Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd

A Deferred Model for Evaluating and Improving The Dubai Metro Train Security Management

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Abstract

Recent attacks on train facilities and passengers in different cities of the world have turned attention to the security risks in the rail transportation system and the need to prevent, eradicate and manage the risks and the consequences. The disruptive impacts on the efficiency of transport systems and the safety and security of passengers and assets have become a major concern to the government and management of Dubai Metro. The ability to meet the security needs of passengers is therefore of vital importance and requires the creation of a secure environment for passengers, staff and the facilities of the Metro.

This research evaluates the present security systems in place at the Dubai Metro lines to forestall terrorist attacks and manage the aftermath of emergent crises effectively with minimal loss or damage to the system. The evaluation aims to determine the extent to which emerging social factors and emergencies and the impacts are taken into consideration concerning existing planned action to formulate deferred action suitable to meet the challenges of the current situation. This is with the view of designing an improved Metro line security system that will enable the organization and the security personnel to act purposefully in the face of terrorist attacks or any form of crime.

Dubai is described as the fourth most-visited city in the world based on the number of international visitors and is the fastest growing city. A fast, modern and reliable transportation system is therefore required to move people around the city.

A case study using Dubai and the Dubai Metro Line system was adopted in this research investigation to provide a qualitative interpretation of the study phenomenon.

The study examines how the management of the Dubai Metro line plan for emergent situations to forestall and manage terror attacks on the rail transportation system. It examines

how the organization reacts to emergencies which describe the evolutionary and random changes of relationships between agents and different organization systems. The study also examines how such interactions facilitate the development of new systems.

The theory of deferred action which is a design and action theory was applied to evaluate the three meta-design dimensions namely planned action (rational design), emergence and deferred action or modalities. This was applied to determine how planning for emergent situations required a fluid system that allows changes and adaptability of security systems to coping with current emerging situations.

The three dimensions and constructs of the theory of deferred action helped the formulation of the research framework which enhanced the research design, investigation, data collection, analysis and interpretation of results using an interpretive qualitative methodology. Different sets of data were collected using in-depth interviews, focus groups and document analysis for a comprehensive and holistic view of the study phenomenon.

The data set was analysed using thematic analysis which identified concepts and themes that showed the planned action (real systems) of the metro line in terms of its organisational infrastructures, organisational framework and resource developments that are constantly reviewed in line with the current trend in rail operations and security. The data also showed the efforts of the organisation to plan for emergencies in terms of security training and the involvement of passengers through awareness and feedback mechanisms. The findings also showed how the organisation created a fluid system that easily merges the planning for emergent situations into the existing planned action of the security system to create a deferred action (system) to deal with any emergency crises at any time.

The study concludes that the management of the security system of the Dubai Metro line has put in place structures and systems that can enhance the improvement and the development of

the MetPass model required to forestall and manage crises. The MetPass model has extended the deferred action by enforcing its concepts in the analytical tool, for the Dubai Metro Trains security management system. This is an adjustment of the theory in practice. The research further approved that deferred action is necessary for security systems development in emergent organizations.

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List of Abbreviations

ABIOS – Agent-Based Inter-Organizational system

ATC – Automatic Train Control

ATPS – Automatic Train Protection System

CBTC – Communication Train-Based Control

DPD – Dubai Police Department

DPF – Dubai Police Force

ERTMS – European Rail Traffic Management

FBI –Federal Bureau of Investigation

HSM – Hard System Methodology

IBIS – Issue Based Information System

IP – Information Protocol

IS – Information System

IVA – Intelligent Virtual Assistant

JAD – Joint Application Development

KM – Knowledge Management

MMI – Man Machine Interface

OR/MS – Operation Research/ Management Science

QFD – Quality Functions Deployment

SCADE – Safety Application Development Environment

SSM – Soft System Management

ST – System Thinking

WBIS – Web-Based Information System

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May Allah Bless you all abundantly

Declaration

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DECLARATION

This Work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.....(candidate)

Date .....27-07-2021.....

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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1.0 Chapter One – Introduction, Research Rationale and Background

This introductory chapter gives an overview of the study and the reasons behind conducting this research. The background of the study, the problem statement, the rationale of the study, the research aims and objectives, and the research questions guiding this study are hereby discussed. This chapter further discusses the theoretical contribution to security management systems and finally outlines the structure of the thesis.

1.1 Research Rationale

Global terrorism focusing on the massive destruction of lives and properties in public places such as airports, rail stations and public gatherings has taken a new dimension in the last two decades. The incidences of terrorist's attacks have increased from about 700 in 1970 to about 16800 in just 2014, and very recently in 2017 on Westminster Bridge in London.

Terrorists continue to target railway services across the world. The Madrid commuter train attacks on 11th March 2004, London attacks on 7th July 2005 (three of which occurred on the Underground) and suicide attacks in Volgograd railway station on the 29th and 30th December caused death, injury and disruption. These are very rare events, but potentially high impact, hence there is a need to plan, and to remain vigilant. Along with physical attacks, the transport network has also been disrupted by telephone threats, unattended items and hoax devices (Murray, 2019).

The difficulty and cost of protecting the transportation sector from attack raise a core question for policymakers, governments and researchers. The issues on focus relate to how much effort and resources need to be put toward protecting potential targets versus pursuing and fighting terrorists. While hardening the transportation sector against terrorist attack may be difficult considering the complex characteristic features, there is a need to put measures in

place to deter terrorists and counter other security threats. The focus of the debate is how best to implement and finance a system of deterrence, protection, and response that effectively reduces the possibility and consequences of terrorist attacks without unduly interfering with travel, commerce, and civil liberties.

