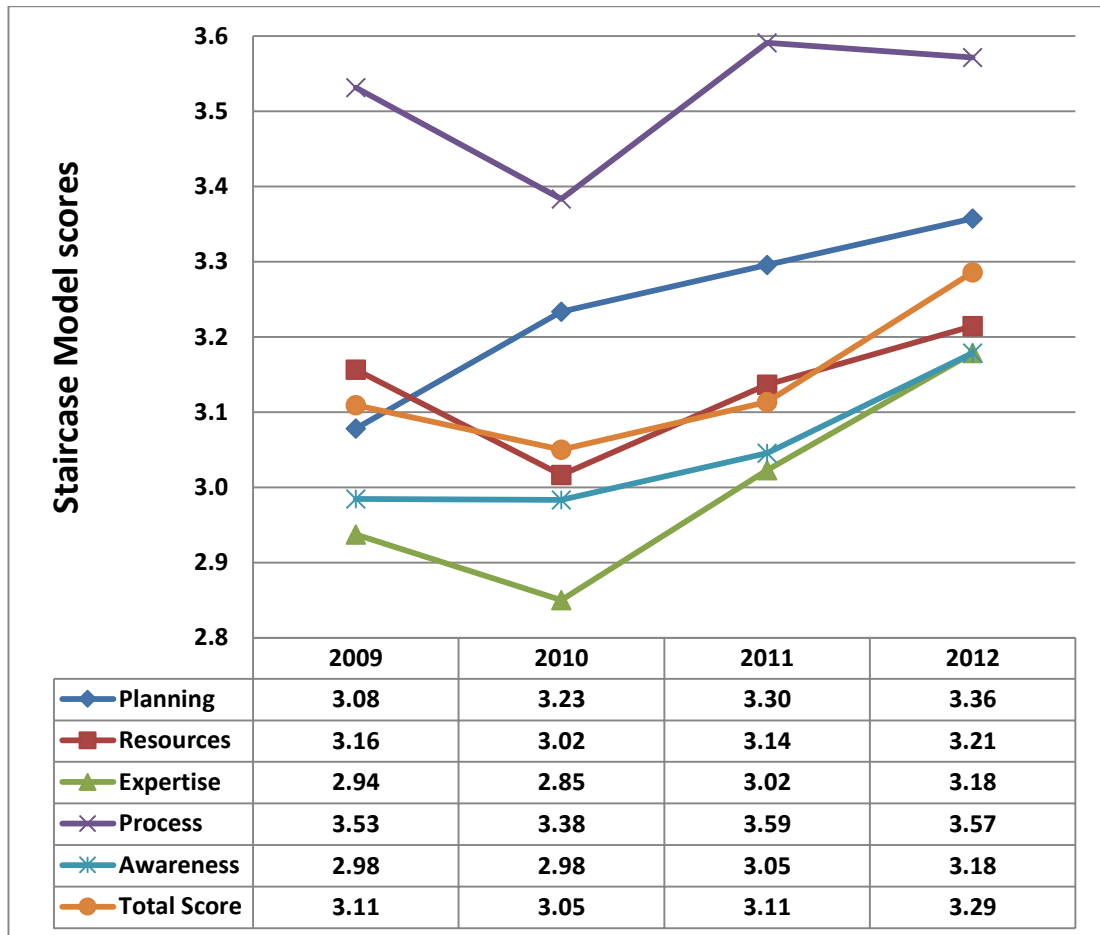


Figure 9.2: Development of the Design Management Staircase Model factor and level scores for 2009-2012

All Design Management Staircase Model scores for the five factors, and the final level score, showed a general positive trend over the four-year period, as illustrated in Figure 9.2. The factors *expertise*, *resources* and *process*, as well as the final level score, showed a decrease in their scores for the year 2010 but increased in 2011. Despite this, the scores still remained high overall, and all factors, except for the factor *process*, reached their highest Design Management Staircase Model factor score in 2012. The factor *process* had its highest score in 2011, and showed a minor decrease

in its score for 2012. Furthermore, the scores for the factor *process* were higher than the other factor scores overall throughout the four-year period.

9.3.2.2 DISTRIBUTION OF DESIGN MANAGEMENT STAIRCASE MODEL LEVEL SCORES 2009-2012

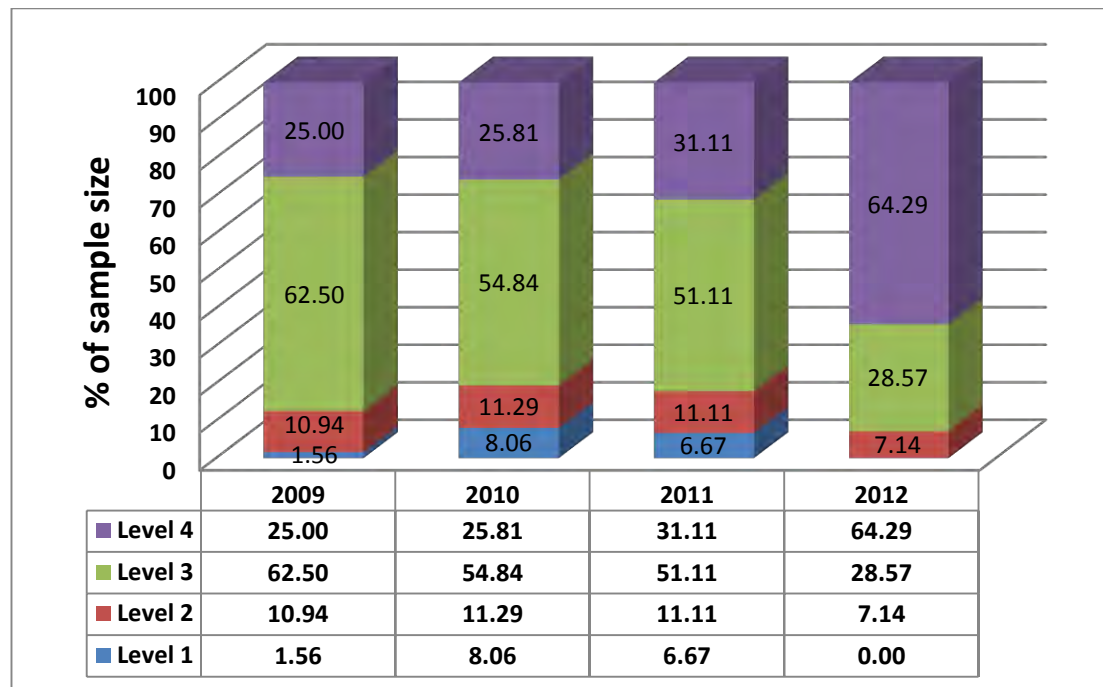


Figure 9.3: Distribution of Design Management Staircase Model level scores in percentages 2009-2012

Figure 9.3 shows the relative distribution of the Design Management Staircase Model level scores of the dataset split into the four different years. The majority of the companies in the dataset achieved level 3 for the years 2009-2011, while slowly decreasing over this period from 62.5% to 51.11%, until it dropped significantly to 28.57% in 2012. On the contrary, the proportion of level four companies slightly increased from 25% to 31.11% in 2009-2011, and more than doubled in 2012 to 64.29%. The percentage of level two companies remained relatively stable over the four-year period, having its smallest proportion in 2012 with 7.14% and its highest in

2010 with 11.29%. Similarly, the level one percentage was the highest in 2010, and lowest in 2012 with 0%.

9.3.2.3 DEVELOPMENT OF DESIGN MANAGEMENT STAIRCASE MODEL LEVEL SCORES ACCORDING TO DME AWARD ENTRY CATEGORIES 2009-2012

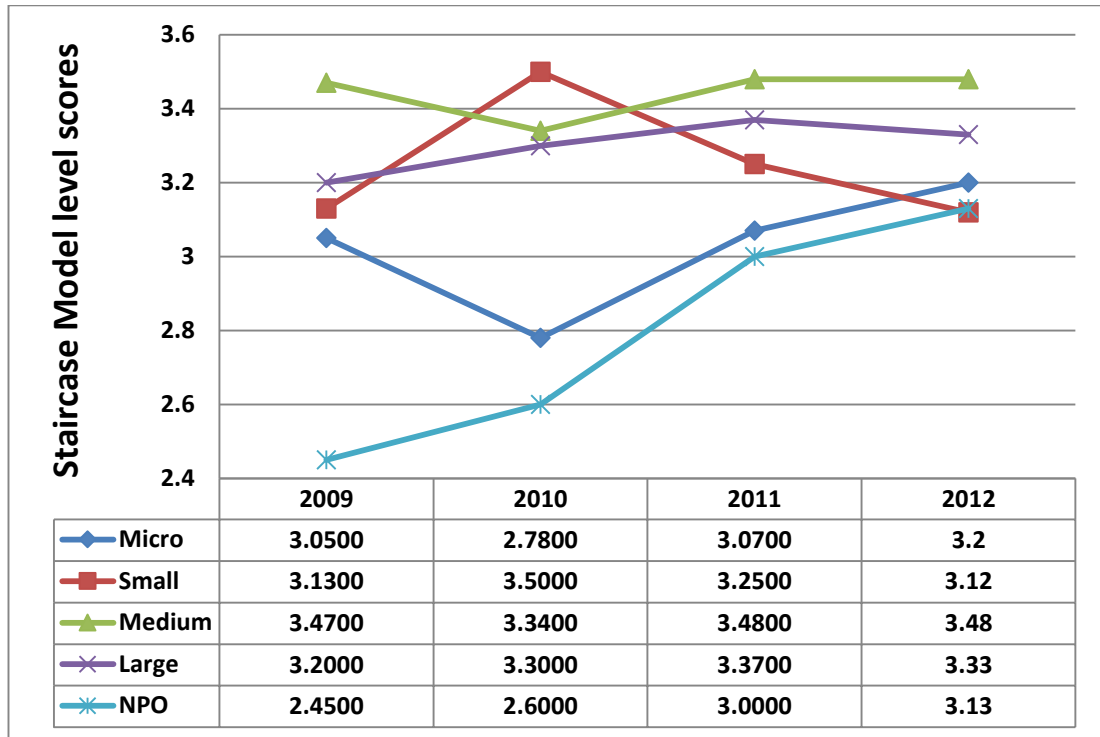


Figure 9.4: Development of Design Management Staircase Model level scores 2009-2012 according to DME Award entry categories

Figure 9.4 shows the dataset categorised into the five DME Award entry categories. All categories, except for the small company category, showed a general positive trend over the four-year period. The small company category showed a weak negative trend, and reached its lowest Design Management Staircase Model level score in 2012.

9.3.2.4 DESIGN MANAGEMENT STAIRCASE MODEL LEVEL SCORES OF THE DME AWARD AWARDEES

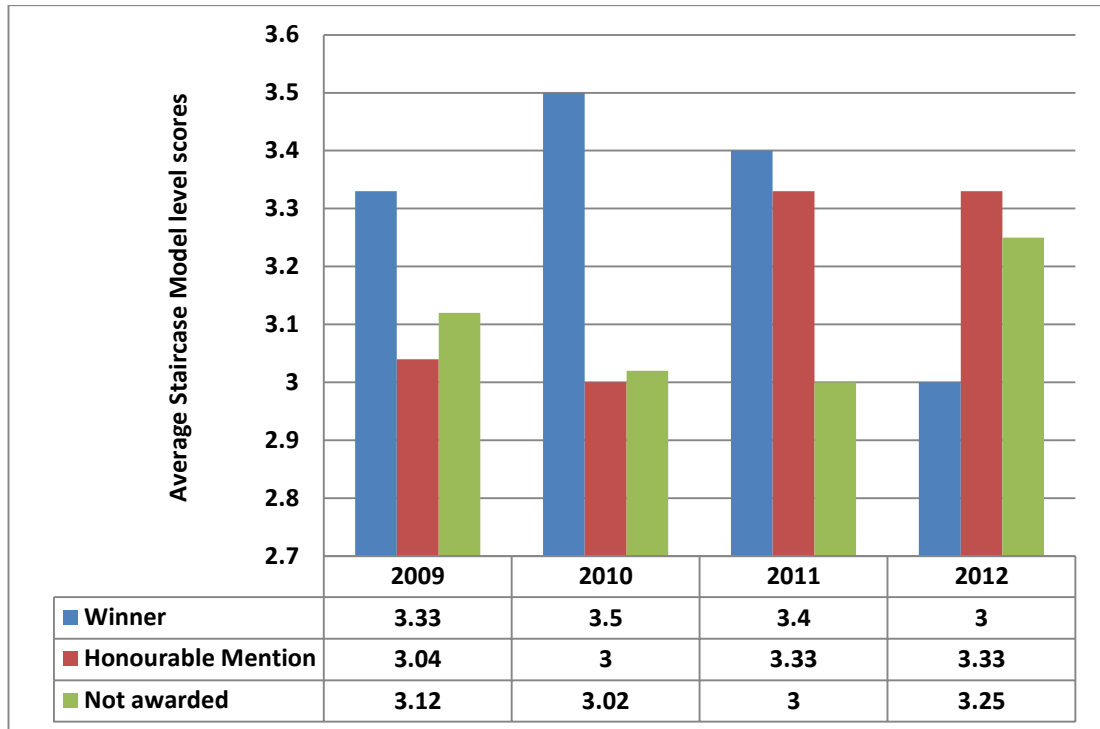


Figure 9.5: Design Management Staircase Model level scores of the DME Award awardees from 2009 to 2012

Figure 9.5 shows the average Design Management Staircase Model level scores of the DME Award awardees for each year of the four-year period. The DME Award Winners achieved the highest average score out of the three groups in 2009-2011, with the highest average level score in 2010, and the lowest in 2009. In 2012 the winners achieved the lowest score out of the three groups, while the DME Award Honourable Mentions achieved the highest. The 'not awarded' entrants reached the second highest level scores in 2009 and 2010, and outperformed the Honourable Mentions in each of these two years. In 2011, the 'not awarded' entrants achieved the lowest score of all groups and years with a score of 3.

9.3.3 POSITION INFLUENCING THE DESIGN MANAGEMENT STAIRCASE MODEL LEVEL SCORES

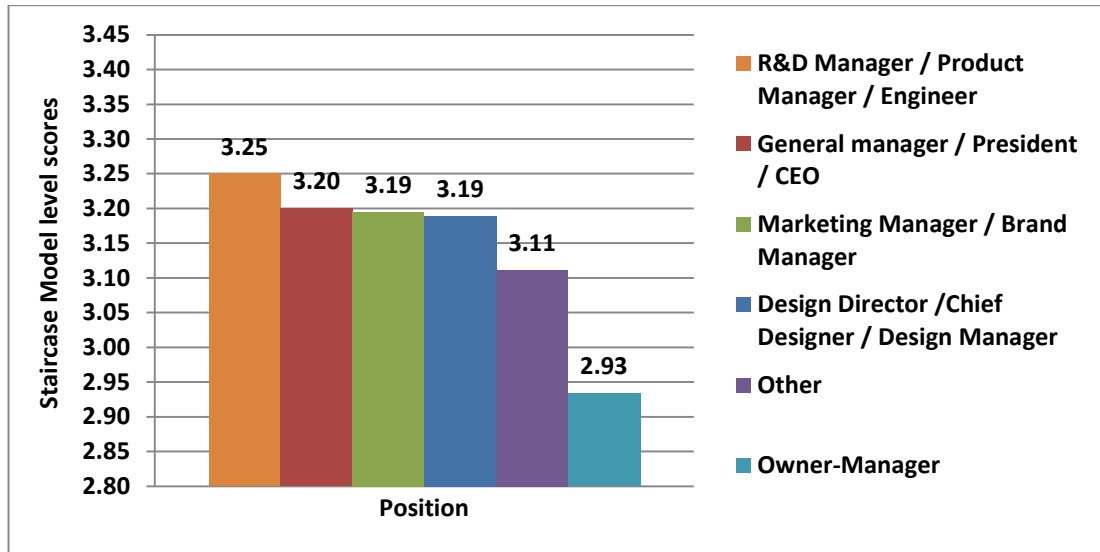


Figure 9.6: Design Management Staircase Model level scores according to the position of the DME Award questionnaire submitter

The questionnaires of the companies that were submitted by the group R&D Manager/Product Manager/Engineer achieved the highest Design Management Staircase Model level scores with 3.25, while the lowest scores were achieved by companies that were submitted by the Owner-Manager, with 2.93.

9.3.4 DESIGN MANAGEMENT AS A TOOL FOR INNOVATION

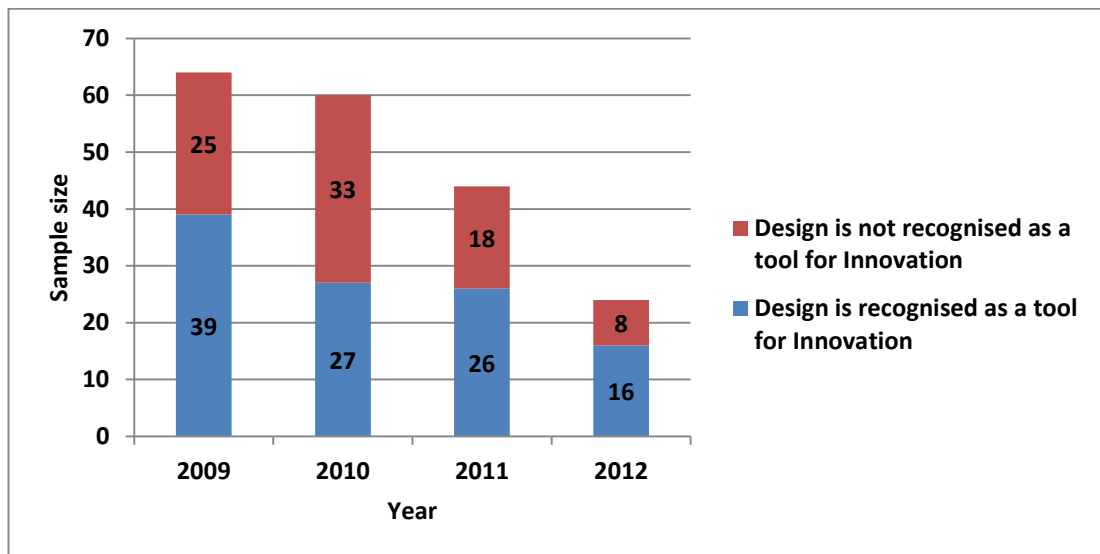


Figure 9.7: Sample size according to businesses recognising design as a tool for innovation for 2009-2012

A comparison was made between the Design Management Staircase Model level scores of DME Award entrants that indicated a recognition of design as a tool for innovation, and those that did not. Across these two groups there were significant differences across the factors *resources*, *process* and *planning* in 2009 and the factor *awareness* in 2010 [see Table 9.1].

Staircase factor	2009		2010		2011		2012	
	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value
Resources	Yes	0.038	No	0.526	No	0.533	No	0.528
Process	Yes	0.001	No	0.235	No	0.084	No	0.881
Planning	Yes	0.035	No	0.807	No	0.648	No	0.928
Awareness	No	0.196	Yes	0.040	No	0.327	No	0.697
Expertise	No	0.212	No	0.620	No	0.051	No	0.976

Table 9.1: Independent Samples Mann-Whitney test

The frequencies for the factors with significant differences between the two groups for 2009/2010 are presented in *Figure 9.8* to *Figure 9.11*.

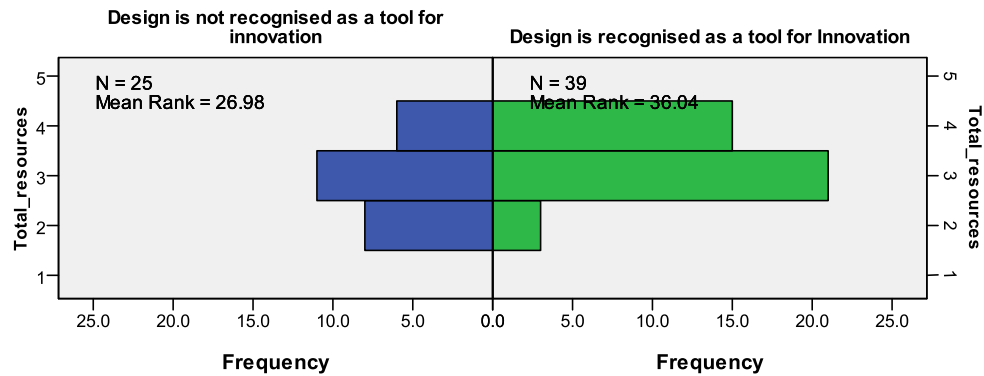


Figure 9.8 Innovation frequencies for the factor 'resources' 2009

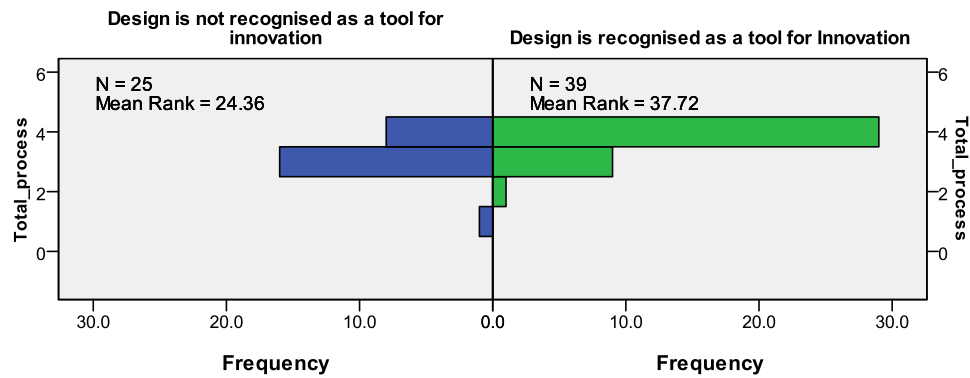


Figure 9.9 Innovation frequencies for the factor 'process' 2009

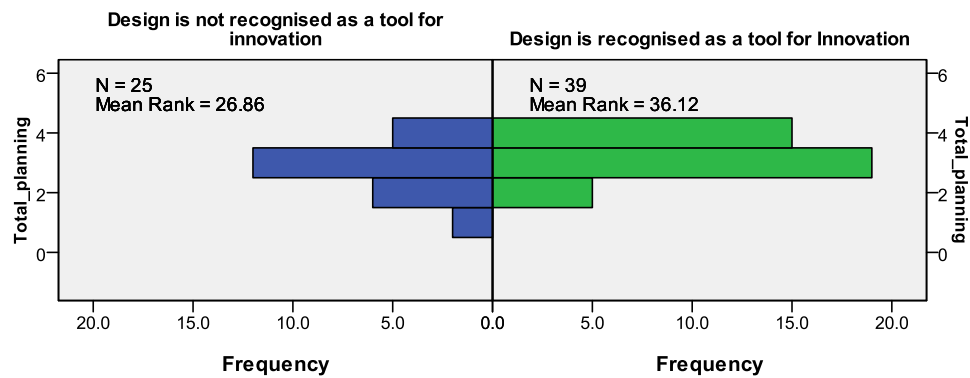


Figure 9.10 Innovation frequencies for the factor 'planning' 2009

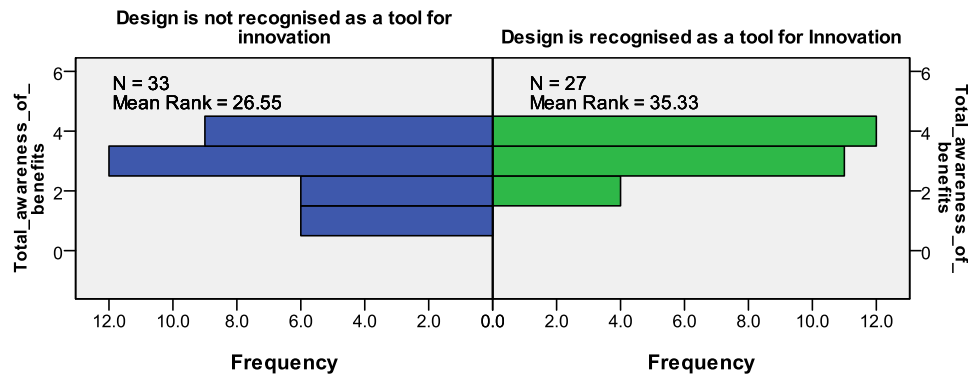


Figure 9.11 Innovation frequencies for the factor 'awareness of benefits' 2010

9.3.5 INTERDEPENDENCIES OF THE DESIGN MANAGEMENT STAIRCASE MODEL FACTORS

Correlations			awareness	planning	resources	expertise	process	total
Spearman's rho	awareness	Correlation Coefficient	1.000	.323**	.395**	.463**	.403**	.645**
		Sig. (2-tailed)		.000	.000	.000	.000	.000
		N	192	192	192	192	192	192
	planning	Correlation Coefficient	.323**	1.000	.398**	.495**	.486**	.626**
		Sig. (2-tailed)	.000		.000	.000	.000	.000
		N	192	192	192	192	192	192
	resources	Correlation Coefficient	.395**	.398**	1.000	.512**	.365**	.679**
		Sig. (2-tailed)	.000	.000		.000	.000	.000
		N	192	192	192	192	192	192
	expertise	Correlation Coefficient	.463**	.495**	.512**	1.000	.561**	.770**
		Sig. (2-tailed)	.000	.000	.000		.000	.000
		N	192	192	192	192	192	192
	process	Correlation Coefficient	.403**	.486**	.365**	.561**	1.000	.608**
		Sig. (2-tailed)	.000	.000	.000	.000		.000
		N	192	192	192	192	192	192
	total	Correlation Coefficient	.645**	.626**	.679**	.770**	.608**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.000	
		N	192	192	192	192	192	192

** Correlation is significant at the 0.01 level (2-tailed).

Table 9.2: Design Management Staircase Model factor Spearman Rank Correlation

The only elements that displayed a strong correlation to each other were between factor *expertise* and the Design Management Staircase Model level score ($r=0.770$, $P<0.0001$). However, all of the other factors displayed a moderate correlation to the Design Management Staircase Model level score ($r=0.608$ - 0.679 , $P<0.0001$) [see Table 9.2].