Recent security and terrorist attacks and threats have raised alarm on the risks of an attack on passengers on the rail transport system and the rail infrastructures and the need to take necessary actions (Strandh, 2015). There have been calls for a systematic analysis of transportation assets, the risks to those assets, and the costs and benefits of different approaches to defending those assets (Strandberg, 2013).

The constantly changing nature of the risks and threats has necessitated a redesign of existing security systems. An effective protective security regime must take account of the prevailing threat and likelihood of a security incident, the vulnerability of potential targets and the potential consequences of an attack. Together these identify the risk to the operators and infrastructure and those using them and working on them.

1.2 Research Background

Dubai is described as the fourth most-visited city in the world based on the number of international visitors and is the fastest growing city at a rate of 10.7% rate (Murray, 2019). The city hosted 14.9 million overnight visitors in 2016 and is expected to reach 20 million tourists by 2020 (Murray, 2019).

The UAE is made up of seven emirates and Dubai is one of the main city Emirate. The city is situated on the Persian Gulf, Southeast Coast. The city borders Abu Dhabi, Sharjah and Sultanate. Over the past three decades, the city was filled with sand, lacking observable natural merits. The sand has been dethroned by epicurean futurist skyscrapers and cosy villas

on the coastline. The city thrives on tourism to maintain the flow of cash into the emirate. The city is rapidly growing into a centre of IT, trade and finance. The expanding Emirates airline has been a catalyst to the expanding tourist growth, with approximately 12 million passengers per year. The population based on the last census is 3.137 million (The World Bank Data, 2019).

Dubai has been able to manage the transformation of the city to grow into a centre of tourist attraction in the UAE. The city can manage the millions of tourists who flow in the city throughout the year. Tourism is now considered as the greatest GDP contributor there is, therefore, a need to keep Dubai a modern secure city (Prayag and Hosany, 2014).

With an expected rise in the number of tourists from 15 million to more than 20 million by the year 2020 there should be an efficient and safe mode of transport around the city. Tourists consider Dubai a safe and politically stable city. Achieving the safety and security of the most reliable transport systems requires an integration of services from government agencies. This is where the Dubai Police Department, RTA, and Metro Trains come in. For the study, the researcher collected data from DPD and RTA.

Tourism has played an important role in the positioning of Dubai in the world's economy and become an important strategy of the Dubai government to maintain the flow of foreign cash into the emirate. Dubai is described as the fourth most-visited city in the world based on the number of international visitors and is the fastest growing city at a rate of 10.7% rate (Murray, 2019). The city hosted 14.9 million overnight visitors in 2016 and is expected to reach 20 million tourists by 2020 (Murray, 2019).

A fast, modern and reliable transportation system is therefore required to move people around the city. Transport in Dubai is controlled by the Roads and Transport Authority (RTA), an agency of the government of Dubai, formed by royal decree in 2005.

Dubai has an expanding transport network which includes the metro, tram, buses and ferries with a zero-crime rate record in the last eight years. In recent years the ridership of public transport using various transport modes has risen. Around 16 per cent of Dubai residents use public transport, with daily ridership on Dubai Metro alone exceeding 500,000 commuters. More than 656 million people have used Dubai Metro to date and the number continues to grow.

1.3 Dubai Metro Line

Dubai Metro opened in September 2009, has two lines (Redline and Green line) currently in operation which runs through the financial and residential areas of the city. The Red Line has 4 underground stations, 24 elevated stations and 1 station at ground level totalling 29 stations. The line which runs from Rashidiya Station to UAE Xchange Station in Jebel Ali is described as the major backbone line. On the other hand, the Green Line with 8 underground and 12 elevated stations totalling 20 stations run services from the Etisalat Station to the Creek Station. An extension to the Red Line connecting the EXPO 2020 site is due to open in April 2020 with plans for a Blue and a Purple Line in the nearest future. The Dubai Metro is the first urban train network in the Arabian Peninsula with trains that are fully automated and driverless. Until 2016, the Dubai Metro was the world's longest driverless metro network with a route length of 75 kilometres (47 mi) (Kanna, Hourani and Kanna, 2014; Gulf News, 2018).

The Dubai Metro is a rail transport network in Dubai envisioned with providing a mode of safe and smooth transport to all. The trains are driverless and fully automated. The Metro trains are the first underground urban trains in the UAE. Dubai Metro trains are the highest selected mode of transport across Dubai with the highest volume of users due to their efficiency. More than 20 per cent of Dubai citizen use the Metro trains. There are minimum

chances of a terrorist attack on the Metro trains since the environment is highly controlled with considerable surveillance tools and the ability to respond fast. This makes it an unpleasant target for terrorists. This does not mean that there are no safety and security risks; it is just because there has been no terrorist attack in the country. The crime rate in Dubai is lower than in other developed Western World. However, in the Middle East is associated with terrorism there are increased risks on Dubai Metro trains as a soft target. This is what motivated the researcher to consider Dubai Metro Trains as a contingency and emergent planning in their study to improve on the existing security management systems. Terrorists impairing the transport system could hurt the city and a bad reputation for the tourists (Gulf News, 2018).

Over the past five years, Dubai Metro Trains have been successful with a rising number of commuters from less than 70,000 passengers a day during establishment to more than 500,000 per day currently. This makes the Dubai Metro Trains one of the unique success stories in Dubai. Dubai Metro trains are constructed and architecture to satisfy the highest environmental sustainability degree. It contributes to the clean energy movement with their reduced carbon dioxide (CO2) emissions. This has minimum impact on air pollution as compared to cars which emit tons of carbon dioxide daily. The metro trains are considered as the most convenient, safest and cleanest, the trains are 100% available and 99.8% punctual. Metro trains around the world are prone to crime and vandalism but the Dubai Metro crime rate is less than 1% (Kanna, Hourani and Kanna, 2014; Gulf News, 2018).

The role of the train transportation system cannot be eroded. Transporting over 500,000 million passengers in less than 10 years has created convenience thereby demanding an efficient security management system. The rail has effectively contributed to enhancing the business conditions and living in Dubai (Acuto, 2014). As the number continues growing

every day this could be a security threat to the users, therefore, the need for an effective and efficient security management system.

The disruptive impacts on the safety and efficiency of transport systems due to man-made calamities or natural disasters are a major concern to the government and management of Dubai Metro. The ability to meet the security needs of the customer is therefore of vital importance. In ensuring this, a secure environment for passengers, staff and the facilities of the Metro is created with the establishment of two operations control centres and the incorporation of advanced video surveillance technology using 3,000 cameras to monitor the network including platforms, trains, stations and their surroundings.

1.4 Problem Statement

The open environments required for public transit to operate from and the ease of access required for passengers who need to join the train network are essential factors in a rail transportation system. These features enable public transit to provide efficient and convenient transportation to passengers through regions and communities. They are also necessary for efficient public transportation but on the other hand, also make the public transit vulnerable to criminal and terrorist threats. This makes it necessary for having a good understanding of security threats and the necessary planning required to effectively manage public transport security risks.

Train transportation has been described as the safest, fastest and convenient land transportation system relative to other means of transportation due to its large connected networked infrastructure driven by modern technology (Savage, 2013). The technologically driven rail infrastructure has also been designed not only to provide smooth operations of the rail system but also to provide comfort and security to rail passengers and the assets (Jacyna *et al.*, 2015).

The open environment within which the rail transportation system operates and the required ease of access of passengers to the facilities of the rail system, coupled with a large number of a different set of passengers carried in different confined spaces are factors considered for the design of efficient and convenient transportation through cities.

Recent attacks on-train facilities and passengers in different cities of the world have turned attention to the security risks in the rail transportation system and the need to prevent, eradicate and manage the risks and the consequences. There has been an increase in terrorist attacks over the past decade in different parts of the world including Spain, India, Pakistan, and Columbia, and the UK resulting in over 200 incidents and over 400 deaths between 2008 and 2013 (Jordan and Horsburgh, 2005).

Terrorist actions can have grave consequences on passengers and rail systems as demonstrated in Spain, Madrid (Jordan and Horsburgh, 2005). With the emerging increase in cases of insecurity among the different transportation system, none is considered as the safest since terrorists evolve with technology. Train transportation provides an ideal opportunity for a terrorist attack because it is public, used by millions of people and has little security and checkpoints like that at airports (Jenkins, 2001). Records from the database of terrorist incidents maintained by the RAND Corporation and the Oklahoma City Memorial Institute to Prevent Terrorism show a total of 181 terrorist attacks on trains and rail-related targets such as stations worldwide between 1998 and 2003, an average of 30 per year. These incidents resulted in a total of 431 deaths.

Moreover, in other to respond to the growing needs of commuting daily the impact of the ever-changing technology is to be given serious consideration in the provision of security to passengers and facilities (Jacyna *et al.*, 2015). Security issues in rail transport are diverse and complex due to the threats posed by terrorism and other forms of crime, and the challenges of

the ever-changing technology. Effective security of rail transportation systems against terrorism is a growing concern and therefore may require different strategies and technological solutions for the different threats and different circumstances (Jenkins, 2012). Furthermore, the unpredictability of the terrorist threats and attacks makes security planning a serious issue and highlights the need to strategically plan for emergencies (Corning, 2002).

Emergencies or reactions and planning for emergent situations describe the evolutionary and random changes of relationships between agents and different organization systems, such interactions facilitate the development of new systems (Seel, 2006). Strandh, (2015) suggests that planning for emergent situations and forestalling crises such as terror attacks on rail transportation system may thus require a fluid system that allows changes and adaptability of security situations to cope with current situations.

This research evaluates the present security systems in place at the Dubai Metro lines to forestall terrorist attacks and manage the aftermath of emergent crises effectively with minimal loss or damage to the system. The evaluation aims to determine the extent to which emerging situations and their impacts are taken into consideration concerning existing planned action to formulate deferred action suitable to meet the challenges of the current situation. This is with the view of designing an improved Metro line security system that will enable the organization and the security personnel to act purposefully in the face of terrorist attacks or any form of crime.

The theory of deferred action which is a design and action theory will be applied to evaluate the three meta-design dimensions namely planned action on security based on rational design of the Metro line, planning for emergencies and any deferred action or modalities to accommodate emergent changes (Patel, 2007).

1.5 Research Questions

The main research question focuses on how the Dubai Metro security system can be designed to be flexible and adaptable to cope with emergent situation purposefully. Based on this main question, the following sub-questions would help to put the research question in proper perspective.

1. What are the current planned actions of the Dubai Metro security system and their effectiveness in preventing and managing terrorist attacks?