9.4 CONCLUSION/SUMMARY

The primary purpose of the analyses of the Design Management Staircase Model was to gain insight into the working mechanism of the Design Management Staircase Model, with the help of the practical application of the DME Award dataset to the Design Management Staircase Model. Hence, the objectives of this chapter were outlined as:

1. Application of the Design Management Staircase Model to the DME Award datasets of European businesses gathered from the years 2009-2012.
2. Analysing the trend of the design management capabilities of European businesses, as reflected in the Staircase scores 2009-2012 based on different parameters.
3. Analysing the influence of the position of the questionnaire submitter on the Design Management Staircase Model level scores.
4. Analysing the performance of businesses recognizing design and design management as an important tool for innovation reflected in the Staircase scores.
5. Analysing the interdependencies of the five underlying Staircase factors.

The Design Management Staircase Model level and factor scores were successfully calculated for the entire dataset 2009-2012. Subsequently, the design management capability trends of the Design Management Staircase Model scores based on different parameters were represented. The main conclusions are summarised as:

- The development of the Design Management Staircase Model level score and all factor scores showed a general positive trend over the four-year period [see Figure 9.2].

- The majority of the DME Award entrants achieved the Design Management Staircase Model level score three or four in each year [see Figure 9.3].
- DME Award entrants in the medium-sized category achieved the highest Design Management Staircase Model level scores over the four-year period [see Figure 9.4].
- The DME Award Winners achieved the highest Design Management Staircase Model level score in three out of four years [see Figure 9.5].

Furthermore, the position of the person who submitted the DME Award questionnaire does not appear to have any major influence on the Design Management Staircase Model level score, as there is no major difference between all level scores [see Figure 9.6]. Hence, hypothesis 1 is supported by the results.

The second hypothesis is rejected. A difference in the Design Management Staircase Model level scores between the two groups, recognising design as a tool for innovation or not, was only supported for the Design Management Staircase Model factor scores *resources*, *process* and *planning* in 2009 and *awareness of benefits* in 2010 [see Figure 9.8 to Figure 9.11 and Table 9.1].

The third hypothesis is rejected. The factor *expertise* had the strongest influence on the Design Management Staircase Model level score. However, all of the other factors showed a moderate correlation ($r=0.608-0.679$, $P<0.0001$) [see Table 9.2] to the Design Management Staircase Model level score.

CHAPTER TEN

10. DISCUSSION

This thesis focused on the identification of design management success factors and tools and models to assess design management capabilities in businesses and organisations. The rationale for this research has been to explore how a more robust design management capability assessment model may be developed through a theoretical and empirical investigation into NPD process success factors and design management practice.

This chapter discusses the key research findings from the literature and contextual review and the three analysis chapters.

10.1 INTRODUCTION

The literature review set the scope and theoretical framework for the thesis. The findings of the literature review led to the development of the main research question:

Which factors promote design management success and how are design management capabilities in businesses and organisations assessed?

The methodology chapter provides the general research aim, research objectives, research approach and design, as well as the methodological framework for the literature and contextual review and the case study analysis. The contextual review arose due to the identification of the Design Management Staircase Model as the only available model for assessing design management capabilities. Therefore, in a thesis that aims to understand the requirements for design management success and propose improved ways of assessing design management capabilities, an understanding of the origins of the Design Management Staircase Model is required. The three analysis chapters of this thesis explored and identified important factors for the successful use of design management, and provided a detailed insight into the working mechanism of the Design Management Staircase Model. All results have been summarised at the end of each chapter. This chapter collates and discusses the results.

10.2 AN INVESTIGATION INTO DESIGN MANAGEMENT SUCCESS FACTORS

The literature review examined the development of research on NPD process success factors. In the last 40 years, studies were performed to discover the key success factors that a business needs to employ during new product development.

During this period of time, the emphasis on NPD process success factor research underwent a physical and cultural shift. The early years of NPD process research focused on efficiently performing operational-type factors (e.g. Szakasits, 1974). Gradually, the attention was moved toward the importance of managerial-type factors (e.g. Zirger and Maidique, 1990). It was eventually realised that a combination

of both is necessary for a firm to perform well against its industry competitors (e.g. Song and Parry, 1997a). The most contemporary findings now emphasize the critical value of not just the tasks themselves, but the utilisation of 'soft skills' when conducting these tasks (e.g. Brentani and Kleinschmidt, 2004). Soft skills essentially refer to 'management skills'.

The change from operational to managerial task importance was a significant development in business strategy. Nonetheless, the essence of modern-day new product development is in how design management became the leader and its own discipline within the NPD process.

Particular factors in the NPD process were identified as being the key predictors for successful product development [see Table 2.2]. Though there is a lack of similar studies on design management, with the clear role of how design management acts within the NPD process, it is reasonable to argue that these same factors will be effective in driving successful product development when used in design management. Managerial and operational factors are the important sets of factors in the NPD process. The discriminating factor between the two factor types is that management is the intangible, refining element for all factors. NPD systematically goes through the factors, but depending on the way management is used, specific managing directions can alter the angle with which factors continue. For example, the product strategy determines largely how the NPD process factor of undertaking market research is conducted. This strategy influences the product itself from its purpose to its novel features, in addition to the alignment of the company with the market environment. This, in turn, determines required product materials, market requirements, and thus the necessary market research to accurately pinpoint these

specifications. The same applies to the utilisation of cross-functional teams and the communication therein. Following these principles will change how financial and business analyses are conducted. Having representative experts from a company's various departments meeting periodically, especially before and after key stages of the process, will enable a better understanding to be cultivated of the products' development and financial outlook. An awareness of whether or not budgets are being over- or underestimated is critical in ensuring that product expenditure does not overtake product profit.

In contrast to simply managing the NPD process, design management is the 'how to' of NPD management. It is the management of new product development process factors acting under design principles. As outlined, design management arose out of the shift in importance of the NPD process factor types. By evolving to design management, the actual factors have not changed, but the importance of those factors and the realisation that design can make a difference arose. Therefore, design management primarily refers to the way of managing the NPD process. The actual management factors and operational factors remain the same, and only the recognised importance of design as a leader of the NPD process makes the difference. It may be concluded that all success factors of the NPD process are success factors of design management [see Table 3.1: Research Objectives, number 1]. Consequentially, it may also be concluded that all success factors are managerial-type factors.

A wide range of NPD process success factors have been identified over the last 40 years. However, these research studies were undertaken within different contexts, with different research approaches and methodologies, different data samples, and

resulted in different research outcomes. Hence, it remained unknown which NPD process factors are the most important and have the greatest influence on success in design management and the NPD process alike. The most frequently referenced NPD process success factors from 64 studies were examined and are summarised in Table 2.2. Arguably, these most frequently referenced factors represent the most important factors. Following this argument, it may be concluded that the factor with the most references is de facto the most important factor. On this basis, the most important factors are [see Table 3.1: Research Objectives, number 2]:

- User involvement and testing
- The involvement of cross-functional teams
- The involvement of top management.

The result of this meta-analysis contradicts the previously presented shift in importance of the NPD process success factors from operational to managerial factors. Only the third factor, *top management*, highlights the recognised importance of managerial influence. Hence, in Chapter 6 – ANALYSES I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS was an empirical analysis of the importance of the NPD process success factors undertaken to support the findings of the literature review.

The empirical validation of the nine NPD process success factors based on the DME Award dataset was undertaken in Chapter 6 ANALYSES I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS. The aim of this analysis was to explore the importance of the examined nine NPD process success factors against quantitative data from company participants. Based on the calculated effective utilisation of the NPD process factors it was confirmed that the majority of the DME Award entrants

effectively utilise all established NPD process success factors [see Figure 6.1 to Figure 6.3]. This empirical analysis confirms the validity of the NPD process success factors as success predictors for design management.

Furthermore, it was shown that the effective utilisation of all factors increased over time [see Figure 6.1 and Figure 6.3]. The explanation for the increase in effective utilisation over the four-year period might lie in the acceptance and application of design management. As described by McBride (2007) and Vazquez and Bruce (2002), the field of design management is still emerging and evolving. Because of this, DME Award entrants have a steep learning curve in the field of design management, leading to more effective utilisation of the nine NPD process success factors. Therefore, an increase in the quality of DME Award entrants and their design management capabilities explains the increase of effective utilisation of all factors from 2009 to 2012, and further confirms the validity and accuracy of the NPD process success factors as success factors for design management.

The factors *new product strategy*, *product champion* and *top management* are the most effectively utilised factors and are therefore the most important factors based on this analysis [see Figure 6.1 to Figure 6.5] [see Table 3.1: Research Objectives, number 5]. However, this result differs from the results obtained in the meta-analysis of the NPD process success factors. Further insight from the case studies is thus necessary to explore the relative importance of the NPD process success factors. Only the factor *top management* is represented in both rankings, and can be confirmed as one of the most important of the nine NPD process success factors. However, it is noteworthy that all three are managerial-type factors, while the results from the literature review also included operational-type factors. It can be concluded that this

finding represents a more accurate reflection of the importance of the NPD process success factors. Due to the shift in the research emphasis to highlighting the importance of managerial-type factors, it must be expected that the most important NPD process success factors are managerial-type factors. The literature review, however, included research studies over a forty-year period, which can lead to distortion of the research results as older research studies highlighted the importance of operational-type factors.

Further insight into the utilisation of the nine NPD process success factors was uncovered via a series of semi-structured interviews and questionnaires. The results are presented in Chapter 8 ANALYSES II – CASE STUDIES.

The results of the case studies confirmed the NPD success factors as predictors for design management. Only a minority of the case studies did not utilise all factors. This can be representatively illustrated on the factor *preliminary technical assessment*. According to its definition [see Table 2.2], the factor is primarily concerned with ensuring the feasibility of the new product and its manufacture (Song and Parry, 1997a, e.g. Szakasits, 1974). A number of case study companies did not utilise this factor as they are service providers, rely on external manufacturers or produce very simple products. Hence, the companies state that any technical assessment prior to the production is not required. This illustrates that the extent and scope of the utilisation of the factors largely depends on the particular circumstances of each company. This indicates that the previous argument that some NPD process success factors are more important than others is erroneous. Simultaneously, this also indicates that the previously established rankings of the NPD process success factors do not reflect best practice [see Table 10.1]. A true reflection of the importance of

each NPD process success factor cannot be obtained by solely analysing the utilisation of the factors as companies adapt the extent of the utilisation of the NPD process success factors to their particular circumstances.

Ranking	NPD Process Success Factor List from Literature	Analyses I – Deployment of the NPD Process Success Factors
1	User involvement and testing	Product strategy
2	Cross-functional teams	Product champion
3	Top management	Top management

Table 10.1: Most important NPD process success factors from Literature Review and Analysis I

In particular, the utilisation of the factor *market research* highlights the adaption of the utilisation according to the specific circumstances and needs of each case study company. Multinational companies like the Companies D and E undertake full-scale *market research* including ethnographic, trend and customer research, at every stage of the development process. Micro companies like Company B, however, have to operate on a different scale. Full-scale *market research* during all stages of the development process is not feasible or cost effective for many micro companies. Evidentially, all case studies utilise the nine NPD process success factors and therefore confirm their validity as vital points for design management. At the same time, it is self-evident that all companies adapt the factors according to their needs and special circumstances. Cooper et al. (2002) stated that there is no standard methodology for undertaking *market research*. Nevertheless, it is commonly understood and proven that all factors need to be carried out in a high-quality fashion (e.g. Cooper and Kleinschmidt, 1986). Similarly, Barczak et al. (2009) found that *market research* tools and methods vary from business to business, and even change over time. However, at the same time, it was also evident that the best performing

businesses applied significantly more tools and methods for each factor. This indicates that companies need to adapt the extent and scope of the utilisation of each factor according to their particular needs and circumstances.

The NPD process success factor ranking indicated that the majority of the case studies considered all nine NPD process success factors of similar importance and that a complete process containing all factors is more important than carrying out single factors. Ignoring any one factor leads to insufficient results. Thus, Company G stated that ensuring that all factors are carried out in a high-quality manner is the biggest challenge. In particular, Cooper has described the completeness and proficiency of the NPD process as one of the most important factors. In order to ensure a successful product outcome, the process has to be not only complete and thorough, but also executed in a high-quality manner (e.g. Cooper and Kleinschmidt, 1995a, Cooper and Kleinschmidt, 1993e). This is further highlighted by the results from Company A. Company A does not undertake any *preliminary technical assessment*, but still considered it as a highly important factor, and listed it as the factor where they required the biggest need for improvement. This indicates that Company A achieved insufficient results in their new product development process because this one factor was not addressed in their product development, emphasising the importance of a complete process, as explained by Cooper and Kleinschmidt. This reconfirms that the previously examined rankings of the NPD process success factors do not reflect the best practice [see Table 10.1]. The case study companies not only adapt the extent of the utilisation of the NPD process success factors according to their particular circumstances, but also rank all NPD process success factors of an equal importance.

Lastly, it remained open if any additional factors were considered as important by the case study companies. The factors *feedback* and *prototype testing* were highlighted as important factors for design management. The factor *user involvement and testing* is defined as:

- *User involvement and testing* refers to the understanding that a new product has to respond to user needs. A frequent interaction with users is required in order to gain all necessary information regarding their needs, to understand what benefits are desired, what superior performance is, what quality means and what the user value depends on. A verification that the product responds to the customers' needs and the customer acceptance is obtained through testing the product or prototype before the full-scale launch or development. Hereby, testing can refer to the technical inspection in a lab or under controlled conditions or field trials in collaboration with the end users [see NPD process success factor definitions in Table 2.2].

According to the definition, both *feedback* and *prototype testing* are contained in the factor *user involvement and testing*, which concentrates on ensuring that the new product responds to actual customer needs and wants. It is therefore crucial that customers are part of the development process, their feedback incorporated and prototypes verified and tested against this feedback. Hence, the nine NPD process success factors are confirmed as the only important success factors for design management as none of the case study companies highlighted any additional factors to the already existing list.

Therefore, it can be concluded that nine NPD process success factors from the meta-analysis are valid success predictors for the NPD process and design management alike [see Table 3.1: Research Objectives, number 6]. The validity of the NPD process

success factors was verified against the DME Award dataset. The ranking of the importance of the success factors differed between the results of the meta-analysis and the verification against the DME Award dataset. However, the analysis of the case study companies revealed that all companies adapt the extent of utilisation of the NPD process success factor according to their circumstances and perceive all factors of equal importance. This vital insight corresponds with results of previous research studies (e.g. Cooper and Kleinschmidt, 1995a, Cooper and Kleinschmidt, 1993e). Simply analysing the extent of the utilisation of the NPD process success factors would have failed to capture this due to the limitations of the DME Award questionnaire. This clearly highlights the inherent problem of the DME Award questionnaire as it is only suitable for assessing the extent of the utilisation of the NPD process success factors. Furthermore, the questionnaire fails to take into consideration that companies adapt the utilisation according to their circumstances, leading to an inappropriate assessment of the companies. Further recommendations on how a revised DME Award questionnaire has to be developed are specified in section 10.4 RECOMMENDATIONS.

10.3 AN INVESTIGATION INTO THE DESIGN MANAGEMENT STAIRCASE MODEL

Based on the literature review, the CONTEXTUAL REVIEW confirmed the Design Management Staircase Model and the underlying DME Award questionnaire as an alternative source to assess design management capabilities [see Table 3.1: Research Objectives, number 3 and 4]. However, it was unclear if the theoretical perspective of the Design Management Staircase Model is reflected in the practical application,

and how the identified success factors for design management relate to the Design Management Staircase Model.

Various tests were performed in order to analyse the working mechanisms and functionality of the Design Management Staircase Model itself. In order to ensure that the submitted information was not biased, the position of the questionnaire submitter and their influence on the Design Management Staircase Model level scores was tested [see Figure 9.6]. No major differences in the scores were revealed. In fact, questionnaires submitted by the owner scored the lowest, though it is expected that business owners present their companies in a positive way. In addition, the group 'design managers' achieved a midpoint Design Management Staircase Model level score out of all groups. Hence, it can be concluded that the submitted data represents a non-biased insight into the DME Award entrants.

In order to investigate the working mechanism of the Design Management Staircase Model, the Staircase Model scores for entrants that took a varied view of design as a tool for innovation were analysed. Kootstra (2009) claims that design-driven businesses are better innovators than other businesses. Various studies have demonstrated that design can be the major force for innovation, influencing innovation on different levels (e.g. Perks et al., 2005, Montana et al., 2007). But only through a well-managed process can design release its full potential and enable businesses to use design for innovation (Knošková, 2011). Following this argument, the Design Management Staircase Model level classification states that only at level three and four do businesses start to recognise design as a tool for innovation. Therefore, it would be reasonable to conclude that all businesses that recognise design as a tool for innovation will obtain level three or four within the Design

Management Staircase Model, and conversely all other businesses will be limited to levels one and two. The analyses with the Mann-Whitney test, comparing the scores of each Design Management Staircase Model factor for businesses that did or did not recognise design as an important tool for innovation, revealed significant differences in the scores for 2009 in the factors *resources*, *process* and *planning*. In 2010 a significant difference was uncovered for the factor *awareness* [see Table 9.1 and Figure 9.8 to Figure 9.11]. However, the significant difference in the scores is only detected for the above-listed four factors in 2009 and 2010. Hence, it is indicative of a problem with the Design Management Staircase Model if the instruction is that one does not need to achieve a high level (only an appropriate one), yet recognition of design as a tool for innovation is a pre-requisite for achievement of the higher levels. Further, it is possible (and demonstrated in the results) to achieve these high levels even if a company indicates that it does not recognise design as a tool for innovation, as the overall score is generated from a simple average across all responses.

Furthermore, the interdependencies of the Design Management Staircase Model factors and their influence on the Design Management Staircase Model level score were analysed [see Table 9.2]. The only strong correlation was discovered between the factor *expertise* and the Design Management Staircase Model level score. This highlights the factor *expertise* as the most important factor within the Design Management Staircase Model as it has the strongest influence on the final level score. However, this is not reflected in the structure of the model or in the calculations for the final Design Management Staircase Model level score as the overall score is generated from a simple average across all responses, which indicates the same weight for each of the factors [see Table 3.1: Research Objectives, number 7]. Further

recommendations on how a revised Design Management Staircase Model has to be developed are specified in the section 10.4 RECOMMENDATIONS.

Further recommendations could potentially be gained from exploring the relationship between the NPD process success factors and the factors of the Design Management Staircase Model. The undertaken analyses in Chapter 6 ANALYSES I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS and Chapter 9 ANALYSES III – THE DESIGN MANAGEMENT STAIRCASE MODEL reveal a distinct relationship between the Design Management Staircase Model and the examined NPD process success factors. Both Figure 6.2 and Figure 9.3, the development of the effective utilisation scores and the development of the Design Management Staircase Model factor scores, show a simultaneous increase over the four-year period. This indicates a clear relationship between the Design Management Staircase Model scores and the effective utilisation scores. In the same way, it is shown that the companies with the highest Design Management Staircase Model level score also achieve the highest effective utilisation scores of the NPD process success factors [see Figure 6.4]. Also, all other Design Management Staircase Model level scores correlate with the effective utilisation of the NPD process success factors as the effective utilisation for all factors de- / increases with the Design Management Staircase Model level score. Furthermore, the analyses of the effective utilisation of the NPD process success factors confirmed that the DME Award Winners show the highest effective utilisation scores [see Figure 6.5]. However, the DME Award Honourable Mentions do not show higher effective utilisation scores than the not-awarded companies for all years. The Design Management Staircase Model scores of the DME Award awardees [see Figure 9.5] demonstrate a similar distribution. The DME Award Winners achieved higher

Design Management Staircase Model scores in three out of four years, and the not-awarded companies partly outperform the DME Award Honourable Mentions. Again, both the effective utilisation scores of the NPD process success factors and the Design Management Staircase Model scores display similar patterns. The missing accuracy is explained through the fact that the DME Award Winners are awarded for their presumed outstanding design management performance based on the judges' subjective assessment.

Lastly, the medium-sized category of the DME Award showed the highest effective utilisation scores over all other entry categories [see Figure 6.6]. The medium-sized category of the DME Award showed also the highest average Design Management Staircase Model scores in three out of four years. Again, both results correlate with each other. Hence, it is clearly demonstrated that the Design Management Staircase Model and the NPD process success factors are closely related to each other. However, it remains unclear as to the nature of this relationship and how the NPD process success factors might be integrated into the Design Management Staircase Model.

In comparing the definitions of the Design Management Staircase model factors against the definitions of the NPD process success factors, a wide range of similarities are found. However, there is no direct match between the two sets of factors due to differences in both the definitions and numbers of factors. An overview of the comparison between the Staircase Model factors and the NPD process success factors is provided in Table 10.2.

Staircase Model Factors	NPD Process Success Factors	Similarities
Planning	Partially reflected in: <i>New Product Strategy</i>	<ul style="list-style-type: none"> Defining a strategy in different contexts Design strategy versus Product strategy
Awareness of benefits	Partially reflected in: <i>Top management</i>	<ul style="list-style-type: none"> Management attitude and support is crucial Staircase model factor implies knowledge about design of <i>top management</i> NPD process success factor demands involvement of <i>top management</i>
Resources	Not reflected (excluded from list due to insufficient references)	
Expertise	Reflected to a limited degree in: <i>Product champion</i>	<ul style="list-style-type: none"> Limited information about skill set and expertise in NPD process success factor <i>product champion</i>
Process	Not reflected	<ul style="list-style-type: none"> Not reflected in any single NPD process success factor Every single NPD success factor represents one step of a development process

Table 10.2: Comparison Staircase Model factors - NPD process success factors

The only two factors that contain similar elements in their definitions are *planning* and the NPD process success factor *new product strategy*. Both factors are described as defining a strategy. The factor *planning* refers to outlining a design strategy for design whereas the factor *new product strategy* refers to a product strategy. However, considering that design management is the ‘management portion’ of the NPD process that functions under the consideration of design principles, they both refer to the same principle, but in different contexts [see Chapter 2 LITERATURE REVIEW]. Furthermore, both NPD process and the Design Management Staircase Model set out that the definitions and objectives of the item to be developed must be established and not only be aligned to the overall corporate strategy, but contribute to it as well. An interplay between the overall corporate strategy and the new development is crucial in such a way that they both supplement and complement each other.

Partial overlap can be found between the Design Management Staircase Model factor *awareness of benefits* and the NPD process success factor *top management*. In both, the attitude that the management reflects is crucial. It is important that the

management is convinced and supportive of the NPD and design process. However, it appears that the Design Management Staircase Model factor *awareness of benefits* acts on a slightly different level. The Design Management Staircase Model contains a taught awareness that results in the necessary support for the design process, while the NPD process factor *top management* simply refers to the involvement, commitment and support of top management to ensure a smooth process. Hence, the factor *awareness* actually implies that the top management is knowledgeable about design while the NPD process success factor *top management* calls for the involvement of the top management.

The Design Management Staircase Model factor *resources* is not reflected in the most referenced NPD process success factors [see Table 2.2]. It has been excluded from the list due to a smaller number of references. However, this should not result in a complete mismatch, as both different factors are defined as the same, with the only difference being that the Design Management Staircase Model factor is more clearly defined. It specifically asks for the allocation of resources to the design function, while the NPD process success factor *resources* covers a much wider allocation of resources. Both request the allocation of sufficient resources to ensure the best possible project outcome, and include assessing and budgeting the available resources before the start of the project.

The Design Management Staircase Model factor *expertise* is also not reflected in the listed NPD process success factors. However, the NPD process success factor *product champion* includes limited information about a necessary skill set and level of expertise.

The definition for the Design Management Staircase Model factor *process* outlines the necessity to follow a structured, formalised and implemented process for innovation and development activities. This factor is not reflected in any single factor of the listed NPD process success factors. However, every single listed NPD process success factor represents one step of an innovation or development process. Whilst the NPD process success factors naturally describe in detail which factors are the most prominent for the NPD process, the Staircase factors are defined on a superordinate level. Instead of describing the required process in detail, the Design Management Staircase Model factor *process* only states that a professional and effective design management process which is embedded in core business processes must be followed. Evidently, the Design Management Staircase Model is using a much wider approach than the process-oriented NPD process success factors. The NPD process success factors concentrate on one particular factor of the Design Management Staircase Model, the factor *process*. As it has been shown that these NPD process success factors are suitable to assess design management capabilities, it can be concluded that the NPD process success factors are suitable to inform the Design Management Staircase Model factor *process*. The integration of the NPD process success factors into the definition of the Design Management Staircase Model factor *process* and, in particular, into the underlying questionnaire will significantly enhance and refine the current assessment of design management capabilities through the Design Management Staircase Model. Further recommendations for the integration of the NPD process success factors are made in the following section.

10.4 RECOMMENDATIONS

Based on the gained results, a set of recommendations for the improvement of a revised design management assessment model is developed. This includes:

1. Integration of the NPD process success factors into the Design Management Staircase Model factor *process*.
2. Revision of the DME Award questionnaire.
3. Revision of the calculations for the Design Management Staircase Model level scores.
4. Revision of the relative importance of Design Management Staircase Model factors.

The DME Award questionnaire which provides the information for the calculations of the Design Management Staircase Model scores will have to be changed in a number of different ways. The examined NPD process success factors inform the Design Management Staircase Model factor *process*. An adequate assessment of the nine NPD process success factors is, however, not feasible based on the existing questionnaire. Hence, it will be necessary to include nine new questions which assess each of the nine NPD process success factors. This set of questions will replace the current questions for the factor *process*. Further research will be necessary to determine the exact choice of the questions, and in particular the answer choices. It seems logical to research the most commonly used tools and methods for each of the NPD process success factors and establish multiple-choice answer options with all tools and methods. Based on the extent of the usage of these tools and methods it will be possible to determine the level of sophistication.

Furthermore, it has been demonstrated that large companies utilise significantly more tools and methods than micro companies. The current assessment method fails to take into consideration this adaptation of the utilisation of all tools and methods according to specific circumstances. In order to address this it is recommended to either develop different versions of the questionnaire for each company size or to develop different calculation methods for the different company sizes. Both options will have to consider that the utilisation of the tools and methods varies depending on the size, and that this does not necessarily result in lower design management capability levels. For an even further refinement it is recommended to customise the assessment methods according to sectors as different tools and methods are of different importance in different sectors, for example manufacturing companies versus service providers. This research provided deep insight into design management success factors and consequentially into the Design Management Staircase Model factor *process*. It is self-evident that the remaining four factors will have to be researched in the same way in order to ensure a more adequate assessment of design management capabilities. All of the recommendations above will also naturally apply to the remaining four factors.

The Design Management Staircase Model classification states that only at level three and four do companies start to recognise design as a tool for innovation. The results demonstrated that companies on levels one and two recognised design as a tool for innovation, and, vice versa, companies on levels three and four did not. The recommended changes will address this failure of the Design Management Staircase Model in two different ways. Firstly, due to the recommended customisation to the questionnaire or the score calculation, it will be ensured that good design

management capabilities are also recognised even if fewer tools and methods are utilised. Secondly, it has been argued that only a well-managed process can unleash the full potential of design (Knošková, 2011). However, arguably, the process is not adequately captured in the current Design Management Staircase Model, which leads to an inaccurate assessment of the design management capabilities. It is expected that the above proposed integration of the NPD process success factors will significantly improve the accuracy of the assessment and simultaneously address the discrepancy between the Design Management Staircase Model classification and the results.

Lastly, it is recommended to adjust the weighting of the influence of the Design Management Staircase Model factor scores and the overall level score. It is demonstrated that the factor *expertise* has the highest impact on the overall level score. Nevertheless, this is not reflected in the calculations of the overall level score as it is calculated out of a simple average of all five factor scores. Hence, it is recommended to adjust the calculation in order to reflect the high importance of the factor *expertise* for design management capabilities. The calculations for every single factor of the Staircase Model will remain the same. However, it will be necessary to adjust the relative influence of the factor *expertise* on the overall score. Hence, calculating the overall score out of a simple average of all Staircase Model factor scores is not adequate. Based on the statistical calculation [see Table 9.2] it will have to be determined how the factor *expertise* has to be weighted in order to reflect its highest impact on the overall score.

CHAPTER ELEVEN

11. CONCLUSION

This chapter presents the conclusions drawn from the research undertaken in this thesis by answering the presented research questions and highlighting new contributions to knowledge. It will reflect on the weaknesses and limitations of the research and set out recommendations for future research to expand on the results.

11.1 INTRODUCTION

Over the last decades, design has become an imperative for innovation, differentiation and economic success. This PhD thesis identified a particular lack of knowledge available on the assessment of the impact of design and the management of design on business performance. Little evidence has been presented to quantify what design and business capabilities have to be developed and utilised for the successful implementation of the management of the design function, design management. Hence, the purpose of this PhD was to uncover which factors support a successful implementation of design management and to explore how existing design management capabilities within organisations and businesses can be evaluated.

The main research question was formulated as:

Which factors promote design management success and how can design management capabilities in businesses and organisations be assessed?

The research in this thesis has attempted to fill the identified gap in knowledge and has addressed the derived research question with a theoretical and empirical investigation into design management success factors. The Design Management Staircase Model was assessed as the currently only existing model to assess design management capabilities. Based on the gained insight from the investigation into design management success factors, a set of recommendations was made for how the model can be improved and how design management capabilities can better be assessed.

11.2 REVISITING THE RESEARCH QUESTION

11.2.1 EMPIRICAL FINDINGS – AN INVESTIGATION INTO DESIGN MANAGEMENT SUCCESS FACTORS

The following section provides an overview of the main research findings of the first part of the main research question ‘*Which factors promote design management success?*’.

The first part of the research question was answered through research presented in the following chapters: LITERATURE REVIEW (Chapter 2), ANALYSES I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS (Chapter 6) and ANALYSES II – CASE STUDIES (Chapter 8).

The findings of the literature review and a meta-analysis on NPD process success factor research proposed that NPD process success factors may also be a set of the most important design management success factors. An empirical validation of the NPD process success factors based on the dataset from the DME Award confirmed these findings in Chapter 6. Based on the literature review, the NPD process success factors *user involvement and testing*, *cross-functional teams* and *top management* were identified as the three most important success factors. The results from Chapter 6 indicated the success factors *new product strategy*, *product champion* and *top management* as the most important success factors.

These discrepancies were further explored through the analysis of case studies in Chapter 8. The analysis results also confirmed the nine NPD process success factors as predictors for design management success. The extent and scope of the utilisation was context dependent for each case study. Furthermore, it was disclosed that the case studies consider all nine NPD process success factors to be of the same importance. A complete process containing all factors is of higher importance than the individual factors.

11.2.2 EMPIRICAL FINDINGS – AN INVESTIGATION INTO THE DESIGN MANAGEMENT STAIRCASE MODEL

The following section provides an overview over the main research findings of the second part of the main research question '*How can design management capabilities in businesses and organisations be assessed?*'.

The second part of the research question was answered through research presented in the following chapters: CONTEXTUAL REVIEW (Chapter 4), ANALYSES III – THE

DESIGN MANAGEMENT STAIRCASE MODEL (Chapter 9) and parts of ANALYSES I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS (Chapter 6).

The findings of the contextual review confirmed the validity of the Design Management Staircase Model as a robust and suitable model to assess design management capabilities. The structure, factors and the underlying questionnaire of the Design Management Staircase Model built largely on a combination of the Design Ladder, the Design Process Audit and the Design Atlas (Moultrie and Fraser, 2004, Preddy and Conte, 2000, Ramlau and Melander, 2004). However, it is not without limitations, and this research has developed recommendations to significantly improve the tool.

The results of the analysis of Chapters 1 and 3 confirmed the validity of both approaches – the Design Management Staircase Model assessment and the NPD process success factors – as important predictors for design management capabilities and success. This was confirmed by the relationship between the Design Management Staircase Model scores and the effective utilisation scores for different parameters. Further tests highlighted the inherent problem of the instructions of the Design Management Staircase Model that one does not need to achieve a high level (only an appropriate one), yet recognition of design as a tool for innovation is a pre-requisite for achievement of the higher levels. The results demonstrated that it is possible to achieve these high levels, even if a company indicates that it does not recognise design as a tool for innovation, as the overall score is generated from a simple average across all responses. Testing the interdependencies of the Design Management Staircase Model factors and their influence on the Design Management

Staircase Model level score revealed that the only strong correlation was between the factor *expertise* and the Design Management Staircase Model level score.

11.3 CONTRIBUTION TO KNOWLEDGE

The research contained in this thesis has the potential for significant impact on design management capability assessment tools and methods and contributes to various areas in the field of design management. In particular, the research contributes to the following:

- Understanding of the discipline design management
- Contribution to research in the field design management
- Design management capability assessment tools and methods

A multitude of design management definitions have been established over the last decades but no commonly accepted definition exists. It is perceived that the lack of clarity in the field design management is largely derived from uncertainty about the origins of the field. The extensive literature review provides a systematic overview of the history of design management and its development. The thesis demonstrates that both the NPD process and the design function underwent a significant shift in importance over the last decades, highlighting the increased importance of design. This shift in importance of both has led to the development of the concept design management. In the evolution of design management, the actual factors have not changed, but their importance and the realisation that design can make a difference, increased. Therefore, design management can be viewed as a way of managing the NPD process. Understanding its history is a crucial step for every discipline to develop a self-conception and for differentiation from other disciplines, eventually leading to

commonly accepted classifications and definitions. By highlighting the historic development of design management, this thesis makes a significant contribution towards this.

Further contributions to the field are made through establishing a better understanding of crucial design management capabilities. The literature review highlights a range of existing design management models as well as the lack of research and models assessing design management capabilities. Understanding what capabilities need to be established for successful design management is a prerequisite for the success and continuity of the academic discipline design management and its practical application in businesses and organisations alike. Research into the design management capabilities that need to be developed and how they can be assessed represents fundamentally important research in the field. The research paves the way for a more consistent application of design management across organisations. The Design Management Staircase Model is identified as the only existing model which sets out to assess design management capabilities. However, it lacked academic evaluation and thus remained open to criticism. The undertaken research confirms the validity of the model as a suitable model to assess design management capabilities as an initial step to close this gap in the existing research. The meta-analysis reveals the nine most important factors for the NPD process and is followed by an empirical investigation demonstrating that these same nine NPD process success factors should be used to facilitate design management success. It is concluded that the derived NPD process success factors represent a valid and suitable tool to assess design management capabilities and success. The nine NPD process success factors are not exclusive to the NPD process but are considered

as the most important factors. A wide range of additional factors have to be considered to establish a complete NPD process, such as the allocation of sufficient resources, creating an innovation culture, and, foremost, the identified factors feedback and prototype testing. The research revealed that all NPD process success factors are of equal importance, highlighting that a complete process is of higher importance than single factors. Both results contribute largely to the understanding of design management and in particular how design management can be assessed. It confirms that it is not only important to implement a process, but also highlights the most important factors which have to be part of a complete and consequentially successful design management process. Nevertheless, it is noteworthy that the conducted research concentrates on research on the design management process. The comparison of the NPD process success factors, as shown in the discussion, highlights that the five Design Management Staircase Model factors are defined on a broader level than the NPD process success factors. The Design Management Staircase Model factors include further areas such as awareness of design management benefits, the design management process or design management expertise. On the contrary, the NPD process success factors represent process-oriented factors and are therefore suitable to inform the Design Management Staircase Model factor *process*. Hence, the research presents an important step in understanding necessary design management capabilities and how to assess them but only examines one important factor in a set of design management capability factors. However, the gained results provided ground for a set of recommendations for the development of an improved design management capability assessment model and data capture.

Furthermore, the high importance of the Design Management Staircase Model factor *expertise* highlights the importance of acquiring the right expertise in order to build design management capabilities. The underlying message of the results in this PhD thesis can be summarised as: successful design management capabilities are highly dependent on the right expertise and building a complete process which consists of the derived nine NPD process success factors. This finding provides an important indication that future research in design management will have to concentrate in particular on the soft skills necessary for the successful implementation of design management, a field which has been largely unexplored up to date. The future research section suggests that consideration of intangible skills such as management and leadership skills for design management is required.

Furthermore, the Design Management Staircase Model has been shown to be a potentially valuable tool for the self-assessment of design management capability in businesses. It offers a simple and effective way for companies to discover their own weaknesses, and the obstacles that prevent them from implementing design in their management structures, whilst also highlighting strong areas and increasing the awareness of design management and company capabilities. For the first time, the application of the Design Management Staircase Model provides the opportunity for every business and organisation to turn the largely intangible and blurred concept of design management into a tangible concept with clear targets and predictable outcomes.

In summary, the PhD thesis contributed new knowledge in the following ways:

- For a design management-led NPD process, the implementation of a complete process of factors is more important than any single factor.
- The Design Management Staircase Model factor *expertise* is of outstanding importance for design management.
- A set of recommendations for the development of an improved design management capability assessment model and the data capture related to the Design Management Staircase Model factor *process*.
- A meta-analysis revealing the nine most important factors for the NPD process.
- An empirical investigation demonstrating that these same nine NPD process success factors should be used to facilitate design management success.
- The Design Management Staircase Model is a suitable tool to assess design management capabilities, despite its identified limitations.
- Further justification of why design and design management are increasingly important business resources.

11.4 LIMITATIONS

This PhD thesis has extended the academic knowledge about design management and contributed to an improvement of how to assess design management practices in an industrial context. The research has covered a wide area of different topics. However, as with any research programme, there are limitations inherent within the chosen methodologies and the extent and scope of research undertaken in the thesis. Some of these limitations are discussed in the following.

11.4.1 LITERATURE REVIEW

The literature review was undertaken in a systematic manner, with predefined search options, and clearly defined criteria for the identification of relevant articles. However, it has to be considered that the derived NPD process success factors reflect research findings over a 40-year period. The literature review itself demonstrated that the research focus and findings have significantly developed over this period. Hence, findings of a certain period might have influenced the final list to a high degree, leading to an underrepresentation of particular factors in the list. Therefore, the list of the most frequently used NPD process success factors may represent a biased portrayal.

The aim of the literature review was to identify the development of NPD process success factor research, as well as the evolution of the design management field, and compile a list of the most frequently referenced NPD process success factors. Given this aim, the meta-narrative mapping analysis provided the most rigorous and appropriate methodology choice as it aims to demonstrate the development of a particular topic over time by linking the analytical narrative literature review with the rigorous methodology of a systematic review. This results in capturing qualitative changes over a particular period of time, as well as incorporating quantitative data (Jesson et al., 2011). Utilising this method allowed the presentation of the development of both research fields over the chosen time period, while simultaneously examining the quantitative data of the NPD process success factor research studies. The incorporation of rigorous methodologies regarding the selection of research articles ensured comprehensive insight into both developments and significantly reduced any bias.

Further measures were taken to widen the inclusion of research articles by reference searching the bibliographies of two articles on existing literature on NPD process success factor analyses by Montoya-Weiss and Calantone (1994) and Ernst (2002).

Furthermore, it has to be considered that the dominance of some authors (e.g. Robert Cooper and Elko Kleinschmidt) might have led to over-emphasising the importance of some NPD process success factors as the same datasets and results may have been used for different articles. Every considered article was carefully analysed to exclude any articles based on the same datasets and results and to minimise any bias.

11.4.2 ANALYSIS I – DEPLOYMENT OF THE NPD PROCESS SUCCESS FACTORS

The ranking system mitigated the uneven distribution of corresponding questions of the DME Award questionnaire to the nine NPD process success factors. With this ranking system, each corresponding question for each factor has an equal weight on the final score for each factor. Nevertheless, all NPD process success factors still have an uneven distribution of corresponding questions which cannot be compensated by the ranking system, and highlights the complication of working with a predefined questionnaire and dataset. It is for this reason that this thesis has presented recommendations for the future improvement of the DME Award questionnaire.

11.4.3 ANALYSES II – CASE STUDIES

Two of the case studies were conducted via questionnaires, and not via semi-structured interviews. This changed setting and format, as well as the time frame to respond, may well have influenced the given answers. Also, the questionnaire format

is not as detailed as the semi-structured interview, and does not allow further follow-up questions et cetera.

Finally, it has to be taken into consideration that some case study respondents might not fully understand each question, as for example most considered preliminary market analysis and market research as the same. This limitation can never be fully excluded. However, all possible measures were undertaken to ensure a full understanding of all aspects of the semi-structured interview.

11.4.4 ANALYSES III – THE DESIGN MANAGEMENT STAIRCASE MODEL

One of the major limitations is the data gathering. The answers to the questionnaire that underpin the Design Management Staircase Model scores are largely dependent on the individual's perception. This makes comparison between businesses and the classification in the model itself subjective. Furthermore, as the questionnaire is linked to a competition, then organisations might bias their self-reporting in an attempt to win an award. Testing if the position of the person who submitted the questionnaire influenced the Design Management Staircase Model scores showed no major differences in the Design Management Staircase Model scores for the different groups.

In addition, the data sets contain different businesses each year, so there is no opportunity for the examination of business progression over time

.

11.4.5 FURTHER LIMITATIONS

Further limitations are due to the focus of the thesis and the inherent scope of the undertaken research.

The thesis fully concentrates on research regarding the NPD process and consequentially on the design management process. However it is evident that a wide range of other factors influence the successful application of design management and the development of design management capabilities. The Staircase Model covers further four factors which are considered as important design management capabilities, namely: *awareness of benefits*, *expertise*, *resources*, and *planning*. Arguably, developing capabilities in all five factors should enable every business and organisation to operate successful design management. However, this fails to take into account that soft skills such as in particular management and leadership skills largely influence the successful application of design management. This ties in with the limitation that the thesis did not investigate the appropriateness of the Staircase Model factor structure in detail. It was established that the Staircase Model is adapted from three different established sources. Therefore, it was concluded that the model presents a valid approach to assess design management capabilities. It was however refrained from undertaking a detailed analysis if the five Staircase Model factors are the only factors which are important to build up design management capabilities. Hence, it remains unknown if any additional factors such as management and leadership skills are important design management capabilities.

Furthermore, the scope of the research was limited to the datasets from 2009-2012. The dataset from 2008 was excluded due to differences in the questionnaire. This dataset contained 152 questionnaires, which could have strengthened the obtained results and potentially offered further insight into the utilisation of the NPD process success factors as well as into the working mechanism of the Staircase Model.

11.5 FUTURE RESEARCH

A range of future research opportunities were listed in the recommendations, including:

1. Integration of the NPD process success factors into the Design Management Staircase Model factor process.
2. Revision of the DME Award questionnaire.
3. Revision of the calculations for the Design Management Staircase Model level scores.
4. Revision of the relative importance of Design Management Staircase Model factors.

Additional research opportunities were highlighted in the limitations. Addressing the potential underrepresentation of particular factors in the list due to the significant changes in the research focus and findings of the NPD process success factor research over the considered 40-year period is of particular importance for this research. Figure 2.1 and Figure 2.2 highlighted the peak period (1984-1997) of research into NPD process success factors. It is recommended to concentrate on this period and establish an updated list of NPD success factors. This would result in limiting the amount of considered research studies to 36. However, by concentrating on this 13-year period any potential bias regarding the representation of the factors in the NPD

process success factor list would be addressed. Further research in this area would greatly benefit from comparable datasets for different years so that progression over time could be evaluated. Hence, it is proposed to approach a set number of previous DME Award entrants in order to obtain an update questionnaire and enrich the current dataset by an additional component.

Furthermore, it is proposed to extend the amount of conducted case studies, although the ten conducted case studies have proven to be sufficient to generate meaningful results for the current research. To remove further bias and to ensure coherent data gathering methods it is further proposed to exclude the two case studies gathered via questionnaires and to fully concentrated on conducting case studies via semi-structured interviews for any future research.

Considering that medium-sized companies show the best utilisation of the NPD process success factors and the highest Design Management Staircase Model level and factors scores, it is proposed to concentrate on these particular businesses to identify why medium-sized companies are particularly well-performing as opposed to, for example, micro companies.

Despite the differences in the dataset from 2008 and 2009-2012 it is proposed to include the dataset from 2008 for further analyses. It is expected that the inclusion of 152 additional questionnaires will further strengthen and confirm the gained results. This applies in particular because the dataset from 2008 contains a significant percentage of companies scoring level 1 and 2 on the Staircase Model. Comparing “good” against “bad” performers will add a new perspective to the undertaken analyses and reconfirm examined trends in the dataset.

As highlighted in the LIMITATIONS it is also intended to undertake a comprehensive literature review regarding the appropriateness and exclusivity of the five factors of the Staircase Model. Particular attention will be given to soft skills such as management and leadership skills.

A wide range of further research opportunities have been enabled by the results of the thesis such as analysing the impact of the research outcomes on Design Policy and design support programmes. In particular, a wide range of interdisciplinary research about the impact of the different degrees of design policy implementation on European national levels could be undertaken based on the DME Award dataset. It is proposed to undertake a comparative analysis between the impact of design policy on the design awareness and implementation across different European countries. Furthermore, it is proposed to utilise the additionally gather data (as outlined above) to analyse the impact of design policy on national levels on design awareness and implementation over time. A potential hypothesis for both strings of research could be “The implementation of design into national policy leads to greater design awareness and consequentially to greater design management capabilities”. Furthermore, the author intends to develop and standardised programme for design support programmes. It is proposed to utilise the updated DME Award questionnaire and the assessment based on the Staircase Model as the basis for any design management consultancy work. This standardised assessment will highlight strong and weak areas of participants. Simultaneously, the DME Award database offers the opportunity to develop a best practice benchmark tool. Hence, it would not only be possible to assess current design management capabilities but also offer the

opportunity to provide advice on how to improve performances based on the best practice benchmark tool.

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APPENDICES

1. PARTICIPANT INFORMATION SHEET

Participant Information Sheet

PhD Project Title

An investigation into the correlation between Design Management capability and economic performance

Study Title

Success activities for Design Management

Aim of this study

The PhD project aims to analyze the potential correlation between Design Management practice and economic performance in a wide cross-section of European companies.

Following a chronological literature review of research on essential activities within the New Product Development process, it was discovered that the same activities that drive the NPD process are also the most influential for successful Design Management. Thus, nine 'success activities' were established. An empirical data analysis of 313 questionnaires, gathered from the DME Award entrants as part of a Europe wide investigation into best Design Management practice was conducted. It was observed that the majority of the DME awardees employed each of the nine established success activities and thus may be reasonably argued that these activities are universally adopted by successful companies.

An interview examining a high performing and accessible company's utilisation of the nine success activities was developed. This interview will be used to further refine the set of identified success activities and to cross-examine the identified best performing DME Award entrants.

Who is undertaking the research?

Sebastian Hesselmann will be undertaking the research. Sebastian is in his second year of his PhD study based at the National Centre for Product Design & Development Research.

Who is funding the research?

The study is funded by The National Centre for Product Design and Development Research and the PhD funding is supported by the Vice-Chancellor's Doctoral Scholarship from the University of Wales Institute, Cardiff.

How will the data be gathered?

Semi structured interview techniques will be used to gather data. We are not seeking to collect any sensitive data on you. Permission will be sought before any notes are taken or recording of audio.

Why have you been asked?

Volunteers are required for this research study from the best performing DME Award entrants from 2008-2011 so that expert opinion can be gathered and practice can be analysed. It is entirely voluntary – there is no obligation of any kind to join the study and we will not discriminate in any way against if you decide not to take part.

Are there any risks?

We do not foresee any immediate risks to the participants of the study. If you decide to join the study you can change your mind and stop at any time. There are no penalties for stopping.