2. What are the emergent situations of terrorist attacks that impact the security of Metro rail transportation?

3. What are the possible deferred actions or modalities for an improved security system in the Dubai Metro to accommodate emergent situations?

1.6 Research Aims

Based on the research questions, the research is thus aimed at evaluating the Dubai Metro security system and its ability to adapt and cope with emerging terrorist attacks on the Metro rail lines. The research will therefore focus on the examination of the present security system which is the planned action to prevent terrorist attacks and to manage crises. The research will also evaluate emerging terrorist attacks and their possible impact on the planned action. The research will then evaluate deferred action or modalities capable of coping with the demands of the emerging situations that would enable security personnel to act purposefully.

1.7 Research Objectives

The provision of research answers to the research questions and the achievement of the aims of the research would require the following objectives to be carried out in the study. A

literature review of the concept of train security, demands of security, components of the security system and the social/technological factors impacting on train security will be carried out. This is with the view of gaining an understanding of the artefacts of security systems and planned actions.

The research will also carry out a literature review of terrorist attacks/crimes on rail transportation, methods of attacks, and the social and technological factors contributing to the increase of terrorist attacks. This is with the view of identifying possible terrorist attacks and emergent situations.

The research will also carry out a case study of the Dubai Metro security system, existing planned actions designed to secure passengers and facilities, components of the security systems, training and skills development, and the impact of social and technological factors. This is with the view of evaluating the existing systems' effectiveness and preparedness in preventing terrorist attacks and managing emergent situations.

The research will also carry out the application of the theory of deferred action in understanding the emergent nature of security in Dubai Metro with a view of developing a deferred action / analytical model (MetPass).

Summary of research objectives are –

1. To conduct a systematic review of the relevant literature addressing train transport systems, theories on terrorism, components of trains security systems to identify gaps in existing trains security management systems.

2. To evaluate the current planned actions of the Dubai Metro security system, and its effectiveness in preventing and managing terrorist attacks and resulting emergencies

3. To identify possible emergent situations of terrorist attacks in the Metro rail transportation and the preparedness of the security units in managing emergent situations

4. To identify and formulate possible deferred actions or analytical model (MetPass) for an improved security system in the Dubai Metro capable of accommodating emergent situations

1.8 Research Methodology

1.8.1 Methodological Approaches

Research methodology describes the guiding principles of a research investigation of a studied phenomenon that reflect the philosophical assumptions of the researcher on the nature of reality and how required knowledge may be effectively obtained (Dawson, 2009; Bridges & Smith, 2007). The two main types of research methodologies reviewed in this research are qualitative and quantitative research with different research design. Qualitative research methodology is chosen for the research using case study design. This will provide the required platform of subjectivity and interpretive research to allow for a comprehensive collection of data from different sources and rigorous analysis.

The research design of a research methodology describes action plans and defines necessary steps of activities in collecting data and ways of analysing the data to provide the required knowledge of the research focus which will facilitate the achievement of research objectives and the provision of answers to the research question (Yin, 2002). Different research designs may be adopted in the research. This research will adopt a case study design that provides flexibility, depth of coverage with different tools.

The limitations of case studies include its lack of scientific rigour which provides little basis for generalisation of results to the wider population; the possible influence of the researcher's subjective feeling; the difficulty of replicating the research/result; and the time consuming and expensive nature of the method.

However, the case study design applied in this research would attempt to work around these limitations. Scientific rigour would be applied in this research through the use of methodological data collection and analysis such as thematic analysis. The researcher's subjectivity is eradicated as the data used is factual and objective (McLeod, 2019).

1.8.2 Data Collection

Popular data collection methods and tools include interview, observation, case study, ethnographic study, action research, archival or document as primary research methods used in qualitative research designs, but the above list is not exhaustive (Hennink et al, 2011; Bryman 2001; Myers 2009).

The research will use a qualitative methodological approach to examine the research issues and provide answers to the research questions. The technique or instrument for primary data collection will be a semi-structured interview with selected participants from government offices and the Dubai Metro organisation. The participants will be allowed to share their experiences freely under the guidance of a set of semi-structured questions based on the research objectives and conceptual framework. The use of semi-structured interview allows for a comprehensive collection of data as it allows for follow-up questions which

1.8.3 Data Analysis

The type of data analysis in a research investigation depends on the type and nature of data collected. Qualitative data which would be collected in this research would require a qualitative analysis that provides a subjective interpretation of the data set to yield

meaningful results. A thematic analytical method which is a popular qualitative data analytical method would be used in this research to provide qualitative data analysis. The use of thematic analysis provides rigour and a subjective interpretation of the data. The set of data obtained from the interviews will be analysed using sets of codes to identify specific patterns and themes that reflect meanings to interpret the data (Hennink et al, 2011; Bryman 2001).

1.9 Theoretical Approaches

Theories on countermeasures on terrorism have focused on deterring and preventing crime but are not concerned about how crimes may be managed and the security system to be put in place for such activity. Such theories include social learning theories and classical sociological theories and deterrent theories that focus on the crime designed to influence the perception of the criminal concerning the crime situation (Manza and McCarthy, 2011).

The focus of this research is to explore ways terrorist attacks on the train can be managed and how the resulting emergencies can also be managed effectively to contain any loss. Theories that can address the management of crises resulting from terrorist attacks based on organisational planning and preparedness are therefore required to investigate the management of security on the train.