How we protect your privacy

All data collected from the study will be handled in accordance with the Data protection Act. Any consent forms and written documents will be retained by the principle investigator for a period of at least 5 years in a secure location within UWIC. The documents will be made available for the purpose of inspection. Digital data such as audio recordings and video and notes taken will be kept on a password protected computer. **All data will be anonymized and treated confidentially.**

YOU WILL BE GIVEN A COPY OF THIS SHEET

If you require any further information about this project then please contact:

Sebastian Hesselmann

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PLEASE NOTE: By taking part in the study implies consent to participate.

2. SEMI-STRUCTURED INTERVIEW GUIDE

Date:

Semi- Structured Interview Questions for studying success predictors for Design Management in practice

Subject: Design Management in practice – Success factors

Aim: To probe for your expert opinion, gain insight on your experiences and design process, why you follow this process and how you evaluate it.

Note: Take as little or as much time as you like for each question, and there is no right or wrong!

Section 1 – Company details

Company Details	
Name of company	
Address	
Tel Fax Email	
Interviewee	
Position	
Ownership	
Years in operation	
Business sector	
Nature of the business	
Years of using Design Management	

Section 2 – General questions

Question	Answer notes
Please briefly explain how products are developed in your company.	
How do you/ your company define Design Management?	

Section 3 – Success factors

Product strategy:

Question	Answer notes
Does your company have a company strategy?	
Please briefly describe this company strategy.	
Does your company develop a product strategy prior to each product development?	
Is the product strategy aligned to the company strategy?	

Cross-functional teams and internal communication:

Question	Answer notes
What are the project management standards of your company?	
Does your company form cross-functional teams when developing a product?	
Which departments are typically parts of these teams?	
What methods do you use to ensure good communication between the different departments?	

Top management involvement and support:

Question	Answer notes
Is the top management of your company involved in the product development?	
If yes, how can this involvement be characterized?	

Product champion:

Question	Answer notes
Does your company have a product champion in place who is responsible for the product throughout the entire development process?	

If not, who is responsible for the product development?	
What are their responsibilities?	

Market research:

Question	Answer notes
Does your company undertake market research?	
What particular market research methods are used?	
At which stage of the product development process does your company typically undertake market research?	

Customer test and involvement:

Question	Answer notes
Are customers/ users involved in your product development process?	
How are customers/ users fed into your development process? / What methods do you use?	
Does your company undertake customer/ user testing?	
At which stage of your development process are customers/ users involved?	

Financial and business analysis:

Question	Answer notes
Does your company undertake financial and business analysis prior and/or after the product development?	

Preliminary market assessment

Question	Answer notes
Does your company undertake preliminary market assessments prior to the product development?	
If yes, what exactly is undertaken?	

Preliminary technical assessment:

Question	Answer notes
Does your company undertake preliminary technical assessments prior to the product development?	
If yes, what exactly is undertaken?	

Other factors:

Question	Answer notes
What other activities are undertaken when developing a new product?	

Factor ranking

Activity	RATING (1 Not influential → 6 Very influential)					
Customer test and involvement	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Product strategy	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Market research	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Cross-functional teams and communication	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Top-management involvement and support	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Financial and business analysis	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Product champion	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Preliminary market assessment	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Preliminary technical assessment	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Other (see question 10)	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>

Question	Answer notes
How are the above listed factors interrelated and how important is the interaction between these?	

Challenges:

Question	Answer notes
What do you feel are the most challenging factors out of those and why are they the most challenging?	
Can you name areas/factors which should be improved? Are you missing any factors in your opinion?	

3. DME AWARD QUESTIONNAIRE

3.1 DME AWARD QUESTIONNAIRE 2013

DME AWARD DESIGN MANAGEMENT EUROPE	
Registration and research questionnaire, deadline 30th September 2013 Completion of the questionnaire is a requirement for registration and participation in the DME Award 2013. It is confirmation of your organisation's participation in the DME Award and acceptance of its rules and regulations which can be found at www.designmanagementeuropa.com . At this moment it is not yet possible to upload and pay for your poster. In the questionnaire, we will ask for your email address in order to inform you as soon as this will be possible. Please note that some of the information you will provide in this questionnaire will be presented to the jury to assist them, at their discretion, in their decision making. Any data presented to the jury will be non-transferable and will not be published.	
PART A - REGISTRATION	
Name of company or organisation:	
Address:	
Country:	
Website:	
Contact name:	Email:
Telephone (including international code):	
I accept the rules and regulations of the 2013 DME Award as detailed on the DME website. <input type="checkbox"/> Accept	
I agree that the information I will provide in this questionnaire can be used for design management research. Published results will not refer to any participant company explicitly and the information will not be disclosed outside of the DME research partners. <input type="checkbox"/> Accept <input type="checkbox"/> Don't Accept	
Is your company part of an enterprise group? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, in which country is the head office of your group located? _____ <i>If your enterprise is part of an enterprise group, please answer all further questions only for your enterprise. Do not include results for subsidiaries or parent enterprises outside of your country.</i>	
Please tick which DME Award category your organisation is entering: <ul style="list-style-type: none"> <input type="checkbox"/> Large company category (250 employees or more) <input type="checkbox"/> Medium-sized company category (50 to 249 employees) <input type="checkbox"/> Small company category (10 to 49 employees) <input type="checkbox"/> Micro company category (9 employees or less) <input type="checkbox"/> Public or non profit organisation (Government organisations, charities, colleges, councils) <input type="checkbox"/> Organisation outside of Europe 	

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PART B - COMPANY DATA

Q1. Please indicate your position in the company.

- ☐ Owner-Manager
- ☐ General Manager / President / CEO
- ☐ Design Director / Chief Designer / Design Manager
- ☐ R&D Manager / Product Manager / Engineer
- ☐ Marketing Manager / Brand Manager
- ☐ Innovation Manager
- ☐ Other: _____

- Q1. Please indicate your position in the company.
- ☐ Owner-Manager
 - ☐ General Manager / President / CEO
 - ☐ Design Director / Chief Designer / Design Manager
 - ☐ R&D Manager / Product Manager / Engineer
 - ☐ Marketing Manager / Brand Manager
 - ☐ Innovation Manager
 - ☐ Other: _____

Q3. For how many years has your organization been using design?

Q4. Please give a brief overview of what your company does?

Emerging market					Mature market				

[illegible][illegible]

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

Low technology					High technology				

[illegible]

Low volumes High volumes

[illegible]

Price	Quality / uniqueness
-------	----------------------

[illegible]

	Niche market	Wide market
Number of products	10-20	> 20
Product range	Small	Large
Market share	Low	High
Competition	Low	High
Price level	High	Low
Advertising budget	Small	Large
Distribution channels	Specialized	General
Customer loyalty	High	Low
Growth potential	Low	High
Risk level	Low	High
Profitability	High	Low
Brand awareness	Low	High
Marketing strategy	Targeted	Broad-based
Customer segmentation	Specific	General
Geographic focus	Local	Global
Seasonality	Low	High
Innovation rate	Low	High
Regulatory compliance	Low	High
Sustainability efforts	Low	High
Employee turnover	Low	High
Supplier relationships	Close	Arm's length
Financial stability	High	Low
Operational efficiency	High	Low
Customer service quality	High	Low
Product quality control	Strict	Lax
Research & Development investment	Low	High
Patent portfolio strength	Weak	Strong
Government subsidies received	Low	High
Industry reputation	Low	High
Public relations management	Minimal	Extensive
Environmental impact assessment	None	Regular
Human resources development	Low	High
Information technology adoption	Slow	Fast
Supply chain optimization	Basic	Advanced
Logistics network complexity	Simple	Complex
Inventory management system	Manual	Automated
Production cycle time reduction	Low	High
Waste reduction initiatives	None	Active
Energy consumption monitoring	No	Yes
Water usage conservation measures	No	Yes
Air emissions reporting requirements	No	Yes
Soil contamination prevention protocols	No	Yes
Hazardous waste disposal procedures	No	Yes
Occupational safety training programs	No	Yes
Fire safety drills conducted annually	No	Yes
First aid kits available at all workstations	No	Yes
Emergency exit routes clearly marked	No	Yes
Security cameras installed throughout facility	No	Yes
Access control systems implemented	No	Yes
Background checks performed on new hires	No	Yes
Drug testing program established	No	Yes
Mental health support services offered	No	Yes
Ergonomic assessments conducted regularly	No	Yes
PPE (Personal Protective Equipment) provided free of charge	No	Yes
Incident investigation process formalized	No	Yes
Root cause analysis performed after incidents	No	Yes
Corrective actions implemented promptly	No	Yes
Continuous improvement culture fostered	No	Yes
Feedback loops established with employees	No	Yes
Recognition programs in place for outstanding performance	No	Yes
Professional development opportunities available	No	Yes
Flexible work arrangements offered	No	Yes
Volunteerism encouraged as part of corporate social responsibility	No	Yes
Charitable contributions made to local community organizations	No	Yes
Partnerships formed with non-profit organizations	No	Yes
Transparency in financial reporting maintained	No	Yes
Annual general meetings held for shareholders	No	Yes
ESG (Environmental, Social, Governance) metrics tracked and reported	No	Yes
Stakeholder engagement initiatives implemented	No	Yes
Crisis communication plan developed and tested	No	Yes
Reputation management strategies employed	No	Yes
Legal counsel consulted proactively regarding regulatory changes	No	Yes
Data privacy policies updated to comply with GDPR	No	Yes
IT security audits conducted regularly	No	Yes
Disaster recovery plans tested annually	No	Yes
Business continuity plans developed for key functions	No	Yes
Insurance coverage comprehensive and up-to-date	No	Yes
Vendor selection process rigorous and documented	No	Yes
Contract terms negotiated favorably	No	Yes
Payment terms offered attractive to suppliers	No	Yes
Quality assurance processes robust and effective	No	Yes
Defect rates kept consistently low	No	Yes
Customer satisfaction scores trending upwards	No	Yes
Net Promoter Score (NPS) positive and improving	No	Yes
Churn rate stable or decreasing over time	No	Yes
New customer acquisition costs (CAC) decreasing	No	Yes
Lifetime value (LTV) of customers increasing	No	Yes
Referral marketing programs successful	No	Yes
Online reviews monitored and responded to promptly	No	Yes
Social media presence active and engaging	No	Yes
Press releases issued strategically to generate interest	No	Yes
Thought leadership articles published in industry publications	No	Yes
Webinars hosted regularly to educate prospects	No	Yes
Email newsletters sent out weekly/monthly	No	Yes
CRM (Customer Relationship Management) system utilized effectively	No	Yes
Lead scoring implemented to prioritize sales efforts	No	Yes
Sales funnel optimized for conversion	No	Yes
Conversion rates across digital channels improving	No	Yes
ROI (Return on Investment) on marketing campaigns positive	No	Yes
Attribution modeling used to track campaign effectiveness	No	Yes
A/B testing conducted frequently for website improvements	No	Yes
User experience (UX) research integrated into product development	No	Yes
Mobile app launched successfully and adopted widely	No	Yes
Cloud migration completed smoothly without downtime	No	Yes
Scalable infrastructure supporting future growth	No	Yes
Disaster recovery plan tested successfully	No	Yes
Business continuity plan validated through simulation exercises	No	Yes
Insurance claims processed efficiently and fully covered	No	Yes
Vendor contracts reviewed annually for optimal pricing	No	Yes
Supplier diversity programs initiated to promote inclusivity	No	Yes
Green procurement practices adopted where feasible	No	Yes
Carbon footprint calculated and reduction targets set	No	Yes
Renewable energy sources explored for power generation needs	No	Yes
Waste recycling programs implemented across all facilities	No	Yes
Water conservation measures adopted throughout operations	No	Yes
Air quality monitoring stations installed near production areas	No	Yes
Soil sampling conducted periodically to detect contaminants	No	Yes
Hazardous material handling procedures strictly followed	No	Yes
Spill response kits readily accessible at all times	No	Yes
Emergency contact lists distributed to all staff members	No	Yes
First aid training refreshed annually for all employees	No	Yes
Fire extinguisher inspections scheduled quarterly	No	Yes
Security guard patrols conducted hourly during peak hours	No	Yes
Access logs maintained for restricted areas	No	Yes
Background checks renewed biennially for sensitive positions	No	Yes
Drug testing protocol enforced consistently for safety-sensitive roles	No	Yes
Mental health first aiders trained among employee ranks	No	Yes
Ergonomics specialists consulted for workstation adjustments	No	Yes
PPE inventory checked monthly to ensure availability	No	Yes
Incident investigation reports filed immediately upon occurrence	No	Yes
Root cause analysis findings shared transparently with workforce	No	Yes
Corrective action plans communicated clearly to relevant departments	No	Yes
Continuous improvement projects tracked and reported on regularly	No	Yes
Feedback mechanisms anonymous and accessible to all employees	No	Yes
Recognition awards presented publicly to celebrate achievements	No	Yes
Professional development stipends allocated for skill enhancement	No	Yes
Flexible work schedules offered to accommodate diverse needs	No	Yes
Volunteer days organized quarterly to engage employees socially	No	Yes
Charitable donations made tax-deductible through company matching	No	Yes
Partnerships forged with universities for talent pipeline development	No	Yes
Transparency in executive compensation maintained through annual disclosures	No	Yes
Annual general meeting attendance high percentage of eligible shareholders	No	Yes
ESG metrics disclosed comprehensively in annual sustainability report	No	Yes
Stakeholder dialogue sessions held regularly to address concerns	No	

Niche market					Wide market				

Q5. At which levels is your company operating?
Tick all appropriate boxes

- ☐ Local
- ☐ Regional
- ☐ National
- ☐ European
- ☐ International

- Q5. At which levels is your company operating?
Tick all appropriate boxes
- ☐ Local
- ☐ Regional
- ☐ National
- ☐ European
- ☐ International

Q7. Please indicate your company's turnover in Euros € for the last three years.

2010 _____ €

2011 _____ €

2012 _____ €

2011 €

2012	€
------	---

Q8. Please indicate the number of employees in your company in the last three years.

2010 _____

2011 _____

2012 _____

2011

2012

Q9. Please indicate the proportion of you company's turnover from exports for the last three years.

Please indicate 0 if no turnover generated by exports

2010 _____

2011 _____

2012 _____

2010

2011

2012

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Premises _____ %

Training	96
----------	----

Design	%
--------	---

Research & Development	96
------------------------	----

Marketing _____ %

Information Technology	%
------------------------	---

Equipment & Machinery	%
-----------------------	---

Other _____ %

Total	100%
-------	------

Q11a. How many products and/or services does your company currently market, not including minor variations in the same product? _____	Q11d. How many of these products and services were new to your market, i.e. the introduction by your company of a new or significantly improved product onto your market before your competitors? _____
Q11b. Alternatively, do you offer entirely customised services? _____	
Q11c. How many of these products and services were introduced from January 2010 to December 2012? _____	Q11e. What percentage of annual turnover did these 'new to market' products generate in 2012? _____

PART C – THE USE OF DESIGN

<p>Q12. Has your company over the last 3 years engaged in design activities with regard to the following? <i>Select all appropriate boxes</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Corporate Identity / branding (e.g. logo, house style, graphics, communication, website, workwear, vehicle, signage) <input type="checkbox"/> Organisational (e.g. architecture, workplace design, interior design, signage / lighting systems) <input type="checkbox"/> Production / service (e.g. product design or styling, service design, industrial design, engineering design) <input type="checkbox"/> Packaging (e.g. graphic design, printing, layout, structural/assembly design) <input type="checkbox"/> Promotion (e.g. marketing communications, publications, corporate literature, advertising, website, exhibitions, events) <input type="checkbox"/> Market exploitation (e.g. displays, retail, environment, point of information / point of sale, digital & multimedia design) 	<p>Q13. Which of the following does your company exploit to optimise / maximise design capability? <i>Select all appropriate boxes</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> In-house design department <input type="checkbox"/> External design consultancies <input type="checkbox"/> Design management specialists (design manager(s) / design director) <input type="checkbox"/> External design management consultant(s) <input type="checkbox"/> Design colleges <input type="checkbox"/> Design competitions <input type="checkbox"/> A design support centre <input type="checkbox"/> A business support centre <input type="checkbox"/> Public grants for design development work <input type="checkbox"/> Other / don't know
<p>Q14. What level of resources (staff, budgets and means of production or implementation) are allocated to design activity and how? <i>Select only one statement</i></p> <ul style="list-style-type: none"> <input type="radio"/> Resources are not allocated specifically to design <input type="radio"/> Limited resources are allocated for individual projects; one off design investments with no review of potential returns <input type="radio"/> Appropriate resources are allocated on the basis of potential return, but with limited procedures in place to assist in decision making <input type="radio"/> Significant resources are allocated on the basis of potential return, with financial procedures in place to help assist in appraising investments, assessing risk and monitoring returns <input type="radio"/> Other / don't know 	<p>Q15. Which statement best describes who is managing design activities in your company? <i>Select only one statement</i></p> <ul style="list-style-type: none"> <input type="radio"/> Individual design buyers who use design occasionally, as for individual projects <input type="radio"/> External design suppliers who are hired occasionally for projects <input type="radio"/> Owner manager / managing director or CEO <input type="radio"/> Central coordinator / manager <input type="radio"/> Interdisciplinary / multifunctional project team, including design specialist(s) and some senior management <input type="radio"/> Extended team including design specialist(s) on strategic level, with fully integrated directorship <input type="radio"/> Other / don't know

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Q16. To what extent are design activities being coordinated?

Select only one statement

- ☐ No need to coordinate design activities
- ☐ Limited coordination within boundaries of departments or functions
- ☐ Coordination of total design process in the company, including design outputs
- ☐ Continuous coordination at a high level to achieve design management excellence
- ☐ Other / don't know

Q17. What place has design in the process when something new is developed, i.e. when are designers typically involved?

Select only one statement

- ☐ Design is not involved in the development; not considered to have a professional role
- ☐ As styling at the end of the development process; as a final aesthetic finish or enhancement
- ☐ As a working method adapted and integrated early in the process; a multidisciplinary approach is required with contribution from design specialists
- ☐ As a central aspect; as a means of encouraging innovation; driving the development process
- ☐ Other / don't know

Q18. Is design part of company or marketing plans and objectives?

Select only one statement

- ☐ Company or marketing plans and objectives do not mention the use of design
- ☐ Limited plans and objectives exist at the project level; design is considered in the short-term as a means of delivering on individual business objectives
- ☐ Plans and objectives exist which set direction for design and integrate design in various activities
- ☐ Design is included as part of strategic plans; design planning is a dynamic process that drives the business; plans and objectives are communicated widely
- ☐ Other / don't know

Q19. Please rate the following statements that best describe how design research is conducted in your company/organisation:

Select an appropriate box for each statement

1 = Sometimes ; 2 = Frequently ; 3 = Standard procedure ; 4 = n.a. / don't know

When researching a design project ...	1	2	3	4
An engineer or marketer delivers the "expert" knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We use market reports, but no standard methods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We ask wholesale or trade partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We use internet-platforms (virtual communities) for contact with end user	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We interview a representative sample of users	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We create personas to guide the design process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We systematically observe and analyse user processes in target groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We use the Lead User Method	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customers are actively involved in the development of new products and services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We use user feedback to develop and test prototypes or to refine services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20. Is competitors' analysis part of the design planning process in your company? Select only one statement

- ☐ We are not sure about our competitors designs and design usage, we have little or no competitive information
- ☐ We gather some knowledge about our competitors when developing our own designs and design usage
- ☐ We formally consider competitive strengths and weaknesses at the start of a design project
- ☐ We systematically observe our competitors; their design policies, usage and market performance
- ☐ Other / don't know

Q21. How do evaluation and selection of the best design solutions – to satisfy business, market and consumer needs – take place?

Select only one statement

- ☐ There is only one concept to choose from - no process is needed
- ☐ Dominant manager or design team member chooses; decisions are subjective and based upon personal preferences
- ☐ Internal stakeholders involved, aiming towards consensus; use of standard checklist; senior manager still holds veto rights
- ☐ External and internal stakeholders involved; all aspects considered; a range of selection methods / tools may be applied; data driven decisions.
- ☐ Other / don't know

Q22. Does your company evaluate or monitor design performance before and/or after market launch?

Select only one statement

- ☐ We have no time to evaluate or monitor design performance
- ☐ Evaluation and monitoring are not recognised necessary
- ☐ Minimal evaluation on project to project basis; evaluation requirements are not clear
- ☐ Detailed and thorough process and technical evaluation; little post launch monitoring
- ☐ Rigorous evaluation and testing before launch; post-launch monitoring of project success
- ☐ Other / don't know

Q23. Please indicate how the design process in your company takes place.

Select an appropriate box for each statement (1 = Sometimes ; 2 = Frequently ; 3 = Standard procedure 4 = n.a / don't know)

When setting up a design project we ...	1	2	3	4
Define clear design objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporate a requirements capture process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Define a strategy for design (direction, ideation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Define a project plan and key milestones (scope, deliverables, timescale and budget)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plan research for concept / prototype testing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Draw up a creative (design) brief and do a briefing session to ensure common understanding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appoint a project leader or manager who is given responsibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determine the skill requirements of the project team, including all interdisciplinary contributions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Select appropriate designers (in-house sourcing or outsourcing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determine role(s) and responsibilities of the designer(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hold review meetings on a regular basis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q24. Please rate how the tools and methods listed below are applied to design activities in your company?

Select an appropriate box for each statement

1 = Sometimes ; 2 = Frequently ; 3 = Standard procedure 4 = n.a / don't know

	1	2	3	4
Trend research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
User centered design research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Life cycle management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Future scenario building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Portfolio analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unit cost analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Product / brand platform	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design guidelines/ manual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benchmarking best practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design process audit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design policy awareness training (employee training)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research and application For IPR; e.g. patents, models and trade mark registrations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q25. Over the last 5 years, to what extent would you say that design has improved the following within your company?

Select an appropriate box for each statement

1 = To a limited extent 2 = To some extent 3 = To a great extent 4 = Not applicable/don't know

	1	2	3	4
Company / brand image	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication – external and internal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Product ease-of-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employee motivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Corporate culture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Efficiency / productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Employment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sustainability (reduced environmental impact)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Competitiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Development of new or improved products / services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aided development of new markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turnover (greater sales)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Market share	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Profits (by higher margins or lower unit costs)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q26. To what extent do you personally believe the following statements to be true?

Select an appropriate box for each statement

1 = To a limited extent 2 = To some extent 3 = To a great extent 4 = Not applicable/don't know

	1	2	3	4
- Design is an innovating activity leading to implementation of innovations or focused towards this	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- Designers can apply new components, material or production methods in existing products and translate technological concepts to the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- Designers can help to get an innovation valued in the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- Innovation through design can help a company to avoid competing on price	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
- By integrating design in the operations the innovation potential of the company can be utilised better	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q27. To what extent does your company foster a design culture & environment that encourages creativity, originality and novelty?

Select only one statement

- ☐ We don't rely on creativity from our employees
- ☐ Creativity is expected but not explicitly encouraged or rewarded
- ☐ Staff has some managed time for creativity; ideas are fed into the product development process; best ideas are rewarded
- ☐ Creativity is expected and rewarded; there are no restrictions on creativity – provided agreed deadlines are met; time and money is available; physical environment supports creativity
- ☐ Other / don't know

Q28. In your view, what are the benefits for your company when managing design effectively?

Select all appropriate boxes

- ☐ Higher quality of design work (design excellence)
- ☐ Improved profitability and growth
- ☐ Improved performance of processes, by integrating design in other processes
- ☐ Providing a link between strategy and design (align design activities with core objectives)
- ☐ Enhanced customer experience
- ☐ Improved competitiveness
- ☐ A stronger brand / product image and reputation
- ☐ More alignment between functional departments (marketing, R&D, operations)
- ☐ Maintaining competitive edge
- ☐ Enhanced ability to create new market space for the company
- ☐ More effective design projects (less failing projects)
- ☐ Improved product and marketing innovation activities
- ☐ Achieving competitive differentiation and advantage
- ☐ Higher visibility in marketplace to both customers and competitors

Q29. To what extent are people in the company aware of the benefits of managing design effectively?

Select only one statement

- ☐ People are not aware; little or no attention is given to the use or management of design
- ☐ Some are aware of the benefits; directly involved people
- ☐ Most are aware because design management is formally performed and the design process is integrated in other business processes
- ☐ All are aware that it is fundamentally important to our success; the management of design is embedded in our company; design is part of our DNA
- ☐ Other / don't know

Q30. To what extent are the following factors hindering your company to manage design more effectively?

Select an appropriate box for each statement

1 = To a limited extent 2 = To some extent 3 = To a great extent 4 = Not applicable/don't know

	1	2	3	4
<input type="radio"/> Cost factors, e.g. cost too high, lack of funds, doubtful return on investment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/> Knowledge factors, e.g. lack of qualified personnel, lack of information on design cases and best practices, internal designers not qualified for management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/> Cultural factors, e.g. organisational rigidities within the enterprise, attitude towards design, design is isolated function, traditional non-design culture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/> Market factors, e.g. uncertain demand for designed goods or services, limited pressure from competition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/> Other factors, e.g. company size, deficiencies in the availability of external design services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q 31.