The theory of deferred action which is a design and action theory will form the theoretical framework of this research. The three meta-design dimensions of the theory which include existing planned action based on rational design, emergent social/technological and other crises situations and deferred action or modalities (Patel, 2007) will form the pillars of the research investigation.

The theory enables the design of social systems such as rail security systems that are emergent, to grow with and be adapted to the emerging social systems such as emergencies

resulting from terrorist attacks to be used purposefully in meeting current challenges. The theory thus provides the mechanism which allows the design of the systems based on the current situation and an ongoing basis.

Since security risks are emergent and keep on evolving, logically designed security management system, are required to grow with the emerging security threats. This growth is enhanced by the logical design known as deferred design (Patel, 2006). The theory of deferred action is a well-established theory that could address a mismatch in the design challenges of IT systems based on new requirements as circumstances and context of the system change. The theory is embraced in the study of Information Systems (IS) (Marriot School of Management of Brigham Young University, 2011).

The theory of deferred action when applied in organisations allows teleological design in the context of emergent situations as it imposes purposively designed structure on the reality of the moment. It can also help in shaping both the imposed design and reality in an emergent context. Planned actions are usually based on established structure and processes which can change in response to the impact of emergent events. This raises the issue of predictability and unpredictability which deferred action addresses but cannot be managed by planned action alone.

The model will help describe how the management of Dubai Metro can efficiently plan and prepare for crisis resulting from terrorist attacks while adopting modern technology to continuously improve the security management of Dubai Metro trains and accommodate situational requirements to achieve transformative growth. Thus the model will allow an in-depth evaluation of existing planned action of the Dubai Metro security based on rational design, structure and processes of the rail transportation. Using the model will also allow the evaluation of emergent situations and events, the underlying factors, and the impact on the

security of rail transportation. The theory will also enable the researcher to evaluate deferred action and modalities to meet the challenges of current realities.

The theory of deferred action will therefore be the theoretical base for this research and will form the theoretical framework of the investigation. The three conceptual dimensions of the framework are the existing planned security system in the Dubai Metro based on the rationality of the vision and mission of Dubai Metro Rail System, emergencies that may arise in Dubai Metro due to terrorist attacks and threats, and the modalities or formulation of deferred actions to manage crisis effectively

1.10 Generalization scope, Subject Boundaries, and Thesis Outline

This section highlights the research scope, the applicability of the research and its findings in other areas or context, and academic disciplines and subjects covered by the research. An outline of the thesis is also given to put in context the plan of the research investigation and the processes covered.

1.10.1 Generalisation Scope

Generalization is the degree to which there is a claim that an incidence will occur at a place will also occur at another location in a given time (Payne and Williams, 2005). It is argued that a theory tested and verified in one setting should also work in another similar environment (Tsang, 2014). The findings of this research and the contributions in terms of modalities of the deferred action in improving the Dubai Metro can be applicable in other security systems in train transportation and other social systems.

However, the legitimacy of generalization is controversial in research findings based on qualitative research methods that use human perceptions to approve findings. This argument is based on the lack of concept and the small size of samples used. The contributions of

generalization for small samples are not usually recognized (Tipton *et al.,* 2016). On the other hand, similarities of scenarios and objects are easily recognized using human experience and can be used to address other cases with similar circumstances (Stake and Trumbull, 1982).

It is, therefore, important to clarify how findings from a given study can be applied to a given organization, as well as, that different from where the data was collected (Lee and Baskerville, 2012). The findings would provide a rich, contextualized understanding of some aspects of human experience through the intensive study of this case.

1.10.2 Subject Boundaries

The research covers a lot of subject areas and academic disciplines which are interconnected and interwoven due to the nature and complexity of the subject matter and the research phenomenon. The research focuses on improving security in rail transportation to prevent and manage terrorist attacks on rail transportation. This will be based on police preparedness and training and the design of the rail security to accommodate emergencies. The other area of research focus is terrorism, forms of terrorist attacks and the driving social and technological factors (Van Niekerk and Von Solms, 2010; Bai and Policarpio, 2011; Whitman and Mattord, 2011, 2014). Formulating a deferred action of an improved security system flexible to accommodate changes in situations also involves organizational learning and training, organizational planning and management, and information system development (Ibrahim, 2017).

1.10.3 Outline of the Thesis

Chapter 1: Introduction/Background

In this chapter, the background and rationale of the study are presented. The chapter also introduces the aims, objectives and research questions of the study.

Chapter 2: Literature Review

Chapter Two of the thesis conducts a critical review of the literature on train transport security management, passenger safety, and terrorism, police training, and preparedness for security issues to identify research gaps that require further research. In this chapter, a comprehensive literature search of online peer-reviewed databases/journals and other relevant literature will be conducted.

Chapter 3: Conceptual Framework and Theoretical Framework

The chapter defines the conceptual framework for the research by describing the theoretical lens used for the examination of security systems in Metro lines and how to improve and adapt the security system to accommodate emergency crises due to terrorist attacks. The conceptual framework has three main constructs relating to the three main constructs of the theory of deferred action which enables the provision of answers to the research questions and the achievement of research objectives.

Chapter 4: Research Methodology and Design

This chapter reviews research methodological approaches and their underlying ontological and epistemological assumptions. It outlined the attributes of the two main types of research methodology and their relevant applications in different research situations. The chapter also discussed the choice of an appropriate methodology for the study and its justification. The chapter also discussed research design and methods of data collection and analysis.

Chapter 5: Data Analysis and Findings

In Chapter data analysis and findings, the data that is gathered through focus groups discussions, in-depth interviews, and document analysis, will be introduced and analyzed. The analysis chapter focuses on the discussion of issues related to the Dubai Metro train

security measures and their preparedness as well as the strategies and plans to improve the train security management. The data will be analyzed using Nvivo 12 software to identify key themes and explore findings on the conceptual model for evaluation and improving security management as informed by the theory of deferred action. The empirical validation of the conceptual model will be applicable to explain how to evaluate and enhance the Dubai Metro train security management. Proposals to improve the Dubai Metro Train security system are provided in this chapter.

Chapter 6: Conclusion, Limitations, and Further Research

Conclusions drawn on the objectives of the research are discussed here by; this chapter is the place where the researcher presents the research overview, limitations of the study and suggests further research. Benefits from the study to Dubai Metro Trains will also be discussed here. The main contribution to knowledge, literature, and theory are presented here; the chapter also makes the implications on the research. The need for future studies using the deferred model to improve security management systems will be discussed here.

2.0 Chapter Two – Literature Review

2.1 Introduction

This chapter reviews the literature on the concepts of rail transportation, its importance in modern society, its infrastructural requirements, design methods, vulnerabilities and impact on security requirements and designs. The review of these concepts provides the required background and highlights the need to consider rail transportation design and the infrastructures in the design of rail transportation security and security systems. The chapter also reviews the literature on terrorism to highlight methods of terrorist attacks and the required form of security systems to forestall and manage the resulting crises. The chapter also reviews forms of rail security systems and preparations for emergencies, the security agents responsible for rail security and required training.

2.2 Rail transportation

Rail transport commonly known as train transport is a means of transport, on vehicles running on tracks (rails or railroads). Rail transport has become an important mode of transportation commonly used for commuting goods and passengers over long and short distances. It runs on metal (usually steel) rails and wheels and therefore has lesser frictional resistance required to carry heavy loads safely. This gives it a unique advantage and makes it the safest, secured and fastest modes of land transportation. This means of transportation is better organised providing regular and secured services with its fixed routes and schedules and is least affected by weather challenges (Redding and Turner, 2014). The origin of rail transport is associated with the human hauled contraptions in ancient Greece which has now evolved into a modern, complex and sophisticated system. It is now used everywhere as the most convenient, cost-effective and dependable mode of transportation with loads of benefits (Neff and Dickens 2017).

It has also been described as a product of the industrial era with a major improvement in land transport technology bringing important changes to the movement of freight and passengers which played a major role in the economic development of Western Europe, North America and Japan, where such systems were first massively implemented (Ertem and Keskin Özcan, 2016; Vienneau *et al.*, 2015). Furthermore, its higher level of ubiquity and its speed has dramatically improved travel time as well as the possibility to offer reliable and consistent schedules that could be included in the planning of economic activities such as production and distribution, the social lives of the people. This has substantially improved economic activities and social interactions amongst the people.

The importance of rail transportation as a means of work travel has also increased substantially over the decades (Neff and Dickens 2017). In several countries such as China, India, and Japan, rail transportation accounts for the majority of interurban passenger transportation. Train transportation provides a boost to the economic activities of a country as it accommodates a large number of passengers and is a cheaper and reliable source of transportation for many (Redding and Turner, 2014). Studies, therefore, show that rail transportation is one of the pertinent transportation systems in the world and has played a relevant role in connecting the communities (Ertem and Keskin Özcan, 2016; Vienneau *et al.*, 2015).

Train transportation has also experienced technological innovations with adaptations including passenger railways, underground (or overground) urban metro railways and goods carriages (Jacyna *et al.*, 2017). With the automation of trains, where passengers purchase tickets through automated machines or online, train stations are now less manned by staff. This has resulted in cases, where crime and vandalism occur without train staff available (Jacyna *et al.*, 2017). However, the changes in technology have not been reflected in train security, which is still backward. A lot of crime takes place at the train stations; thus,

passengers are vulnerable and exposed to several security risks. Technology has had an impact on the security of trains because it helps in identifying the individuals who make the violation but cannot control them on the spot. This caused a need for extra staff, which respond to certain situations on the spot by taking the assistance of information technology (Jacyna *et al.*, 2017).

Developments in the area of electrification and innovations in automation of machines and other systems have had a great impact on rail transportation with increasing efficiency, effectiveness and comfort. This also resulted in the building of more rail lines to increase the capacity of rail transportation. Railway speed records have constantly improved with the introduction of high-speed rail systems that require more safety considerations and real-time planning for scheduling and security systems (Liu, Saat, and Barkan, 2013; Liu *et al.*, 2014). Furthermore, the continuous adoption of technological innovations requires changes and planning of the system ((Jacyna *et al.*, 2017).

Innovations in rail transportation can be seen in the increasing quality of the rail infrastructure, particularly rail tracks (e.g. better steel, concrete ties), which has affected the quality of operations and services provided. Railway systems because of the vast components of infrastructure of stations, control rooms, thousands of miles of tracks and lineside equipment, vast amounts of which are located in remote locations where monitoring is complicated are both challenging and complicated to secure (Powell and Fletcher, (2011). This situation creates a potential of lack of coordination or inability of staff to resolve issues immediately. Besides this, stations are crowded places; thus, control and monitoring of security concerns become difficult. Cross-country and urban commuter stations have concourses, where waiting passengers gather before boarding on the trains. Alongside, many mass transit or underground services tend to have a more flowing transient passenger,

resulting in the platforms being the place where gathering occurs (Powell and Fletcher, 2011).