**YOU HAVE NOW COMPLETED THE QUESTIONNAIRE STAGE
OF YOUR APPLICATION, THANK YOU.**

3.2 DME AWARD QUESTIONNAIRE 2008

DME AWARD	<small>DESIGN MANAGEMENT EUROPE</small>	PHASE 2 DME Award questionnaire Deadline 31st May 2008
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Submission of the questionnaire is a requirement for participation to the DME Award. It is confirmation of your organisation's registration to the DME Award and acceptance of its rules and regulations. Please note that the information you will provide in this questionnaire will not be passed on to the jury panel and will only be used for Award administration and for design management research (pending your consent). We also believe that the questionnaire will benefit your preparation for the next phase of the DME Award (poster display).

PART A - COMPANY REGISTRATION

Name of company:

Address:

Country:

Website / URL address:

Contact name:

Email:

Telephone (include full international code):

Fax:

Please sign here:

I agree that the information I will provide in this questionnaire can be used for design management research. Published results will not refer to any participant company explicitly and the data collected will not be disclosed outside of the DME research partners.

☐ Accept ☐ Don't accept

I accept the rules and regulations of the DME Award as detailed in the DME Award guidelines. The complete rules and regulations can be found on the DME website at www.designmanagementeuropa.com

☐ Accept

Is your company part of an enterprise group*?

☐ Yes

In which country is the head office of your group located?

☐ No

If your organisation is part of a group, please answer all further questions **only** for your enterprise. Do not include results for subsidiaries or parent enterprises outside of your country.

Please tick which DME Award category your company or organisation is entering:

- ☐ 1. Large company category*
- ☐ 2. Medium-sized company category*
- ☐ 3. Small company category*
- ☐ 4. Micro company category*
- ☐ 5. Public or non-profit organisation*
- ☐ 6. First time design project*
- ☐ 7. Design strategy for sustainability*

* See end of questionnaire for definitions

1. Please indicate your position in the company:

- ☐ Owner-manager
☐ General manager / president / CEO
☐ Design director / chief designer / design manager
☐ R&D manager / product manager / engineer
☐ Marketing manager / brand manager
☐ Innovation manager
☐ Other, please specify:

2. What year was your company founded?

3. Number of years your company has been using design:

4. Please indicate the Business Sector your company operates in. Select all appropriate activities from the following list:

- ☐ Agriculture, hunting and forestry
- ☐ Fishing
- ☐ Mining and quarrying
- ☐ Manufacturing
 - ☐ Manufacture of food products, beverages & tobacco
 - ☐ Manufacture of textiles and textile products
 - ☐ Manufacture of leather and leather products
 - ☐ Manufacture of wood and wood products
 - ☐ Manufacture of pulp, paper, paper products; publishing, printing
 - ☐ Manufacture of coke, refined petroleum products, nuclear fuel
 - ☐ Manufacture of chemicals, chemical products, man-made fibres
 - ☐ Manufacture of rubber and plastic products
 - ☐ Manufacture of other non-metallic mineral products
 - ☐ Manufacture of machinery and equipment
 - ☐ Manufacture of basic metals, fabricated metal products
 - ☐ Manufacture of electrical and optical equipment
 - ☐ Manufacture of transport equipment
 - ☐ Manufacture of furniture
 - ☐ Other manufacturing activities
- ☐ Electricity, gas and water supply
- ☐ Construction
- ☐ Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
- ☐ Hotels and restaurants
- ☐ Transport, storage and communication
- ☐ Financial intermediation
- ☐ Real estate, renting and business activities
 - ☐ Specialised design activities
- ☐ Public administration and defence; compulsory social security
- ☐ Education
- ☐ Health and social work
- ☐ Other community, social and personal service activities
- ☐ Activities of households
- ☐ Other, not elsewhere classified

Please give a brief overview of what your company does:

the authors are not aware of any other studies that have examined the effects of the use of a single, non-validated, self-report measure of perceived effort on the relationship between perceived effort and the other variables in the model. The authors are also not aware of any other studies that have examined the effects of the use of a single, non-validated, self-report measure of perceived effort on the relationship between perceived effort and the other variables in the model.

5. At which levels is your company operating?

Tick all appropriate boxes

- ☐ Local
☐ Regional
☐ National
☐ European
☐ International

6. Please mark the following scales according to your company position in the market.

Emerging market					Mature market				
									n/a

Low technology					High technology				
									n/a

Low volumes					High volumes				
									n/a

Price								Quality	n/a
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

n/a: not applicable

7. Please indicate your company's turnover for the last three years.

TURNOVER		
2005	n/a <input type="checkbox"/>	2006
€	€	€

8. Please indicate the proportion of your company's turnover due to exports for the last three years.

Please indicate 0 if no turnover generated by exports

EXPORTS (% of turnover)					
2005	n/a	2006	n/a	2007	n/a
	%		%		%

9. Please indicate the number of employees in your company for the last three years.

NUMBER OF EMPLOYEES					
2005	n/a	2006	n/a	2007	n/a
	%		%		%

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10a. Please indicate your company's total annual investment for the last three years, in terms of percentage of turnover.

TOTAL INVESTMENT (% of turnover)					
2005	n/a <input type="checkbox"/>	2006	n/a <input type="checkbox"/>	2007	n/a <input type="checkbox"/>
	%		%		%

10b. Please indicate the average proportion of your company's investments in the following areas.

Please indicate 0 if no investment in a specific area

% of Total investment in the following areas			Over the last 3 years, has the investment		
	2007		Decreased	Remained	Increased
Premises	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Design	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research & Development	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marketing	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IT	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment & Machinery	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	%	n/a <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total	100%				

11. Marketable products and services (a, b, c, d)

Where figures do not exist, please give an estimate value

a. How many products and services does your company currently market (not including minor variations in the same product)?

Alternatively: My company provides entirely customised services ☐

b. How many of these products and services were introduced from January 2005 to December 2007?

c. How many of these products and services were 'new*' to your market?

d. What is the average percentage of annual turnover generated by these 'new*-to-market' products?

PART C - THE USE OF DESIGN

12. To which of the following areas has design been applied over the last three years? Tick all appropriate boxes

- ☐ Corporate Identity / branding: e.g. logo, website, house style, graphics, communication, work wear, vehicle signage
- ☐ Organisation: e.g. architecture, workplace design, interior design, signage / lighting
- ☐ Production: e.g. product design, service design, industrial design, engineering design, product styling
- ☐ Packaging: e.g. packaging, graphic, structural design
- ☐ Promotion: e.g. graphic design, advertising design, website design, exhibition design
- ☐ Market exploitation: e.g. retail (shop) design, environment design, signage, digital & multimedia design, point of sale

☐ Other, please specify:

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13. Which statement best describes who is managing design activities in your company? Please tick only one of the following boxes

- ☐ Individual design buyers who use design occasionally, as for individual projects
- ☐ External design suppliers who are hired occasionally for projects
- ☐ Interdisciplinary / multifunctional project team including design specialist(s); some senior management
- ☐ Extended team including design specialist(s) on strategic level; fully integrated directorship
- ☐ Other, please specify:

15. Which statement best describes the extent to which design activities are coordinated? Please tick only one of the following boxes

- ☐ No need to coordinate design activities
- ☐ Limited coordination within boundaries of functional areas
- ☐ Coordination of total design process in the company, including design outputs
- ☐ Continuous coordination at a high level to achieve design management excellence
- ☐ Other, please specify:

14. Which of the following does your company exploit to maximise design capability? Tick all appropriate boxes

- ☐ We have an in-house design department
- ☐ We work with external design consultancies
- ☐ We use freelance designers
- ☐ We work with design colleges
- ☐ We run design competitions
- ☐ We source external design management professionals
- ☐ We use a design support centre
- ☐ We receive public grants for design development work
- ☐ Other, please specify:

16. Who has the overall responsibility* for design in your company?

*The initiation of design projects, decision making, allocation of budgets and resources Please tick only one of the following boxes

- ☐ Owner / managing director / chairman / board of directors
- ☐ Business (unit) management team
- ☐ Individual at operational level
- ☐ Interdisciplinary or multifunctional project team
- ☐ Marketing / Brand / Communications manager
- ☐ R&D manager
- ☐ Design manager
- ☐ Not identified as formal functional responsibility
- ☐ Other, please specify:

PART D - PROCESS FOR DESIGN

17. Are user needs and requirements assessed and fed into the design process when developing products or services? Please select as many as required of the following statements to best describe the current situation. Please also indicate the frequency.

- | | | | |
|--|------------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> No, user information is not required | | | |
| <input type="checkbox"/> To a certain limit: engineer or marketer delivers the "expert" knowledge | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> To a certain limit: we ask some users | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> To a certain limit: we use market reports, but no standard methods | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> Yes, a representative sample of users is interviewed | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> Yes, we systematically observe and analyse use processes in target group | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> Yes, customers are involved in the development of new products and services | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> Yes, we use user feedback to develop and test prototypes | <input type="checkbox"/> Sometimes | <input type="checkbox"/> mostly | <input type="checkbox"/> always |
| <input type="checkbox"/> Other, please specify: | | | |

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18. Is competitors' analysis part of the design planning process in your company? Please tick only one of the following boxes

- ☐ We are not sure about our competitors, there is little or no such information
- ☐ We do not systematically analyse such data when planning for design
- ☐ We gather some knowledge about our competitors to compare with our own design policies
- ☐ We formally consider competitive strengths and weaknesses
- ☐ We systematically observe our competitors; their design policies, usage and market performance
- ☐ Other, please specify:

19. How do selection and evaluation of the best design solutions - to satisfy business, market and consumer needs - take place? Please tick only one of the boxes

- ☐ There is only one concept to choose from - no process is needed
- ☐ Dominant manager or design team member chooses; decisions are subjective and based upon personal preferences
- ☐ Internal stakeholders involved, aiming towards consensus; use of standard checklist; senior manager still holds veto rights
- ☐ External and internal stakeholders involved; all aspects considered; a range of selection methods / tools may be applied; data driven decisions
- ☐ Other, please specify:

20. Does your company evaluate / monitor design performance before or after launch? Please tick only one of the following boxes

- ☐ We have no time to evaluate
- ☐ Evaluation is not necessary
- ☐ Minimal evaluation - no time or plan: inconsistency across projects; evaluation requirements are not clear
- ☐ Detailed and thorough process and technical evaluation; little post-launch monitoring
- ☐ Rigorous evaluation and testing before launch; post-launch monitoring of project success
- ☐ Other, please specify:

21. Which of the listed tools and methods are applied with regard to design activities in your company?

Please select only the tools that apply, then indicate the frequency of use.

	Sometimes	Frequently	Standard Procedure
<input type="checkbox"/> Future scenario building	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Portfolio analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Product/brand platforms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Life cycle management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Budget planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Creative brief/design brief	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Image boards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Programme of requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design guidelines / manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design strategy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design audit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design process audit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Benchmarking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Design policy awareness training (employee training)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Market research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Trend research / analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> People-centred design research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Unit cost analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Pre-test / concept test (evaluation of Designs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Usability test (ergonomic test)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Consumer research (market appraisal)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Research and application for intellectual property rights, e.g. patents, models and brand registrations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> None of the above	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. Over the last 3 years, which of the following methods has your company been using to protect its products and services?

Select all methods that apply & indicate frequency

	Sometimes	Frequently	Standard Procedure
<input type="checkbox"/> Products and services are not protected	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formal methods:			
<input type="checkbox"/> Patents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Registration of design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Trademarks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Copyrights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Confidentiality agreements and trade secrecy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Utility Models / Short-term patents (only available in some countries)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Other formal methods, please specify:			
.....			
Informal methods:			
<input type="checkbox"/> Secrecy not covered by legal agreements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Complexity of product design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Lead time advantage over competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Other informal methods, please specify:			
.....			

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PART E - BELIEFS AND ATTITUDES

23. Over the last 3 years, to what extent would you say design contributed to the following within your company?

Please rate all of the following statements

	Not at all	To a limited extent	To some extent	To a great extent
Improved company / brand image	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved communication (external with clients, internal with employees)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved staff moral or confidence / increased staff retention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved client / customer satisfaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved differentiation / added value	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of new or improved products / services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased turnover	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased profits (by higher margins or . lower unit costs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aided development of new markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhanced exports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhanced efficiency / productivity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhanced competitiveness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased employment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintaining competitive edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved sustainability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. How is the importance of innovation* valued in your company?
Please tick only one of the following boxes

- ☐ Innovation is not a necessity
☐ Innovation has a positive and significant impact on productivity and business performance
☐ Innovation is important to remain competitive
☐ Innovation is important in order to stay ahead of the competition
☐ Innovation is crucial for business success
☐ Other, please specify:

25. To what extent do you personally believe the following statements to be true?

Please rate all of the following statements

	Not at all	To a limited extent	To some extent	To a great extent
Design is an innovating activity leading to or aiming at the implementation of innovations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Design has bearing on the purposeful application of creativity in the process of innovation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovation through design can help a company to avoid competing on price only	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
By integrating design in operations the innovative potential of the company can be better utilised	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Designers can apply new components, material or production methods to existing products and bring technological concepts to the market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Designers can help to get an innovation valued in the market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. To what extent does your company foster a design culture & environment that encourages creativity, originality and novelty?
Please tick only one of the following boxes

- ☐ None or very little encouraging; creativity is an unwanted distraction
☐ Creativity is expected but not encouraged or rewarded
☐ Staff have some managed time for creativity; ideas are fed into the product development process; best ideas are rewarded
☐ Creativity is expected and rewarded; there are no restrictions on creativity - providing agreed deadlines are met; time and money is available; physical environments supports creativity
☐ Other, please specify:

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27. What do you believe are the benefits for your company when managing design effectively? Tick all appropriate boxes

- ☐ Enhanced ability to create new market space for the company
- ☐ Greater differentiation of offering in market place; increased competitiveness
- ☐ A stronger brand/product image and reputation
- ☐ More coherence and consistency on visual appearance (product appearance, brand communications and customer touch-points)
- ☐ More alignment between functional departments (marketing, R&D, operations)
- ☐ More effective design projects (less failing projects)
- ☐ Higher quality of design work
- ☐ Improved performance of processes, by integrating design in other processes
- ☐ Improved product and marketing innovation activities
- ☐ Providing a link between design and strategy (corporate, business and product strategies)
- ☐ Improved profitability & growth
- ☐ Improved sustainability
- ☐ Other, please specify:

28. To what extent are people in the company aware of the benefits of managing design effectively? Please tick only one of the following boxes

- ☐ People are not aware; we do not emphasise the use or management of design
- ☐ Some are aware of the benefits; directly involved people
- ☐ Most are aware because design management is formally performed; the design process is integrated in other business processes
- ☐ All are aware that it is fundamentally important to our success; the management of design is culturally embedded in our company
- ☐ Other, please specify

Thank you for your time!

DEFINITIONS

Large company category

This category is open to private companies with 250 employees or more or with an annual turnover in excess of €50,000,000.

Medium-sized company category

This category is open to private companies with 50 to 249 employees or with an annual turnover not in excess of €50,000,000.

Small company category

This category is open to private companies with 10 to 49 employees and with an annual turnover not in excess of €10,000,000.

Micro company category

This category is open to private companies with 9 employees or less and with an annual turnover not in excess of €2,000,000.

Public or non-profit organisation

This category is open to public or non-profit organisations such as charities, government programmes, city councils or schools and colleges.

First time design project

This category is specific for SMEs (less than 250 employees and a turnover not in excess of €50,000,000).

The purpose of this category is to showcase good examples of organisations managing design for the first time. This can either come from established organisations or from start-ups.

Design strategy for sustainability

This category is open to private companies and public organisations of all sizes. Sustainability relates to design strategies encompassing social responsibility, improving the environment or reducing ecological impact.

Enterprise group

A group consists of two or more legally defined enterprises under common ownership. Each enterprise in the group may serve different markets, as with national or regional subsidiaries, or serve different product markets. The head office is also part of an enterprise group.)

Innovation

An innovation is the successful exploitation of new ideas that increase value; or the introduction of both radical and incremental changes to products, processes or services (technological or non-technological) that create a new dimension of performance.

New-to-market

That is to say the introduction by your company of a new or significantly improved product or service onto your market before your competitors. Definition adapted from the Community Innovation Survey CIS-2006.

4. CONFERENCE PAPER 1

SUCCESS ACTIVITIES FOR DESIGN MANAGEMENT – A THEORETICAL AND EMPIRICAL INVESTIGATION

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ABSTRACT

The objective of this paper is to examine, analyse and verify possible success activities for Design Management. Based on mapping out the development of the New Product Development process and its design sub-process it is hypothesized that New Product Development success activities which promote product success are also the central activities for a Design Management process that leads to successful products. Resulting from this a list of New Product Development success activities is established. Further, it is hypothesized that the most frequently referenced activities are also the most important. In a subsequent analysis of the DME Award company dataset, the elaborated activities are verified and analysed against the established list of activities promoting success. Results show that companies which are recognized for good Design Management address this set of success activities in their Design Management process. However, the second hypothesis that the most referenced success activities are also the most important is not supported.

INTRODUCTION

This paper forms part of a wider research project examining the impact of Design Management (DM) on companies' economic performance. This article presents the initial step of such an aim in seeking to identify which DM activities need to be addressed in order to maximise the potential for success when developing a new product. This is undertaken via an empirical investigation on Europe-wide company data which originates from the Design Management Europe (DME) Award. This award has been held since 2005 by a group of design centres, cities and the University of Wales Institute, Cardiff amongst other universities and is bestowed for the best practice in DM. Along with the DME Award a significant volume of data was gathered on each of the entrants via questionnaires. This data relates to the DM organisation in practice and the economic performance of the DME Award entrants. Altogether there are 313 completed questionnaires from the DME Awards 2008-2010 available for further study and interpretation.

The main hypothesis of this article is that New Product Development (NPD) process activities which promote product success are also the central activities for a DM process that leads to successful products. The first objective of this article is to map out the development of the NPD process, including the sub-process of design which later evolved to DM. This will show that both the NPD process and DM actually follow the same pathways. Secondly, derived from the literature a theorized listing of particular NPD activities is established. These activities have been proven to promote successful product development. Further, it is hypothesised that the activities with the most frequent references in the literature are also the most important success activities.

But does the theory match industrial practice and do companies actually follow those pathways in their daily business operations? The DME Award data on companies' DM performance in practice provides a rare opportunity to analyse this question. In a subsequent analysis of the DME Award company dataset, the elaborated activities will be verified and analysed against the established list of activities promoting success.

Success might be described as a common goal of any business. However, the term "success" is subjective; thus, every company might define and measure success differently. To address such subjectivity Cooper and Kleinschmidt (2007) investigated common success metrics. Throughout this article success is defined by the success metrics presented in Table 1.

Table 1: Performance/Success metrics

Performance metrics	Explanation
Success rate	The proportion of development projects that became commercial successes
Percentage of sales by new products	The percentage of the business unit's sales accounted for by new products
Profitability relative to spending	How profitable the business unit's total new product efforts were, relative to the amount spent on them
Technical success rating	How successful the total effort was from a technical/technological perspective
Sales impact	How strong an impact the total new product effort had on the business unit's top line or sales revenues
Profit impact	How strong an impact the effort had on the business unit's bottom line or annual profits
Meeting sales objectives	The extent to which the total new product effort met the business unit's sales objectives for new products
Meeting profit objectives	The extent to which it met the business unit's profit objectives
Profitability versus competitors	How profitable the total new product effort was relative to competitors
Overall success	All things considered, how successful the business unit's total new product efforts were when compared to competitors

(Cooper and Kleinschmidt, 2007, p. 55)

It is widely recognized that the success, growth and prosperity of any business is highly dependant on successful NPD and the market introduction of the new products and services (Cooper and Kleinschmidt, 1986, Cooper and Kleinschmidt, 1993b, Huang et al., 2002). Identifying the activities within the NPD process which are accountable for new product success has been a major research field for academics and managers (Rochford and Rudelius, 1997).

However, ever increasing competition, fast paced alterations in technology and product's economic life time has caused a growing need for businesses to develop and innovate new products more efficiently and effectively (Huang et al., 2002). Therefore, the role of design within the NPD process, e.g. as a key factor of product differentiation, is increasingly recognized. The integration of design into the NPD process emerged into the concept of DM (Buchanan, 2004, Montana et al., 2007). In spite of this, the current research regarding DM is limited and diverse. Nevertheless, current literature suggests that successful DM has a positive impact on design effectiveness. Furthermore, it has been demonstrated that design has a positive contribution to company performance. However, empirical evidence that DM has a positive correlation and impact on companies' economic performance has not been adduced (Best, 2006, Chiva and Alegre, 2009). Addressing this lacuna of knowledge may have a significant impact on basic principles of DM organisation and execution.

METHODOLOGY

This article draws on two approaches.

- Establishing a common success activity list of the NPD process from literature
- Empirical validation of the established success activities

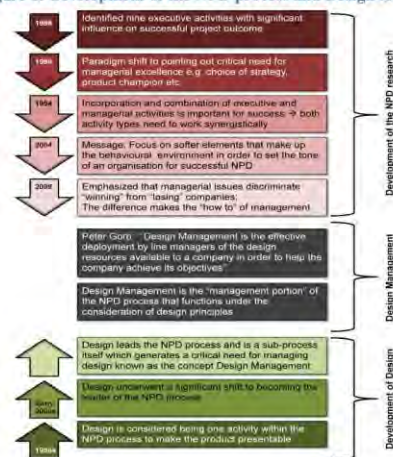
The literature review considers a wide range of NPD success activity research, although particular attention is given to the research conducted by Cooper and Kleinschmidt throughout the years (Cooper and Kleinschmidt, 1986, Cooper and Brentani, 1991, Cooper and Kleinschmidt, 1991, Cooper and Kleinschmidt, 1993a, Cooper and Kleinschmidt, 1993b, Cooper, 1994, Cooper and Kleinschmidt, 1995, Cooper, 2000, Cooper et al., 2002, Cooper and Kleinschmidt, 2007, Cooper and Edgett, 2008, Cooper, 2009). Resulting from this analysis a common success activity list has been established according to the most often cited activities appearing in the examined literature. The literature review maps out the development of NPD success activities research over time. It shows that eventually the importance of design in the NPD process underwent a significant shift from being a sub-process to becoming the driver of the NPD process, evolving into the concept of DM. By means of this evolvement it is argued that NPD success activities are equally important for DM and that the previously examined NPD process success activities can logically be considered the most important activities for successful DM. Secondly, the hypotheses, derived from a theoretical analysis, are validated by an empirical test of company data captured via the DME Award.

DEVELOPMENT OF THE NPD AND DESIGN PROCESS

NPD is defined as the development process of designing novel goods and services. This involves a set of activities which should follow a methodology in order to get from the initial product idea to a market launch of the product. Ideally, these methods should incorporate solutions that are most applicable to the business (Brentani, 2000, Otto and Wood, 2001).

Examining published research on the NPD process has revealed a distinct development of the NPD process over time. It became apparent that the considered importance of certain sets of activities within the NPD process has drastically changed over the past 25 years. At the same time the importance and recognition of design as one activity of the NPD process also changed radically. Eventually, NPD research resulted in the evolvement of a new concept, known as Design Management. This bidirectional development is outlined in Figure 1 and will be further mapped out in the following section.

Figure 1: Development of the NPD process and Design to the concept of Design Management



The NPD process

During the period from the late 1980s to the early 1990s, different specific NPD process activities were identified and tested to discriminate which activities in particular were deemed critical for success. In the earliest considered study, Cooper and Kleinschmidt (1986) identified 9 activities as having a significant influence on a successful project outcome.

All of these activities were related only to the pure set of executive activities. Executive activities refer to the set of physical activities a new product has to undergo during its development process, e.g. market research. Supporting executive activities are managerial activities which encompass activities related to the structure of managing a project. This first study hinted that how well each of these activities is managed is critical to product success (Cooper and Kleinschmidt, 1986).

In 1990 Zirger and Maidique analysed 86 electronic product pairs in a comparative study for success factors. The most outstanding result of the comparison was the critical need for managerial excellence. Particular importance was attributed to cross-functional groups with an appropriate leader and the existence of a strategy aligned to the firm's existing competences and resources (Zirger and Maidique, 1990). Overall, these study results abetted a paradigm shift considering only four years prior the emphasis was placed on executive activities.