2.3 Rail transportation infrastructure and vulnerability

Passenger rail services and transportation are in different forms such as light railways, metro rails and heavy rails but all share common features engineered by modern technological developments. Continuous technical, regulatory and policy innovations have also affected infrastructural developments and the quality of these infrastructures such as high-speed rails, electrical rail tracks, better steel and concrete ties, which have all contributed to the operational characteristics in the form of allowed speed, resilience to the environment, ease of control and permitted weight (Savage, 2013; Jacyna *et al.*, 2015).

A notable design of most rail transportation is the use of centralized systems which allows for the easy integration of the entire tracks of trains aimed at effective control, monitoring, maintenance and security of the tracks and trains. This also ensures that trains are running as per the schedule and defined railway lines (Zhao *et al.,* 2016).

Modern rail transportation, therefore, features large connected networked infrastructure driven by modern technology which has enhanced safe, fast and convenient form of transportation (Savage, 2013). The technologically driven rail infrastructure has also been designed not only to provide smooth operations of the rail system but also mainly to provide comfort and security to rail passengers and the assets (Jacyna *et al.*, 2015).

Rail transportation also has a unique set of infrastructures with a different set of functions and operational systems and procedures which requires careful planning, coordination, control and management for effective provision of safe, fast, secured and convenient service (Zhao *et al.*, 2016). These unique infrastructural features of rail transportation also make the operation

and running of rail transportation a challenge to many organisations (Ertem and Keskin Özcan, 2016).

Another notable feature of rail transportation infrastructure which highlights its vulnerability is the designated tracks and routes that trains have to follow in moving passengers from one point to the other. This shows that train transportation has fixed infrastructures requiring trains to run on the same or specified route without leaving the track to avoid accidents (Vienneau *et al.*, 2015). Ensuring that trains run on their designated routes without any disruption requires the use of appropriate technologies which is paramount to the smooth and safe operations of the trains. The technology is thus to guide the running of trains, monitor the movements of the trains and the scheduling of the train route aimed at providing safe, secured and fast operations.

The complex infrastructural components of a rail transportation network consisting of stations, control rooms, thousands of miles of tracks and lineside equipment, vast amounts of which are located in remote locations, makes the operation of the rail system challenging and the security of the infrastructure complex and demanding (Powell and Fletcher, 2011). It requires lots of planning and coordination among the various sets of operating systems and networks.

The different sets of infrastructural components have inherent risks, vulnerable to attacks and can cause immense disruption to the entire rail system and network (Kalay, French and Tournay, 2011). Each part also has an important role in the overall running and smooth operation of the rail system. The effective management of these components and their vulnerabilities is therefore required to allow for efficient and reliable train operation and excellent and convenient services for passengers and the system as a whole (Yang and Yau, 2011). For example, stations are crowded places; thus, control and monitoring of security

concerns become difficult. Cross-country and urban commuter stations have concourses, where waiting passengers gather before boarding on the trains. In most cases, cross-country and urban commuter stations have concourses, where waiting passengers gather before boarding on the trains. Alongside, many mass transit or underground services tend to have a more flowing transient passenger, resulting in the platforms being the place where gathering occurs (Powell and Fletcher, 2011).

Dewilde *et al.*, (2014a) posit that the railway station is one of the important components of the rail transportation system and plays a central role in the safety and security of rail operations. It provides the platform for passengers, trains, staff, security, monitoring and control of all activities and operations of the rail system (Dewilde *et al.*, 2014a). This is also called the control room for the train system because stations perform multiple functions. A train station deals with passengers by providing them with tickets, train timings, waiting areas and shifting of passenger luggage. In addition to this, stations have another important function namely security. Dewilde *et al.*, (2014a) also argue that the provision of security requires the use of technology to monitor and prevent security threats that may disturb the flow of the train system. To ensure passenger security and avoid any impending terrorist attack, station officials work in coordination with the law and enforcement agencies. Being a chief component of the system, each station unit remains in line with other stations and railway authorities to ensure time management especially when the trains run without drivers (Dewilde *et al.*, 2014a). The paper argues that there is a need to improve the robustness of a railway system in station areas which should provide a good passenger service designed to take all passengers from their origin stations to destinations on time and as scheduled and free from any conflict. It opined that railway systems need to manage unavoidable disturbances that cause conflicts, especially in large cities. Subsequently, a railway station is responsible

for the security, ticketing, booking, luggage handling, customer service, Information Communication Technology (ICT), personnel and other departments (Dewilde *et al.*, 2014a).

Another component of the rail infrastructure that is often targeted because of its easy access by anybody in its remote locations is the network of rail tracks. This network of rail tracks is very vital to the operations of rail transportation but its wide geographical spread in unsecured remote locations makes it a soft and easy target for criminals and terrorists (Nie *et al.*, 2018). This highlights the vulnerability of the rail tracks and the importance of an effective security system to monitor and deter any attack (Nie *et al.*, 2018).

Another key component of the rail infrastructure that is critical to its smooth operations and safety is the network of communication systems. The entire rail transportation system relies on a real-time communication system and signal controls for the transmission of all operational data and information on routes and train schedules (Stoop and Dekker, 2008). The hijack or disruption of the communication network could mean disaster for the entire rail system. This highlights the vulnerability of the rail network and the need for a reliable and secured communication system. Modern technologies such as the communications-based train control (CBTC) have simplified the train system and the communication processes with added security features. Modern rail systems are increasingly relying on information and communications technologies (ICT) for all scheduling and train operations including passenger information systems and ticketing system. This evolution makes cybersecurity an important concern, in addition to the traditional focus on reliability, availability, maintainability and safety.