Cooper's study (1994) expanded the notion of the ideal activity set. The identified activities, in contrast to Zirger and Maidique's study (1990), incorporate and combine both executive and managerial type activities as important for success. In relation to this, it is seen as essential that the organization of the management is well structured and the executive activities are carried out to a high quality standard (Cooper, 1994). The shift from executive importance, to managerial importance and then to a combination of the both makes it apparent that these two categories should work synergistically with the important underscore of quality management overall.

A different approach to the use of management was the concept of the Stage Gate Model. The Stage Gate Process model represents a filtering funnel that ensures only the best ideas and products go through onto the next step to prevent wasting or spreading out resources (Cooper et al., 2002, Cooper, 2009). This approach is critical to highlight because represented an innovative step to taking the focus away from the executive activities and placing more gravity on managerial tasks, in this case, screening. Managing the idea and process and aligning this to the business resources is the key factor.

In 2003, a study by the Product Development & Management Association (PDMA) on best practice projects was conducted. This study was used by Barczak et al. (2009)- whose findings emphasized especially the importance of managerial issues, e.g. strategy, multi-functional teams and top management support.

Similar to this, Brentani and Kleinschmidt (2004) compared 320 companies and found that to achieve outstanding results, the best performers incorporated senior management and utilized appropriate resources that were committed to the NPD process. Most importantly, these companies had a corporate culture that supported their NPD process, where company values were instilled with the importance of the NPD process.

Design Process/ Management

The NPD process has a complementary process known as the design process which describes the creation of solutions for all conducted creative activities (Moultrie et al., 2006).

As with the NPD process, the design process also went through significant changes. In the 1990s, design was considered as one of the activities within NPD. It was only integrated at the stages of the NPD that were associated with design. In the early 2000s, design underwent a shift to becoming the leader of the NPD process. It was recognized that giving designers a more fundamental role can enhance the entire product development process, creating a more synergistic versus individualistic environment. With it the role of design in the NPD process changed, as it not only leads product development, but is also a critical sub-process in itself. (Perks et al., 2005).

The importance of design as a process utilized in product development was studied and shown by Hertenstein et al. (2005). It was discovered that the use of design is strongly associated to better financial performance in various ways, e.g. higher return on sales (Hertenstein et al., 2005).

These findings clearly demonstrate that design is a very powerful sub-process in product development and leads to the conclusion that its positive effects are magnified once integrated into the entire methodology. However, once a part of the process, it will also be necessary to implement management skills such as motivation and persuasion, relationship management and negotiation and the ability to effectively market a product (Perks et al., 2005). Exactly as in the NPD process, this once again highlights the importance of management at any level.

This importance of management in the design process developed a concept known as "Design Management". DM are steps that involve creation and the augmentation of managerial and strategic decisions. As defined by Peter Gorb:

"Design Management is the effective deployment by line managers of the design resources available to a company in order to help the company achieve its objectives" (Gorb in, Mozota, 2003, p. 70)

This discipline oversees and directs a company's creativity and manages the company itself in accordance to their design principles. Through the discovery and conveyance of the mode in which design can add to the value of business strategy, it fulfils the need to manage staff and other financial resources (Mozota, 2003). Most importantly, the coordination with other managerial functions highly influences the effectiveness of the DM process. Through the assimilation of DM with NPD, product development and the generation of positive customer interaction are simplified. Therefore, it is integral that DM is a component of a company's working strategy (Montana et al., 2007).

Both, the NPD process and design underwent significant shifts in the past 25 years. Initially, the major importance in NPD was placed on executive activities with design being one executive activity as part of a wider process. Over time this recognized importance changed, first to emphasizing the importance of managerial and executive activities and eventually to accepting the managerial activities as the most important activities within the NPD process. Simultaneously, design underwent a shift from being a sub-process within the NPD process to becoming its leader. In combination and due to the recognition of the importance of having to manage the NPD process with design as its leader, a new concept arose, Design Management. DM arose out of the shift in importance of the NPD process activity types and the simultaneous shift of design. Inferential, DM is the "how to" facet; it is the "management portion" of the NPD process that functions under the consideration of design principles.

Therefore, it is supposed that all success factors of the NPD process are success factors of DM.

NPD SUCCESS ACTIVITIES

As part of the literature review, 26 studies on NPD success activities were considered and the referenced success activities excerpted. Table 2 lists the most frequently referenced success factors listed in descending order of most referenced and separated into managerial and executive activities.

Table 2: Success activities

Management activities	Executive activities
Strategy	Customer involvement/ focus
Cross functional teams and good communication	Market research and understanding of market needs
Product/ Process Champion	Financial and business analysis
Top management support and involvement	Preliminary market assessment
	Preliminary technical assessment

As stated above, it is hypothesised that these NPD process activities which promote product success also the central activities for DM. This hypothesis will be tested and validated in the subsequent analysis of the company datasets.

THE DATA

The data for the subsequent analysis is derived from the DME Award entrant questionnaires from 2008, 2009 and 2010. This data relates to the DM organisation in practice and the economic performance of the DME Award entrants. The DME Award received 163 questionnaires in 2008, 73 in 2009 and 77 in 2010. Though the questionnaire sets of 2008 and 2009/2010 do not feature identical questions, the questionnaire structure and general baselines remain the same and all questions offer multiple choice answer possibilities. In general, both questionnaires give data that can be broken down into four subcategories. These subcategories are:

1. Company data, e.g. company size, employee count etc.
2. Financial data, e.g. turnover, investments, etc.
3. Design approach, e.g. selection for design, use of design etc.
4. Self-assessment, e.g. affects of DM on performance, customer satisfaction etc.

An analysis will be conducted based on the data from these 313 questionnaires to test if companies with good DM make use of the suggested success activities for the NPD process. If the companies with good DM undertake those activities then the hypothesis can be supported, implying that the same success activities for the NPD process equally apply for DM. In order to test the second hypothesis, the quantitative data analysis will test if the activities with the most references derived from the literature review are also the most frequently used.

In order to quantify good DM in practice, data from the winners of the DME Award were chosen for analysis. These companies were chosen by a jury consisting of internationally recognized DM experts. These experts chose the winners of the DME Award based on the company's DM performance according to opinions formed around their expertise.

Altogether there are 19 DME Award winners from 2008, from which one questionnaire will be deducted due to insufficient data, 6 DME Award winner questionnaires from 2009 and 4 DME Award winner from 2010. The questionnaires from 2008 and 2009 are not identical, thus an all-encompassing analysis is not feasible.

Each of the previously excerpted nine success activities are covered by at least one corresponding question from the DME Award questionnaire 2008-2010.

As a further method of validation and justification for considering the DME Award winners as the main source to investigate the formulated hypotheses, the results of the winners will be compared against the entire dataset. Consequently, the winning companies are expected to reveal more effective utilisation of the nine activities than the entire cohort.

RESULTS

The different examined activities on the basis of the dedicated questions from the DME Award questionnaire reveal different percentages of “effective utilisation” based on the extent to which the companies make use of the nine suggested success activities. The percentage score is dependent on each company’s frequency and extent of utilisation of each activity with the better use of each activity receiving a higher percentage score.

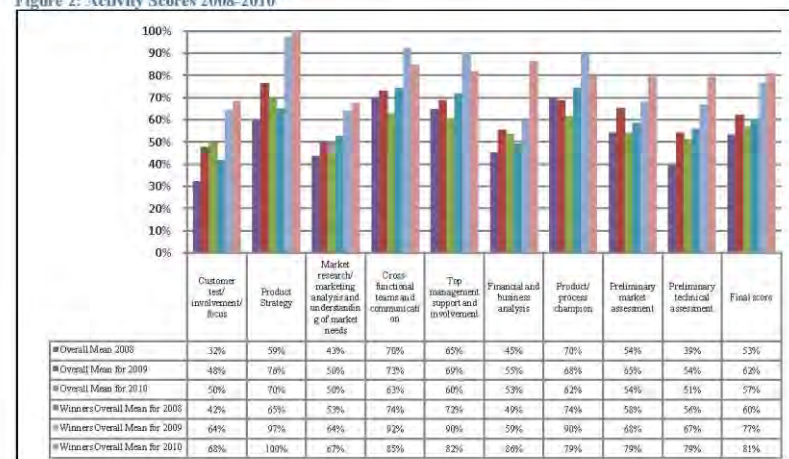
Figure 2 displays the final score of effective utilisation of the nine success activities. This final score for all three years is well above 50% for all companies.

The lowest score tallied at 53% was in 2008, while the highest score of 62% was in 2009. Despite the slight decrease in 2010 the general linear trend remains positive.

Further, it is demonstrated that the overall score of the winners throughout the three years is better than the score of all companies. In 2008 the score is 7 percentage points higher than for all companies, steadily increasing to 77% in 2009 and 81% in 2010.

The same pattern reoccurs throughout the whole analysis. For each of the nine activities and for all three years it is noticeable that the DME Award winners always make better use of the activities in comparison to the entire dataset. Additionally, it is observed that for most of the activities the score in 2009 is the highest while a slight decrease in 2010 occurs. However, the general trend remains positive.

Figure 2: Activity Scores 2008-2010



Furthermore, in 2010 all companies and the DME Award winners score at least 50% in each of the nine activities. This confirms the above stated positive trend since the previous years still showed outlying values. Although, the first activity “customer test/involvement/ focus is the most referenced success activity in the considered literature the results from the data analysis does not support the suggested importance of this

activity. In fact, all companies as well as the DME Award winners scored better overall in the least referenced activity of “preliminary technical assessment”.

CONCLUSION

Every business strives to be successful in terms of performance. The driving force for outperforming competitors is new products. Simply put, new products equal growth and NPD is the primary source for success. However, the process for developing new products is a risky and unpredictable endeavour. This hazardous side-effect led to research concentrated on methods in which to make the NPD process as efficient and predictable as possible. Thus, in the last 30 years, studies were performed trying to discover the key success factors that a business needs to employ during NPD.

This paper demonstrates that the research on NPD success factors underwent a cultural shift. In the early years of NPD process research, focus was maintained on efficiently performing executive type activities. Gradually the attention was moved toward the importance of managerial type of activities. Eventually, it was realized that a combination of both is necessary in order for a firm to perform well against its industry competitors. The most contemporary findings now emphasize the critical value of not just the tasks themselves, but the utilization of “soft skills” when conducting these tasks. Soft skills basically refer to “management skills”. The investigations of studies for success factors confirm the importance of managerial tasks in the NPD process. Additionally, it emphasizes the outstanding importance of conducting pre-development activities. These results follow logically because the pre-development activity largely determines the development of the product concept. Management activities are: Strategy, Cross-functional Teams and Good Communication, a Product/Process Champion and Top Management Support and Involvement. Pre-development activities are: Customer Involvement/Focus, Market Research and Understanding of Market Needs, Financial and Business Analysis, Preliminary Market Assessment and Preliminary Technical Assessment.

The focus change from executive to managerial task importance was indeed an important development in business strategy. Nonetheless, the essence of modern day NPD lies in the way that DM became the leader and its own discipline within the NPD process. DM is managing the NPD process with design principles upheld.

The remaining question was if the excerpted success factors of the NPD process are also applicable when DM is being used. As argued, DM confines itself to the managing activity of the NPD process. The only difference to managing a conventional NPD process lies with the consideration of design principles when using DM, and making design the leader of the NPD process. Since all activities, managerial and executive, remain the same and just the focus of attention changes, it can be concluded that all success factors for the NPD process are also success factors when DM is being used.

This is supported by the results of the effective utilisation of the nine suggested success activities. On average is the final score for all three years well above 50% with a positive general trend. The DME Award winners even make greater use of the nine success activities with an even more positive general trend. All companies score over 50% and the DME Award winners even up 81% in 2010 and a general positive trend towards an improvement for future perspectives is observed. Consequentially, the hypothesis that the most frequently referenced NDP process success activities also apply for DM is supported. However, the ranking of those activities will need to

undergo further adjustments since the second hypothesis that the most referenced success activities are also the most important is not supported. Further, it raises the question: do any additional success activities exist and how influential might they be to the project outcome.

Therefore, a detailed follow up study with some of the investigated companies will be necessary to further refine these findings. Now that predictors have been identified it is possible to conduct empirical research and gather numerical data to support these findings. In addition, it paves the way to more micro-research into the area of DM.

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5. CONFERENCE PAPER 2



1ST CAMBRIDGE ACADEMIC DESIGN MANAGEMENT CONFERENCE, 7 – 8 SEPTEMBER 2011

SUCCESS ACTIVITIES FOR DESIGN MANAGEMENT - A STUDY

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Keywords: *Ranking system, Interview*

The research presents the development of a value ranking system to identify the best performing companies on the basis of their usage of previously identified success activities. Furthermore, it shows the development of the interview questionnaire that was used to cross-examine the identified four best performing companies from the Design Management Europe (DME) Award dataset. For this purpose, one of the 2009 DME Award winners was chosen for a pilot interview and the resultant feedback was used to review the interview questionnaire.

INTRODUCTION

The Design Management Europe (DME) Award recognizes European companies for best Design Management (DM) in practice. The process of considering entries for the DME Award generates a significant volume of data about each of the entrants, gathered through questionnaires. This data relates both to their DM organisation in practice, and their economic performance. Since 2008, data from 313 questionnaires from DME entrants have been gathered for further study. This dataset lays the groundwork for an investigation of the impact of Design Management on companies' economic performance.

Prior to the study reported in this paper, a chronological literature review of DM and New Product Development (NPD) research was conducted. The results showed that approaches to the NPD process underwent a significant shift within the past decades. During the mid 1980s, the NPD paradigm clearly emphasized execution activities as being critical for successful NPD (Cooper and Kleinschmidt, 1986). Over time, this emphasis changed to recognising management activities as the crucial factors for success (Zirger and Maidique, 1990, Cooper, 1994, Cooper et al., 2002, Cooper, 2009, Barczak et al., 2009, Brentani and Kleinschmidt, 2004). At the same time, approaches to the implementation of the design process also

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underwent significant changes. While in the 1990s design was only one activity within the NPD process, the early 2000s brought an understanding that giving designers a more fundamental role can actually enhance the entire process. Eventually, design became the leader of the NPD process while also remaining a critical sub-process in itself (Perks et al., 2005). In combination with the recognition of managerial excellence as being crucial for the success of NPD, a new concept arose, known as Design Management (Mozota, 2003). Consequently, it was hypothesized by Hesselmann et al. (2011) that all success activities of the NPD process are also success activities of Design Management. As part of the literature review, various studies on NPD success activities were examined and a list of the nine most frequently referenced success activities was identified.

Table 1: Success activities

Management activities	Execution activities
Strategy	Customer involvement/ focus
Cross functional teams and good communication	Market research and understanding of market needs
Product/ Process Champion	Financial and business analysis
Top management support and involvement	Preliminary market assessment
	Preliminary technical assessment

This list was tested against the 313 questionnaires to determine if the DME entrants employ any or all of these nine activities. It was observed that the majority of the entrants utilize each of the nine identified success activities (Hesselmann et al., 2011). Further testing and investigation aims to identify a standard set of activities for good Design Management.

Although it was determined that the vast majority of the companies addressed each of the nine success activities, the relative importance of each the individual activities is required. Furthermore, it remains unclear if any additional success activities are present and how influential they might be for the project outcome. This research presents the next step of filling in these gaps, examining the nine identified success activities and paving the way to discover further success activities. A value ranking system will be developed, and the DME Award entrants will be ranked according to their effective utilisation of the identified nine success activities. This will attempt to ascertain the top four performing companies from the cohort of the DME award entrants based on these success activities. Secondly, an interview questionnaire will be developed to discover any additional success activities that are not included in the list. By means of the newly-developed interview questionnaire it will possible to address the open questions regarding the importance, centrality and completeness of the discovered success activities to each company. In order to test the developed interview, one of the 2009 DME Award winners was chosen for a pilot study and their feedback was used to further refine the questionnaire as well as giving initial hints regarding the centrality, importance and completeness of the success activities. Ultimately, this interview questionnaire will be used to cross-examine the identified top four companies in a further follow up study.

THE DATA

The data is derived from the DME Award entrant questionnaires from 2008, 2009 and 2010. This data relates to the DM practices employed by the entrants and their economic performance. The DME Award received 163 completed questionnaires in 2008, 73 in 2009 and 77 in 2010. Though the questionnaire sets of 2008 and 2009/2010 do not feature identical questions, the questionnaire structure and general themes remain the same, and all questions offer multiple choice answer possibilities. The questionnaires from all three years give data that can be broken down into four subcategories. These subcategories are:

1. Company data (e.g. company size, employee count)
2. Financial data (e.g. turnover, investments)
3. Design approach (e.g. selection for design, use of design)
4. Self-assessment (e.g. affects of DM on performance, customer satisfaction)

METHODS

The research study encompassed three aspects:

- Establishing a company ranking system on the basis of the nine success activities and the corresponding questions from the DME Award questionnaires
- Developing and testing an interview through one pilot interview with one of the DME Award winners from 2009
- Refining the pilot interview to be used for the four best performing companies based on the feedback

Ranking system

Each of the identified nine success activities corresponded to at least one question in the DME Award questionnaires. These corresponding questions give information about the extent of utilisation of the nine activities. However, the design of the questionnaires pre-dated the research cited in this paper which is causing an unequal distribution of questions to activities, since some activities have only one closely corresponding question while others have up to four. This inequality is exacerbated by questions having different amounts of possible multiple choice answers, as some questions allow the selection of multiple answers and other questions the selection of only one answer (Table 2).

Table 2: Success activities with the number of corresponding questions

Questionnaire from 2008			Questionnaire from 2009 & 2010	
Activity	Number of corresponding questions	Number of possible multiple choice answers	Number of corresponding questions	Number of possible multiple choice answers
Customer test	2	8	2	11
Product strategy	1	1	2	2
Market research	2	5	3	12
Cross-functional teams	2	2	4	4
Top management support	2	2	2	2
Financial and business analysis	1	4	1	3
Product champion	2	2	3	3
Preliminary market assessment	3	4	3	3
Preliminary technical assessment	1	2	2	2

The overall score was calculated in four different steps:

1. According to the quality of the answer for each question, each answer was ranked in ascending numerical order with the highest number for the best answer. The best answers were defined by the pre-designed DME Award questionnaire. The number given to each answer equates to that answer's score value.
2. Percentage scores were calculated for each answer by dividing the answer score by the number of the total possible answer scores for the particular question and multiplying the result with 100. The end result was the percentage score for each question.

$$\left(\frac{\text{Answer score}}{\text{\# of total possible answers scores}} \right) * 100$$

= Percentage score for each question

3. The average percentage score for each activity was calculated by summing up the percentage scores for each question of the different activities and dividing it by the number of questions corresponding to the activity. The result was multiplied by 100 to calculate the average percentage score for each activity.

$$\left(\frac{\text{SUM of percentage scores for each question}}{\text{\# of questions corresponding to the activity}} \right) * 100$$

= Average percentage score for each question

4. The overall percentage score for effective utilization for all nine activities was calculated by summing the average percentage scores for each activity and dividing it by the total activities. The result, multiplied with 100 represents the overall score.

$$\left(\frac{\text{SUM of average percentage scores for each activity}}{9} \right) * 100 = \text{Overall score}$$

This methodology equalizes the weight of all activities, with all activities having the same influence on the overall score. This overall score was designed to show the effective utilisation of all activities for each company, with the better use of each activity receiving a higher percentage score. Based on the overall score, the four best performing companies were identified. In order to test the spread of the calculated scores for the different activities the standard deviation was calculated.

Companies which did not give a sufficient amount of data to be able to calculate an overall score had to be deleted from the dataset. The dataset from 2008 excluded 11 companies, resulting in 152 valid questionnaires. In 2009 and 2010, 20 companies were excluded which resulted in 130 valid questionnaires in total from both years combined to be used for analysis. The size of the dataset used in the analysis therefore amounts to 282 questionnaires.

Interview

A semi structured pilot interview was developed to gain further insight into the importance, centrality and completeness of the current identified success activities. The company for this pilot study was selected from the cohort of the DME Award winners from 2009. This manufacturing company was chosen as an award winner by a jury consisting of internationally recognized DM experts.

The interview questionnaire was divided into the following categories:

1. Company details
2. General questions regarding the companies' DM
3. Success activities
4. Self-assessment
5. Success measurements

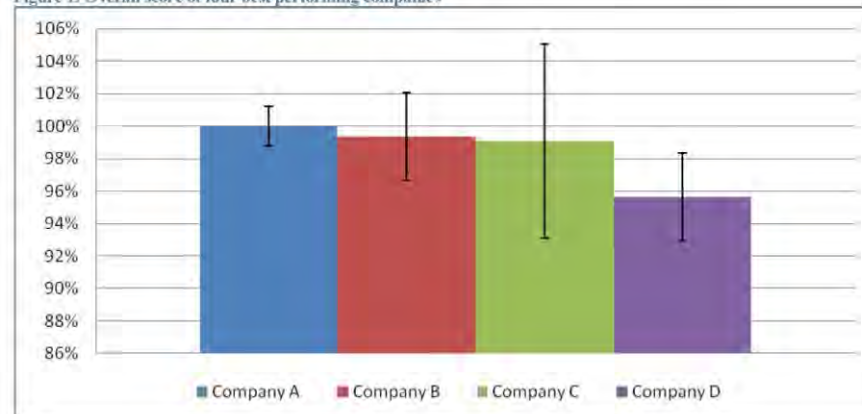
The answers from the pilot interview questions, together with feedback from the interviewed company were reviewed with a view to determining the effectiveness of the interview questions. Section four of the interview "self-assessment" included a six point ranking scheme for the nine activities and any additional activities which the company identified as important. The two interviewees were asked to rank the activities according to their influence to their company from one to six with six indicating the highest influence.

RESULTS

Ranking system

212 out of 282 companies achieved a score of at least 50% in their effective utilization of all nine activities, meaning that over 75% of the companies have a percentage utilization score greater than 50%.

Figure 1: Overall score of four best performing companies



The top four companies from the analysis achieved scores of 99.35%, 99.07%, 99.07% and 95.62% for Company A, B, C, D respectively (Figure 1). Company D was from the 2008 dataset, and the remaining companies from the 2009-2010 dataset. All four companies were chosen for the proposed interviews.

The standard deviation for all four company scores is less than 0.1. The overall score of the company from the pilot study amounts to 87% placing the company 32nd in the overall ranking with a standard deviation of 0.098.

Interview

The pilot interview was conducted with the two owners and CEOs of the chosen DME Award winner. This company was chosen because of its relative high 32nd place in the overall ranking and its accessibility. Furthermore, it was chosen because it had been rewarded for good DM by an international recognized jury. The procedures of the interview were explained to them before the interview start as well as the use of the interview for research purposes. No concerns were raised.

The interview time amounted to 55 minutes and the respondents answered all questions. Due to a satisfying result it was decided that no amendments have to be made to the interview questionnaire.

Two additional activities, “prototyping” and “embedding feedback of unrelated individuals” were pointed out. Embedding feedback of unrelated individuals refers to gaining feedback from not intended users of the product. The ranking of these eleven activities according to the interviewees is displayed in Table 2.

Table 2: Success activity ranking

Success activity	Raking
Customer test	6
Product Strategy	4
Market research	6
Cross-functional teams and communication	3
Top-management support and involvement	6
Financial and business analysis	6
Product champion	6
Preliminary market assessment	6
Preliminary technical assessment	6
Prototyping	6
Embedding feedback of unrelated individuals	4

Although, eight out of eleven activities were ranked with a six, company managers expressed the views that the activity of prototyping was of the highest importance to them. The activity preliminary technical assessment was considered of similar importance.

DISCUSSION

Previous research identified a list of the most frequently referenced success activities from NPD research. It was discovered that the majority of the DME Award entrants employ each of these activities (Hesselmann et al., 2011). In spite of this it should be noted that these are all companies which are looking for being rewarded for good DM. Therefore it might be more likely that these companies address all of the identified activities.

However, the inclusiveness and relative importance of these nine activities remained unclear. A sub-step to obtaining this data was a development of a ranking system used to identify the four best performing companies based on their utilization of the nine activities. Primarily, this ranking system was developed to exclude possible subjectivity regarding the identification of the best performing companies since the DME Award winners were chosen based on the subjective views of a jury and not based on the data. It is to notice that none of the DME Award winners is amongst the four best performing companies. The top four companies showed an effective utilisation of over 95% indicating a very good use of all nine success activities. The standard deviation for all four company scores was less than 0.1, indicating that the scores for each activity hardly deviate from the overall score and the chosen companies effectively utilise all nine activities equally. Therefore, it can be concluded that the chosen companies are potentially good subjects for a further follow up study investigating the inclusiveness and the ranking of the nine activities. Furthermore, the percentage score ranking system provides the opportunity to micro-analyse the effective utilisation of single activities for further research.

Initial information regarding any additional activities was gained from the interview. In addition to the nine activities, “prototyping” and “embedding feedback of unrelated individuals” were considered to be important activities. Furthermore, the activity “preliminary technical assessment” was perceived as almost equally important as prototyping. Both activities, prototyping and preliminary technical assessment have been identified as crucial success activities in various studies (Cooper and Edgett, 2008, Cooper and Kleinschmidt, 2007, Cooper, 1994, Balbontin et al., 1999, Brentani, 2000). According to Cooper (1994, 2008) an execution of these activities at a very early stage of product development has been proven to promote success improving performance by up to 43%. Both activities are important to progress the product development in a successful manner. Technical assessment is considered as being important to provide the foundations for the appropriate design solutions and the production of the product (Brentani, 2000). By prototyping, the product can be tested on an early stage in the development process, providing the opportunity to identify and fix mistakes, improving the quality, reliability and feasibility (Brentani, 2000). Whereby, prototyping can also provide valuable conclusions regarding the technical feasibility of the product. Both activities tie into each other and function supplementary to each other.

In particular, testing the developed prototype with users has been identified as one success activity (Balbontin et al., 1999). Cooper (2008) suggests the execution of this process as a

“spiral development” by testing the prototype on users and using the feedback to adjust the prototype and so forth. The embedding of users into this process offers more insight into the high perception of importance for activity “customer test/ involvement/ focus” of the interviewed company, especially since it is arguable if “embedding feedback of unrelated individuals” should not be considered as part of the already identified activity “customer test/ involvement/ focus”. This shows that the three activities which were ranked the highest by the interviewed company are closely related to each other and work synergistically together.

Based on the preliminary hints from the pilot study, it can be concluded that a set of equally important and interacting activities is considered as more important than single activities. This is even magnified through the ranking of the remaining activities since six out eight remaining activities were ranked with the highest possible importance. Particular emphasis seems to lie on the interaction between technical assessment, prototyping and customer testing. However, it has to be taken into account that the interviewed company is a manufacturing company which has to place more importance on activities just like prototyping and technical assessment than for instance a service company.

In the light of these results new research angles are opened up for the next interviews with the four top performing companies. The conducted pilot interview met the aim to gain further insights into the activities. Nevertheless, since the results give first hints that the interaction between the different activities might be a crucial point the interview questionnaire will be adjusted to gain further insight.

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Sebastian Hesselmann received his Bachelors degree from the Ruhr - University of Bochum in Germany, double majoring in Politics and History. His culminating research involved an in-depth analysis of the business performance of Germany's I.G. Farbenindustrie Aktiengesellschaft, investigating the factors underlying this company's exceptional success.

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6. CONFERENCE PAPER 3

LEADING INNOVATION THROUGH DESIGN

2012 INTERNATIONAL DESIGN MANAGEMENT RESEARCH CONFERENCE
AUGUST 8-9 2012 – BOSTON, MA. USA

Sebastian HESSELMANN, Andrew T. Walters and Gert KOOTSTRA (2013). *An Analysis of Design Management Practices in Europe, A critical investigation of the Staircase Model*. XX – XX.

AN ANALYSIS OF DESIGN MANAGEMENT PRACTICES IN EUROPE - A CRITICAL INVESTIGATION OF THE DESIGN MANAGEMENT STAIRCASE MODEL

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The research presents a critical investigation of the Design Management Staircase model to assess current Design Management practices and capabilities of European businesses. Based on the literature it assesses the Design Management Staircase model regarding its suitability as a method to assess current DM practices of European businesses. Furthermore, it applies the Design Management Staircase model to four different datasets obtained from European Businesses each year from 2008-2011. It explores the development of the trends in the Staircase model scores. Further analyses are conducted examining differences in Staircase scores of businesses recognizing design and design management as an important tool for innovation.

Keywords: Design Management capabilities, Design Management Staircase Model, Innovation

INTRODUCTION

This paper presents a critical investigation of the Design Management Staircase model (Kootstra, 2009). The Design Management Staircase model was developed during the Award for Design Management Innovating and Reinforcing Enterprises (ADMIRE) programme as part of the PRO-INNO Europe initiative formed by the European Commission (EC) Directorate General for Industry and Enterprise. Despite finding evidence of a positive correlation between Design Management (DM) and business performance, the EC identified a substantial lack of knowledge concerning the manner and extent to which European businesses integrate design into their management structures. Therefore, it was one of the key objectives of the ADMIRE programme to investigate the current DM practices of European businesses and to identify obstacles preventing businesses from implementing DM structures.

In the absence of a validated model to assess European businesses' DM capability, the Design Management Staircase model was developed by Kootstra (2009). The model aims to enable European businesses to assess and improve their DM capabilities in order to increase their effective use of design and improve their competitiveness and business

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success. To assess DM capabilities a process perspective was taken, classifying the DM capabilities of businesses into four different levels, ranging from an immature stage, level 1, through to level 4, where design is managed strategically. All four levels are further defined by five factors influencing the success or failure of design and indicating good DM. The level ranking is dependent on the extent to which businesses implemented these five factors. Each of these factors are explained through three to four multiple choice questions. Subsequently, the Design Management Staircase model was tested on a large scale study amongst 605 European businesses. The results of this study were presented in Kootstra's (2009) report "The Incorporation of Design Management in Today's Business Practices". However, the rationale for the model's levels and factors has never received any academic interrogation, leaving the model open to criticism regarding its validity. In order to address such potential for criticism the first part of this paper will critically comment on the five factors and the construction of the DM capability levels on the basis of a literature review. This critical analysis focuses on the suitability of the model as a method to assess current DM practices of European businesses.

The second part of this paper will concentrate on the practical application of the Design Management Staircase model to datasets derived from the Design Management Europe (DME) Award. The DME Award originates from the ADMIRE programme and is bestowed for excellence in DM practice, honouring the DM structures of businesses rather than a designed output. The DME Award adopted the Design Management Staircase questionnaire as part of its entry procedure. Altogether the DME Award gathered 321 completed questionnaires from 2008-2011. This provides a unique opportunity to apply the Staircase model to four different datasets obtained from the questionnaires and to analyse the DM capabilities amongst European businesses. Particular attention will be given to the trend of the DM capabilities of European businesses reflected in the Staircase scores between 2008-2011. This includes an analysis of the performance of businesses recognizing design and DM as an important tool for innovation.

In summary, this paper draws upon the following approaches:

- Presenting the Design Management Staircase Model and its development
- Critical investigation of the Design Management Staircase Model and its five underlying factors based on a literature review
- Application of the Staircase Model to the DME Award datasets of European business gathered from the years 2008-2011
- Analysing the trend of the DM capabilities of European businesses reflected in the Staircase scores between 2008-2011
- Analysing the performance of businesses recognizing design and DM as an important tool for innovation reflected in the Staircase scores

DESIGN MANAGEMENT STAIRCASE MODEL

STAIRCASE LEVELS

Kootstra (2009) describes the structure of the Design Management Staircase Model. He states that the Design Management Staircase model is based on a method comparable to the Design ladder (Ramlau & Melander, 2004) of the Danish Design Centre. The Design Management Staircase model describes the characteristic DM behaviour and capability of businesses at four levels. The level classification ranges from the lowest level "No DM" to the highest level where DM is used strategically and is part of the business culture (Figure 1). This ranking implies that businesses reaching higher levels of the model assign a higher strategic use of design than businesses in lower levels. However, businesses do not necessarily have to strive for the highest level, as various external factors determine the

particular needs of each business and the most sufficient level of the Design Management Staircase model (Kootstra, 2009).

The four levels are presented as:

- Level 1: No Design Management
- Level 2: DM as a Project
- Level 3: DM as a Function
- Level 4: DM as a Culture

LEVEL 1: NO DESIGN MANAGEMENT

In this level businesses make no use of DM. Design has no role in the business objectives and is only applied occasionally with no or limited objectives. All design results are highly unpredictable and inconsistent due to a lack of a clear defined process. Design knowledge and experience is accordingly absent or very limited.

LEVEL 2: DESIGN MANAGEMENT AS A PROJECT

In this level is the use of design still very limited to meeting direct business needs. Design is not recognised as a tool for innovation or implemented in the New Product Development (NPD) process. Therefore, the use of design is restricted to adding value to existing products through styling, packaging etc. and is only used as a marketing tool with minimal coordination. The responsibility of design remains at an operational level.

LEVEL 3: DESIGN MANAGEMENT AS A FUNCTION

In this level businesses start to recognise design as a tool for innovation. Design is integrated in the NPD process and several disciplines and specialists become involved in the design process. The formal responsibility for design lies with an assigned staff member or department managing all involved groups.

LEVEL 4: DESIGN MANAGEMENT AS A CULTURE

In this level businesses are highly design driven and potentially established market leaders through design driven innovations. Design is an essential part of their differentiation strategy, generating a distinct competitive advantage. For this reason, design is an integral part of the business processes with the involvement of a wide range of different departments. A design literate top management is reinforcing the support and significant value of design amongst the entire business. This results in design being a part of the businesses' corporate culture.

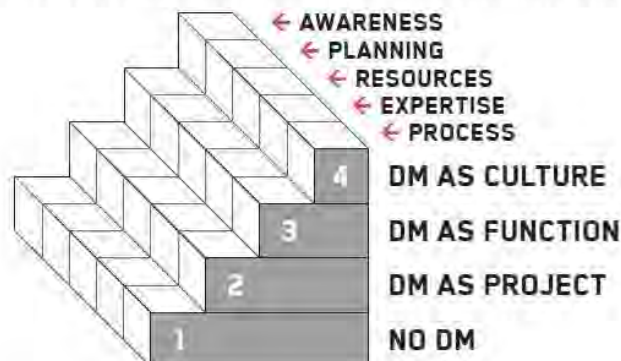


Figure 1 Design Management Staircase model
Source: Kootstra, Gert, (2009)

Author's name(s)

STAIRCASE MODEL FACTORS

All four levels of the Design Management Staircase model are further defined by five factors influencing the success or failure of design and indicating good DM (Figure 2). The level ranking is dependent on the extent to which businesses have implemented these five factors.

The five factors are presented as:

1. Factor Awareness: degree of awareness of benefits
 - The extent to which businesses are aware of the benefits and the potential value that design and DM can offer
2. Factor Planning: whether design plans and objectives are developed
 - The extent to which businesses have developed a strategy for design, articulated in business plans, and communicated widely
3. Factor Resources: people (design staff), funding (budgets) and means of production (facilities)
 - The extent to which businesses invest in design. Resources are considered as the sum of all design investment
4. Factor Expertise: the level of DM experience, skills and expertise
 - The quality of the design staff and the range of tools and methods applied
5. Factor Process: whether an effective process is followed
 - The extent to which businesses follow a professional and effective design management process, embedded in core business processes

FACTORS	DESIGN MANAGEMENT CAPABILITY LEVELS			
	LEVEL 1: NO DM	LEVEL 2: DM AS PROJECT	LEVEL 3: DM AS FUNCTION	LEVEL 4: DM AS CULTURE
AWARENESS (OF BENEFITS)	Not aware of benefits and potential value of design (unconscious use or no use)	Some functional specialists are aware	Most are aware that it is important to remain competitive	All are aware that it is fundamentally important to gain a leadership position
DM PROCESS	No idea where design fits within current processes	Performed inconsistently and late in development process; not repeatable across projects	Performed consistently and early; formal DM process drives performance	Ongoing activity; business is engaged in continuously improving DM process
PLANNING	Company / marketing plans do not mention the use of design	Limited plans and objectives exist at the individual project level	Plans and objectives exist which set direction and integrate design in various activities	Design is part of strategic plans; design planning is a dynamic process that drives the business
DM EXPERTISE	Little or no skills to handle design activity; no DM tools applied	Some skills; basic DM tools applied inconsistently; lots of room for improvement	Standard DM tools applied consistently; some room for improvement	Appropriate expertise; use of advanced DM tools; appropriate metrics used
DESIGN RESOURCES	The business has not committed resources to design activity (may not appreciate the potential return of design investment)	Limited resources are allocated for individual projects; one-off design investments with no review of potential returns	Sufficient resources are allocated on the basis of potential return, but with limited procedures in place to assist in decision making	Substantial resources are allocated, with financial procedures in place to assist in appraising investments, assessing risk and tracking returns

Figure 2 Design Management Staircase model maturity grid
Source: Kootstra, Gert. (2009)

LITERATURE REVIEW

MATURITY GRID

As described above the Design Management Staircase model framework is based on a process maturity model. Each level of the model builds on the previous level. It suggests that each business can undergo a development process to reach the subsequent level. A wide range of maturity and growth models can be found in the literature (Crosby, 1979; Greiner, 1998; Nolan & Gibson, 1974). These models commonly classify development in different stages. Each of the stages has its own challenges to overcome and reaching the subsequent level results in better control. However, it is not essential for businesses to attempt to reach the highest level but rather to settle with the best fit for their specific needs (Nolan & Gibson, 1974).

THE DESIGN MANAGEMENT STAIRCASE MODEL

The Design Management Staircase model was developed to address the lack of knowledge concerning the way businesses in Europe manage design. The main research question was formulated by Kootstra as (2009: 16): 'How do European SMEs manage design in practice, and how can they further develop their (design management) skills to increase the effectiveness of their design activities?'

Author's name(s)

Various studies have shown that design has a positive contribution to business performance. For example, Kotler and Rath (1984) argued that design can create a distinct competitive advantage for businesses, and, Gemser and Leenders (2000) analysed how industrial design affects the performance of businesses. Despite finding evidence for a general positive effect of industrial design on performance, it was found that this impact is unconditionally positive. In fact, the impact of industrial design depends largely on the industry and in particular on the strategy by which industrial design is integrated into the NPD process. Similarly, Hertenstein, Platt and Veryzer (2005) were able to show that good industrial design which enhances the value, utility and appearance of a product improves the performance of businesses in a range of metrics. Industrial design is hereby understood as a process in liaison with multiple departments and stakeholders. The emphasis is clearly that industrial design has to be seen as a design process. Alike Kotler and Rath (1984) argued that design is an active planning and decision making process resulting in a finished product. This design process is seen as a part of the NPD process with the involvement of designers from early stages such as idea generation onwards. Although the design process is closely related to the NPD process there is a clear difference between the two. The design process can be applied to all types of creative activities and focuses on the generation, evaluation and implementation of solutions. It forms the set of technical activities within the NPD process to meet marketing and business aims (Moultrie, Clarkson, & Probert, 2006; Moultrie, Clarkson, & Probert, 2007). Giving designers a more fundamental role can enhance the entire NPD process, creating a more synergistic versus individualistic environment. However, once a part of this process, it will also be necessary to implement management skills such as motivation and persuasion, relationship management and negotiation and the ability to effectively market a product (Perks, Cooper, & Jones, 2005). This highlights the importance of management at any level. The article of Ahire and Dreyfus (2000) showed that managing the design process has a positive input on product design performance and process quality management. It appears that good design emerges as a result of well managed processes, such as a development process that embeds organisational activities, practices and skills. Such a managed process might be considered as DM. This view is supported by Chiva and Alegre (2009) in their assessment of the effect of design investment on business performance and how this effect is mediated by DM. It was revealed that DM improves business performance and that design investment is positively related to DM. However, it is emphasized that purely investing in design does not consequentially lead to improved business performance but rather a well managed and effective process. According to Borja de Mozota (2003: 70) DM has two objectives: '1) To train partners/ managers and designers; 2) To develop methods of integrating design into the corporate environment.'

According to Peter Gorb (cited in Mozota, 2003) DM primarily concentrates on allocating all available design resources to businesses to achieve their strategic objectives. This discipline oversees and directs a business' creativity and manages the business itself in accordance to their design principles. Therefore, DM has got a design educating role by communicating the value of design and integrating it into the business strategy but also a managerial task by allocating necessary resources to design and managing the design process.

The management and foremost integration of design can take place on three different levels in any business, the operational level, the functional level and the strategic level. Design on an operational level is considered as the initial stage towards integrating design, the second level is presented as creating a design function in the business and the strategic level is characterised by the transformation of the business strategy through design. Each of the design integration levels are characterised by eight underlying factors which vary in their specification and execution depending on the levels. (Mozota, 2003) The factors are presented as:

- Strategy (Design strategy)
- Planning (Defining design procedures and briefs)
- Structure (Design process)
- Finances
- Human Resources
- Information (Developing a design understanding in business)
- Communications
- R&D

Possible impacts on the business have been identified in four key areas. Design can act as a facilitator bringing the cost, quality and time to market into rough parity with competitors; as a differentiator making products more attractive, distinctive, relevant and easier to use; as an integrator implementing design effectively with other functions and as a communicator articulating businesses' personality, purpose, and standards to internal and external audiences. However, the impact of design on these four key areas is largely dependant on the style of managing design, the employment of the right expertise and the allocation of the right resources (Hayes, 1990).

Further influential factors for the effective management of the design process have been uncovered. Especially, a set of five skills have been found being essential to the design process. These are on one hand the general ability to manage the activities within the design process. This can be on a very basic level as in managing the design process to produce high quality products but also the ability to manage specialised activities such as the ability to assess manufacturability. Further, essential skills are the ability to involve different stakeholders such as customers and suppliers in the design process. Closely related is the ability to manage change, which can refer to general organisational change but as well to the ability to manage cross-functional teams. Foremost, is the ability to manage innovation. This skill is closely related to cultural factors and especially awareness, as it involves the establishment of a creative environment, raising the awareness and generating ideas for innovation (Dickson, Schneier, Lawrence, & Hytry, 1995). Montana, Guzman and Moll (2007) describe in their brand design management model how creating a design management culture is crucial to unleash the full potential of design. A key point in creating a design culture is a strong involvement of the top management to manage the design process efficiently. Awareness and understanding of the potential of design is hereby a vital precondition. Four further activities have been identified as important DM factors, namely concept generation, design strategy, resource allocation and implementation. Olson, Slater and Cooper (2000) developed a process approach for managing design. The first step in the process is raising the awareness by articulating the business objectives and strategies amongst the entire business. The second step involves the understanding of the design requirements but foremost identifying what skills, resources and financial requirements will have to be allocated to the design process. The third step is mainly concerned with ensuring good communications between different involved departments. The fourth step consists of finalising a detailed design brief including taking into account the business strategy, design specifications and positioning against rival products. The final step is the measurement of design performance. This can include both the evaluation of the output product and the evaluation of the design process itself.

Several attempts have been made to classify design activities and capabilities. The Design Ladder presented by Ramlau and Melander (2004) and in the report of the Danish Design Centre (2003) developed a framework to assess the degree of design activity implemented by businesses. The ladder categorises the design activities into four different levels. An important finding of the framework was that the performance of businesses improves relative

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to their ranking on the Design Ladder. However, the model fails to explain the criteria for placing businesses on the ladder.

The levels are presented as:

- No use of design. In these businesses, design is a hidden aspect of product development. It is generally the task of non design disciplines to develop the functionality and aesthetics of a product.
- Design as styling. Design is seen as the final styling of a product. The task may or may not be undertaken by professional designers.
- Design as process. Design is not an end result, but rather a work method adopted at an early stage of product development and requiring the involvement of several different disciplines, including design.
- Design as strategy. Design has been adopted as a central aspect of the company's business base, used as a means of encouraging innovation, for instance (Ramlau & Melander, 2004: 50).

The Design Atlas was developed to assess business capabilities and the contribution of design (Summers, 2000). It assesses businesses in five key design areas. These are planning, process, resources, skills and design culture. These five factors are assessed on the basis of 15 underlying questions. Depending on the answers given businesses can score between one to four points for each answer, while one is the lowest score and four the highest (Inns, 2002).

Moultrie and Fraser (2004) contributed the Design Process Audit model. This design audit is based on process maturity principles where design performance is classified into four levels. Each level is further defined by five factors. These factors respond to 24 key design activities in which businesses can achieve scores from one to four according to the levels. Maturity is defined as (Moultrie & Fraser, 2004: 34): 'The degree to which processes and activities are executed following 'good practice' principles and are defined, managed and repeatable.' The maturity levels are defined as:

Table 1 Design process maturity model
Source: Moultrie and Fraser (2004)

Factors	Level 1: Not performed or ad hoc	Level 2: Partially performed	Level 3: Formally performed	Level 4: Culturally embedded
Degree of awareness of benefits	Not aware of the benefits	Some are aware of the benefits	All are aware of the benefits	Fundamentally important to success
The people involved	Individual heroics	Functional specialists	X-functional or core team involvement	Extended team including external specialist
The timing of the activity	Typically not performed	Performed inconsistently or late	Performed consistently and early	Ongoing activity
Whether an effective process is followed	No process	Partial process-not repeatable across projects	Formal process drives performance	Continuously improving process
The level of expertise	Little or no expertise No tools applied	Some skills Basic tools applied Inconsistently Lots of room for improvement	Standard tools applied consistently Not ingrained across the business Some room for improvement	Use of advanced tools and methods Culturally embedded Appropriate metrics used

Consulting the extant literature indicates that the Staircase model follows fundamentally the same principles, structures and factors as the Design Ladder, the Design Atlas and the Design Process Audit. All three underlying models are robust, established and accepted working models in the academic and business environment alike. This leads to the conclusion that the Staircase model can be accepted as a valid model to assess Design

Management capabilities. However, it remains unclear if the theoretical perspective offered by the Staircase model is reflected in its practical application to actual business data. The second part of this paper concentrates on the analysis of the performance of businesses recognising design and DM as important tools for innovation. The analysis examines if Staircase scores reflect actual achievement and/or behaviour in line with factor and level explanations.

METHOD

APPLICATION OF THE STAIRCASE MODEL

THE DATA

The data is derived from the DME Award entry questionnaires from 2008, 2009, 2010 and 2011. The DME Award entry questionnaire is largely identical to the original Design Management Staircase model questionnaire and features the same questions which underlie the calculation of the Staircase scores. This data relates to the DM practices employed by the entrants, their economic performance and business details. The DME Award received 153 completed questionnaires in 2008, 64 in 2009, 60 in 2010 and 44 in 2011. Though the questionnaire sets of 2008 and 2009/10/11 do not feature identical questions, the questionnaire structure and the questions for the calculation of the Design Management Staircase scores remain largely the same. The questionnaires from all four years give data that can be broken down into four subcategories. These subcategories are:

1. Business data (e.g. business size, employee count)
2. Financial data (e.g. turnover, investments)
3. Design approach (e.g. selection for design, use of design)
4. Self-assessment (e.g. affects of DM on performance, customer satisfaction)

CALCULATION OF THE DESIGN MANAGEMENT STAIRCASE SCORES

For the calculation of the total Staircase score and for the scores of each of the five underlying factors, numbers are assigned to each question. All five factors are calculated as the weighted average of these numbers. The total Staircase is subsequently derived from the average of the five factor scores.

DATA SAMPLE

Businesses were grouped following standard set in the DME Award entry guidelines (Figure 3) :

1. Micro Companies (1-9 employees)
2. Small Companies (10-49 employees)
3. Medium Companies (50-249 employees)
4. Large Companies (250+ employees)
5. Non-Profit Organisations (NPO)

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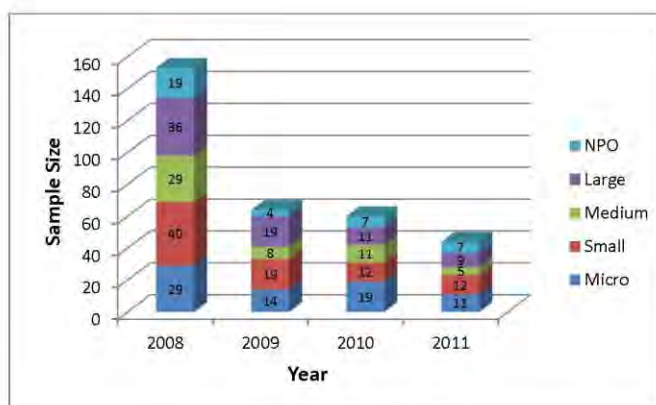


Figure 3 Sample size according to business groups for 2008-2011

DM CAPABILITY TRENDS

The average score for all Staircase categories was calculated for each year and is presented in Figure 5.

DM AS A TOOL FOR INNOVATION

Businesses were grouped following their recognition of design as a tool for innovation (Figure 4).

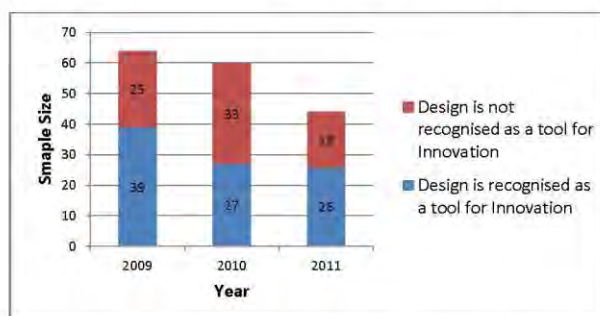


Figure 4 Sample size according to businesses recognising innovation as a tool for innovation for 2009-2011

Non-parametric tests were used since all datasets did not show a normal distribution. All significance levels were set at $\alpha=0.05$.

Datasets for 2009-2011 included additional information regarding businesses' recognition of design and DM as important tools for innovation. The Mann-Whitney test was used to compare the scores of each staircase category for businesses that did or did not recognise design as an important tool for innovation for each year (Table 2, Figure 6, Figure 7, Figure 8, Figure 9).

RESULTS

STAIRCASE SCORES CATEGORY TRENDS 2008-2011

All category scores, except for resources, show a general positive trend over the four year period. The resources scores show a negative trend, scoring highly in 2008 then declining until 2010 with a slight recovery in 2011. Despite this negative trend, the scores still remain high overall. Furthermore, the scores for process and planning are higher than the other factor scores overall throughout the 4 year period (Figure 5).

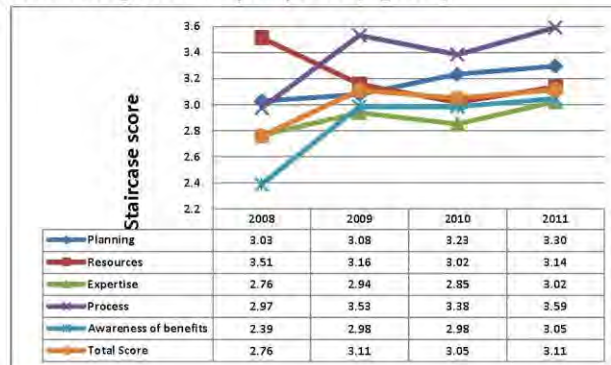


Figure 5 Development of Staircase scores 2008-2011

RECOGNITION OF DESIGN AS AN IMPORTANT TOOL FOR INNOVATION 2009-2011

A comparison was made between the scores of companies that indicated a recognition of design as a tool for innovation, and those that did not. Across these two groups there were significant differences across the factors resources, process and planning in 2009 and for the factor awareness in 2010 (see Table 2).

Table 2 Independent Samples Mann-Whitney test

Staircase factor	2009		2010		2011	
	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value	Significant differences between businesses recognising design as an important tool for innovation or not	P-Value
Resources	Yes	0.038	No	0.526	No	0.533
Process	Yes	0.001	No	0.235	No	0.084
Planning	Yes	0.035	No	0.807	No	0.648
Awareness	No	0.196	Yes	0.040	No	0.327
Expertise	No	0.212	No	0.620	No	0.051

The frequencies for the factors with significant differences between the two groups for 2009/2010 are presented in the Figure 6, Figure 7, Figure 8, Figure 9.

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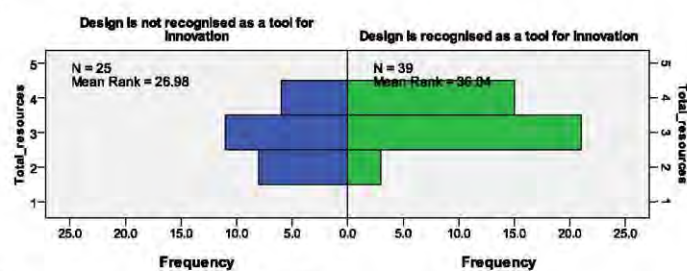


Figure 6 Innovation frequencies for resources 2009

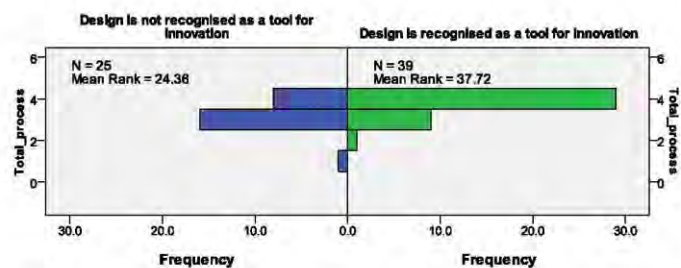


Figure 7 Innovation frequencies for process 2009

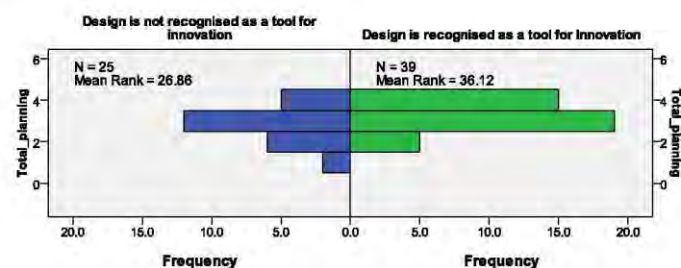


Figure 8 Innovation frequencies for planning 2009

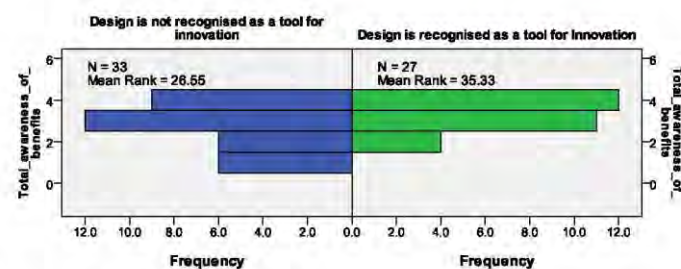


Figure 9 Innovation frequencies for awareness 2010

DISCUSSION AND CONCLUSIONS

To describe and classify DM capabilities a process perspective was chosen for the Design Management Staircase model. Design has been described as a process of active planning and decision making, resulting in a finished product (Hertenstein et al., 2005; Kotler & Rath, 1984; Olson et al., 2000). Therefore, it seems logical to choose a process perspective to classify DM capabilities, especially as recognition of the need for managing this design process emerged into the concept of DM. Further, the choice of a maturity grid implies taking on the process perspective following the definition of Moultrie and Fraser (2004: 34): 'The degree to which processes and activities are executed following 'good practice' principles and are defined, managed and repeatable.'

The structure of the levels of the Design Management Staircase model follow the Design Ladder (Kootstra, 2009). Both rely on classifications in four levels. All four levels are congruent with each other, only differing in classifying design versus DM. However, the Staircase model does not suggest that to be effective in managing design a businesses must strive for the highest level. An essential implication of the Design Ladder on the contrary is that only businesses that reach the highest level will benefiting from the full potential of design (Ramlaa & Melander, 2004). Further, it remains unclear how businesses are placed on the Design Ladder and especially how they can achieve the next highest level. The Design Process Audit developed by Moultrie and Fraser (2004) provides more insight in this area. Similarly to the Design Ladder and the Staircase model, it classifies the design process into four levels. It presents a working model to assess businesses' current performance state. In principle, businesses can work out how to achieve a ranking in the highest level. However, it is pointed out that not every business has to strive for the highest level, rather the challenge is to be at the right level for the particular needs for the specific business, as is the case for the Staircase model. Further similarities between the two models become apparent concerning the supplementary structure of the model and its content. Like the Staircase model, all four levels in the Design Process Audit are further defined by five factors. Three of these factors are concordant with the Staircase model factors. These are: degree of awareness of benefits; whether an effective process is followed; and, the level of expertise. There are also obvious similarities regarding the definitions of the three factors on the different levels. Further, all factors in the Design Process Audit are determined by questions regarding 24 key design areas. Possible answer options are ranked from one to four corresponding to the four levels of the Design process audit. Although the calculation of the Staircase model scores is slightly more complex, the principle remains the same. The same applies to the Design Atlas (Inns, 2002; Summers, 2000). The Design Atlas is also used as a working model to assess weaknesses and strengths in the design process. Comparable to the Design process audit and the Staircase model it assesses the design process based on five factors. Each factor is based on a set of questions in which businesses can score between one and four. Again, three of the five factors are concordant with Staircase model factors. The concordant factors are: planning for design; process for design; and, resources for design. The fourth factor of the Design Atlas is called 'People for design' and is concordant with the factor 'expertise' of the Staircase model as it explores the skill sets for the design process. The fifth factor 'Culture for design' is similar to the Staircase factor 'awareness'.

A wide range of important and influential factors for design and DM were described and are reflected in the Staircase model (Dickson et al., 1995; Hayes, 1990; Montana et al., 2007; Mozota, 2003; Olson et al., 2000). The chosen level structure of the Staircase model is widely recognised, for example Mozota (2003) describes operational, functional and strategic levels. Other factors such as strategy are not reflected in the Staircase model, or are only described as part of other factors such as planning. However, the Staircase model aims to assess the DM capabilities of businesses and not the quality or appropriateness of

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the DM in place, which might explain the lack of consideration of outstanding factors like strategy. Nevertheless, it can be concluded that the Staircase model largely arose out of a combination of the Design Ladder, the Design Process Audit and the Design Atlas, as it follows fundamentally the same principles, structures and factors. The main differences lie in the aims of the different models. Whilst the Design Ladder, the Design Process Audit and the Design Atlas each assess design, the Staircase model examines the design process, and as a result makes a judgement on the management of design. It is arguable that assessing the design process and assessing the capabilities to manage the design process cover the same areas. However, in order to come to a final conclusion it will be necessary to analyse the Staircase model questionnaire in order to determine if the questions aim to obtain insights on businesses' mechanisms for managing the design process. The Staircase model itself does not reveal sufficient information concerning this matter.

Kootstra (2009) claims that design driven businesses are better innovators than other businesses. Various studies have demonstrated that design can be the major force for innovation, influencing innovation on different levels (e.g. Montana et al., 2007; Perks et al., 2005). But only as a well managed process can design unleash its full potential and enable businesses to use design for innovation (Knošková, 2011). Following this argument, the Staircase level classification states that only at level three and four do businesses start to recognise design as a tool for innovation. Therefore, it would be reasonable to conclude that all businesses that recognise design as a tool for innovation would obtain level three or four, and conversely all other businesses would be limited to levels one and two. Within the available data set there are similar numbers of companies that have both indicated that they do indeed recognise design as a tool for innovation, and those that do not (Figure 4). The analyses with the Mann-Whitney test, comparing the scores of each Staircase factor for businesses that did or did not recognise design as an important tool for innovation, revealed significant differences in the scores for 2009 in the factors resources, process and planning. In 2010 a significant difference uncovered for the factor awareness (Table 2). Possible explanations for these differences lie in the nature of the Staircase model, that is, as it is built on a process perspective certain factors influence other factors. In this particular case it is arguable that a changed perception about design as a tool for innovation changes also the allocation of resources to the design process, the design process itself and the planning process. Similarly, an especially a high level of awareness might lead to the recognition of design as a tool for innovation; Mozota (2003) argued that awareness stimulates innovation. Businesses which recognise design as a tool for innovation score significantly higher than the businesses which do not (Figure 6, Figure 7, Figure 8 and Figure 9). However, the analyses of the interdependencies of the different factors go beyond the scope of this paper and will be addressed in future research. A possible explanation for the lack of significant differences in the other factors, and for all factors in 2010 may centre on an improved selection of businesses for the DME Award in combination with the instruction of the Staircase model that businesses do not have to strive for the highest level. Over time it appears that entrance to the award has become more selective. This is reflected in Figure 3 which illustrates the declining number of participants but also in Figure 5 showing the positive trend in the Staircase scores. A combination of both factors may lead to a greater proportion of entrants having good DM at lower Staircase levels, who still recognise design as a tool for innovation. However, it is indicative of a problem with the Staircase model if the instruction is that one does not need to achieve a high level (only an appropriate one), yet recognition of design as a tool for innovation is a pre-requisite for achievement of the higher levels. Further, it is possible (and demonstrated in the results) to achieve these high levels even if a company indicates that it does not recognise design as a tool for innovation, as the overall score is generated from a simple average across all responses.

This paper set out to address five points associated with the development of the DM capabilities evaluation model and subsequently tested the suitability of the model through an analysis of DME Award entry data. The summary below sets out how each of these points has been addressed:

- Presenting the Design Management Staircase Model and its development.
 - The conception of the Staircase model was described in the section "Design Management Staircase Model" and included an explanation of the four different levels and their factors.
- Critical investigation of the Design Management Staircase Model and its five underlying factors based on a literature review.
 - A literature review identified the fundamental influences on the Staircase model and the construction of the model was retraced. Based on the literature it was concluded that the Staircase model is a robust model to assess businesses' DM capabilities.
- Application of the Staircase Model to the DME Award datasets of European business gathered from the years 2008-2011.
 - The Staircase model scores were calculated for the DME Award dataset consisting of 321 business questionnaires.
- Analysing the trend of the DM capabilities of European businesses reflected in the Staircase scores between 2008-2011.
 - The DM capability trends of European businesses reflected in the Staircase scores were presented in Figure 5. All factor scores, except for resources, showed a general positive trend. However, due to different sizes of the datasets and different business entrants each of the four years, a direct chronological comparison is not possible.
- Analysing the performance of businesses recognizing design and DM as an important tool for innovation reflected in the Staircase scores.
 - Statistical analyses comparing the Staircase scores of businesses that did and did not recognise design and DM were performed. In theory, all those recognising design as a tool for innovation should significantly differ in the Staircase scores. The actual results displayed only a few significant differences.

LIMITATIONS

It is the nature of models such as the Design Management Staircase that there will always exist a wide range of limitations. The reasons for this are twofold: there is a limited extent to which a model can consider all of the influential factors for each business; and, models are always limited by the current state of research. A further limitation is the data gathering. The answers to the questionnaire that underpins the Staircase scores are largely dependant on the individual's perception. This makes comparison between businesses and the classification in the model itself subjective. Further still, as the questionnaire is linked to a competition, then organisations might bias their self-reporting in an attempt to win an award. In addition, the data sets contain different businesses each year, so there is no potential for examination of business progression over time.

FURTHER RESEARCH

Understanding how the Design Management Staircase model was developed, and what it is based on, is a first step to understanding the potential of the Staircase model in assessing DM capabilities. As a result, this investigation has produced information that can be used to build upon and improve the Staircase model to create a tool that is useful to business and

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academics in the assessment of DM capabilities. As an immediate action, the authors intend to examine the questionnaire which is used to calculate the Staircase scores. This step will be necessary to analyse how appropriate is the choice of the questions for the provision of insights into the five factors. Further, it would be interesting to analyse the interdependencies of the five factors, in order to gain further insights into which of the factors are the most important or have influence over the others, and, to examine how the scoring reflects the stated criteria for each level. In addition, investigating how business categories differ from each other within the different factors will offer valuable insights into which type of business has the greatest DM capabilities or potential. This will also address one of the limitations of this paper, by examining the influence of the position of the individual on capability level, thus paving the way to establishing the Staircase model as a valuable tool for assessing DM capabilities.

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7. CONFERENCE PAPER 4



2nd CAMBRIDGE ACADEMIC DESIGN MANAGEMENT CONFERENCE, 4 – 5 SEPTEMBER 2013

A Critical Assessment of the Design Management Staircase Model Factors

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Keywords: *Design Management Staircase Model, Success factors, NPD factors*

Since the 1970s a great deal of research has been conducted into the implementation of successful new product development. Current research has demonstrated Design Management to be a vital aspect of NPD. The Design Management Staircase Model has its own key factors for the assessment of DM. In this paper a comparison is made between NPD success factors and the DM Staircase Model, showcasing both similarities and differences. The origins of the factors and their meanings are covered along with an explanation of how the factors are utilised.

INTRODUCTION

The paper forms part of a wider research project investigating the suitability and validity of the Design Management (DM) Staircase model (Kootstra, 2009) as a method to assess current DM capabilities in European Businesses.

The DM Staircase model was developed during the Award for Design Management Innovating and Reinforcing Enterprises (ADMIRE) programme as part of the PRO-INNO Europe initiative formed by the European Commission (EC) Directorate General for Industry and Enterprise in 2009. Despite finding evidence of a positive correlation between DM and business performance, the EC identified a substantial lack of knowledge concerning the manner and extent to which European businesses integrate design into their management structures. Therefore, one of the key objectives of the ADMIRE programme was to investigate DM practices within European businesses and to identify obstacles preventing businesses from implementing DM structures.

In the absence of a validated model to assess European businesses' DM capability, Kootstra (2009) developed the DM Staircase. The model aims to enable European businesses to assess and improve their DM capabilities in order to increase their effective use of design and improve their competitiveness and business success. To assess DM capabilities a process

perspective was taken, classifying the DM capabilities of businesses into four different levels, ranging from an immature stage, level 1, through to level 4, where design is managed strategically. All four levels are further defined by five factors that influence the success or failure of design and are indicative of good DM. The level ranking is dependent on the extent to which businesses implemented these five factors. Subsequently, the DM Staircase model was tested on a large scale study amongst 605 European businesses. The results of this study were presented in “The Incorporation of Design Management in Today’s Business Practices” (Kootstra, 2009).

Prior investigation regarding the Staircase model structure and levels demonstrated that it represents a robust model to assess DM capabilities in European businesses (Hesselmann et al., 2012). However, the five underlying factors of the Staircase model have not been examined regarding their appropriateness to assess DM capabilities of European businesses. Therefore, this paper will examine the five factors that underlie the model. The research is based on the results of a literature review covering 64 studies published between 1974 and 2009 (i.e. from Chakrabarti (1974) to Barczak et al. (2009)). The studies predominantly examine success factors for new product development (NPD). Previous research (Hesselmann et al., 2011) has demonstrated that predictive success factors for NPD are also suitable predictors of DM success. This paper will critically comment on the choice of the five Staircase Model factors based on the established NPD success factors. This critical analysis focuses on the question of how appropriate are the five factors in assessing current DM practices and identifying obstacles preventing businesses from implementing DM structures.

METHOD

The format of the paper is structured as follows:

- A presentation of the Staircase Model and its five underlying factors
- A comprehensive literature review on NPD success factors
- The establishment of a list of the most frequently referenced NPD success factors from literature
- An analysis of the five DM Staircase Model factors based on the findings of the literature review

Following a literature review on essential factors within the NPD process, it was discovered that the same factors that drive the NPD process are also the most influential for successful DM (Hesselmann et al., 2011). Thus, a list of the most frequently referenced NPD success factors was derived from the literature. Based on an empirical data analysis of 313 questionnaires gathered from the DME Award entrants as part of a Europe wide investigation into best DM practice, the data showed that the majority of the DME awardees employed the established success factors and thus it may be reasonably argued that these activities are universally adopted by successful companies (Hesselmann et al., 2011). However, universal adoption of a particular set of factors does not necessarily mean that those factors are the most relevant factors to use to assess effective DM.

DESIGN MANAGEMENT STAIRCASE MODEL

Staircase Model Levels

Kootstra (2009) describes the structure of the DM Staircase Model. He states that the DM Staircase model is based on a method comparable to the Design Ladder (Ramlau and Melander, 2004) of the Danish Design Centre. The DM Staircase model describes the characteristic DM behaviour and capability of businesses at four levels. The level classification ranges from the lowest level “No DM” to the highest level where DM is used strategically and is part of the business culture (Figure 1) (Kootstra, 2009). The four levels are presented as:

Level 1	No Design Management	In this level, businesses make no use of DM. Design has no role in the business objectives and is only applied occasionally.
Level 2	Design Management as a project	In this level, the use of design is limited to meeting direct business needs as a marketing tool. Design is not recognised as a tool for innovation or implemented in the NPD process.
Level 3	Design Management as a function	In this level businesses start to recognise design as a tool for innovation, design is integrated in the NPD process.
Level 4	Design Management as a culture	In this level, businesses are highly design driven; design is an essential part of the differentiation strategy.

Table 1: Staircase model levels

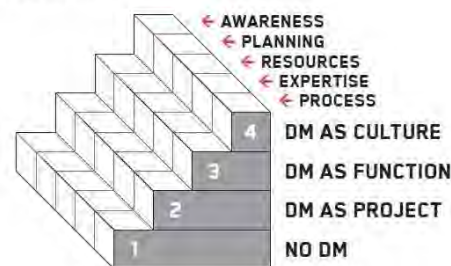


Figure 1: Design Management Staircase model
Source: Kootstra, Gert. (2009)

Staircase Model Factors

All four levels of the DM Staircase model are further defined by five factors influencing the success or failure of design and indicating good DM. The level ranking is dependent on the extent to which businesses have implemented these five factors:

1. *Factor Awareness: degree of awareness of benefits*
The extent to which businesses are aware of the benefits and the potential value that design and DM can offer.

Management's attitude towards design is a critical factor affecting whether design actually contributes to the success of a product or not. A lack of awareness of the possibilities and potential benefits forms a barrier preventing effective use of design. In today's practice, this lack is down to the education and background of senior managers (cultural background, design training, technical and business knowledge, etc.), as well as their attitude towards so-called 'soft' assets, i.e. brands and reputation. It is also important for there to be a common belief in the importance and value of design among employees.

2. *Factor Planning: whether design plans and objectives are developed*

The extent to which businesses have developed a strategy for design, articulated in business plans and communicated widely.

This concerns the formal documentation of basic principles and objectives, and the dissemination thereof among employees, with an intention of gaining their interest and inciting them to action. Whenever business plans are devoid of objectives for design, DM will only be rolled out on a limited scale. Another key aspect is whether a company is able to formulate design targets (in line with their business or market targets) to drive design activities. When it is unclear what design is supposed to achieve, and what effects are to be strived for, developing a good strategy is simply impossible. It will therefore have to be clear what the competition strategy is, and how design should dovetail with that.

3. *Factor Resources: people (design staff), funding (budgets) and means of production (facilities)*

The extent to which businesses invest in design. Resources are considered as the sum of all design investment.

This is mainly about the right design capacity (the number of people), but also about the ability to adequately budget for design projects. Design investments also go into training budgets and production facilities (for example, staff training, hardware and software for design, and an inspiring work environment). One of DM's jobs is to ensure the best possible use of the means available within an organisation. A lack of resources is considered an impediment for good DM practices.

4. *Factor Expertise: the level of DM experience, skills and expertise*

The quality of the design staff and the range of tools and methods applied.

This is all about the quality of the available staff (professional designers, design managers, advisors, multi-disciplinary design team, and the directorship/management) and the advanced nature of the applied tools and methods.

5. *Factor Process: whether an effective process is followed*

The extent to which businesses follow a professional and effective design management process, embedded in core business processes.

Timing, i.e. when design is applied in development processes, also plays a key role here. Is there a systematic policy for product development and innovation processes, into which design was embedded from the start, in place? DM comprises of a formal programme of design activities as opposed to a mishmash of ad-hoc design activities. DM at process level has a formal set up, meaning that it is part of a company's wider policy-making process, and that it interfaces with other areas of the business. Implementation of such a programme within an organisation will depart from an earlier created organisational structure; it is not merely a 'hobby' of one individual manager, but 'interlinks' all involved parties and responsible managers by facilitating effective collaboration.

NPD SUCCESS FACTORS

Method

A systematic literature review of NPD success factor research from 1974 to 2009 was performed. The primary sources for the literature review were the databases Emerald, JSTOR and Business Source Premier. The search terms "New Product Development" and "Success" were used for all three database searches, using the Boolean logic approach (Oliver, 2012). Emerald produced ten results in journal article titles, JSTOR produced 39 results in journal and article abstracts (a search for these terms within titles displayed no results). Business Source Premier generated 57 academic journal articles which contained both search terms in their title. The database search findings contained two articles, Montoya-Weiss and Calantone (1994) and Ernst (2002), that reviewed and analysed existing literature on NPD success factor analyses. A further 45 references were derived from the bibliography of the two aforementioned articles. According to Montoya-Weiss and Calantone (1994) the existing research about NPD success factors can be summarised in three main research strings; NPD factors with a positive correlation to the project outcome, NPD factors with a negative correlation to the project outcome and NPD factors that differentiate between a positive and negative correlation to the project outcome. The scope of the analysed papers was limited to studies with empirical analyses of the correlation between NPD factors and product success based on large scale studies. In total, 64 studies on NPD success factors were considered for the literature review. Each of the 64 studies on NPD success factors was examined and the presented NPD success factors of each study were compiled in a comprehensive list. Further, from each study the definition of the different NPD success factors was examined and terms were clustered and grouped according to definition. The results of the amalgamated terms and the derived definitions are presented in Table 2.

Summary

Extensive research on NPD processes occurred during the 1980s and 1990s. In particular, during this period, different specific NPD process factors were identified and tested to discriminate which activities were critical for success. For example, a study conducted by