Another area of vulnerability of rail transportation is the open environment within which the rail transportation system operates and the required ease of access of passengers to the facilities of the rail system (Zhao *et al.,* 2016). These operational conditions and

circumstances make the rail system a soft target to terrorists and criminal-minded persons. The large number of a different set of passengers carried in different confined spaces across the geographical coverage of the rail network are also characteristic features of the rail system that make it more vulnerable to attacks. The efficiency of the rail system is based on making scheduled stops along fixed routes while enabling passengers to have quick and easy access to stations and trains (Vienneau *et al.*, 2015). These operational features coupled with the number of access points and volume of ridership makes security challenging. It may require constant monitoring and security checks of all passengers, train platforms, station premises (Zhao *et al.,* 2016; Savage, 2013)

Surface transportation systems such as railroads and mass transit, therefore, remain hard to protect because they are so easily accessible and extensive in geographical dimension and number of access points. This raises concern about the design of the rail transportation network and how the design can be used to enhance safety and security in the rail transportation system.

2.4 Rail Transportation System Design and the Impact on Security

The different types of trains such as the Metro line, light railways and over-ground rails have different designs, capacity, speed limits, rail tracks and operating conditions necessary for their safe and secured operations. The Metro line for example has a different set of infrastructure from a traditional rail system and operates mostly underground with driver-less trains (Dewilde *et al.*, 2014b). The train system infrastructure of a metro train includes some extra elements like advanced technology, automatic signals, and auto-ticketing and terrorist analyst devices.

Most rail system designs are based on the Automatic Train Control (ATC) used to control the movement and speed of the trains and also to enable emergency stops when necessary. It is

integrated with the signalling of trains and responds to the signals to guide the operations of the trains (Gao *et al.*, 2013). There are two main types of train control systems used globally namely the European train control system, which is on the platform of Communication-Based Train Control (CBTC) technological aspects; and the Japan train control system based on the technological aspects of high assurance in ensuring the functionality of the entire railway system (Zeng *et al.*, 2010).

The study conducted by Zeng et al. (2010), made a further contribution to the designing of a train control system and suggested that the associated requirements of user demands and system need to be indicated. Users' needs had been in connection with the demand for a system that should be faster, comfortable, stable transportation, and reduced crowds on the trains for eliminating suffocation issues. The designing method had also focused on the characteristics of high efficiency, reliability, safety, and fault tolerance. Based on the defined aspects of the designing procedure, the model of Automatic Train Control (ATC) has been presented by (Zeng *et al.*, 2010). This was demonstrated as the train protection systems, which contributed to the safety and smooth functioning of the trains. Furthermore, it enables authorities to make the protection of all of the passengers as well because of control of the entire system of a train.

Another research by Wang and Liu, (2010) focuses on identifying the benefits and complexities of the Communication-Based Train Control (CBTC). Wang and Liu, (2010) study revealed that the CBTC system is one of the highly complex systems and possess a different hybrid railway application. This system has severe safety features, which point to be its unique and distinct to that of other designing methods. The mentioned research presented a technique of a 3-level hierarchy-modelling framework (Wang and Liu, 2010). The study concentrated on defining the problem of train control in terms of developing the CBTC

system. The operations of the system were separated in terms of identifying them as the higher-level operation model, which was in respect to the continuous data flow.

Wang and Liu, (2010) in their study also discussed a framework for train behaviour by integrating the discrete state machine within the second level and defining the control acts as the continuous data flow. This data flow had been in terms of the lowest level. The study utilized the computational method through SCADE, focusing on the case study that was centred on the CBTC system. In addition to this, the aspect of the Zone Controller was also addressed, which showed that these factors had been identified to determine the depicted approach. Outcomes of the study have shown that the developed approach contributes to a problematic portrayal of the development of a CBTC system, which contributed to enhancing the quality of the system. However, the CBTC system itself is highly complex, and to present such frameworks, further studies should be conducted on an in-depth analysis regarding the severity of the concerned system (Wang and Liu, 2010).

A study shared by Hayat *et al.*, (2010); Dhahbi *et al.*, (2011) discussed the weakness of train systems. They demonstrate that the European Rail Traffic Management System/ European Train Control System (ERTMS/ECTS) was a standardized European railway signal. The study suggests the methods of colour Petri nets in terms of train localization and movement concerning the railway track at the second level of the ERTM signalling system. However, this is hard for processing the design procedure, as it is mainly based on the onboard and trackside ERTMS sub-systems. These two systems communicate with each other. This is highlighted as the weakness of the defined method due to the implementation of the Euroblaser on the railway track. In their study, Hayat *et al.*, (2010); Dhahbi *et al.*, (2011) reveal that ETCS is a vital train control system that enables the auto control of the entire train system. But instead of that, it has some weaknesses that need to be addressed. Researchers state that one of the critical vulnerabilities of this system is that it becomes unable to cater the

safety concerns. The study further developed an understanding that interlocking and train detection functions sometimes fail to detect the upcoming trains on the same tracks.

As a result, trains may collide with each other, and huge damage appears to both of the trains. Besides this, operational risk is also involved because the un-allowed zones are needed to be considered by the signallers and drivers of a train. Junctions fail to lead the commuting train to an un-allowed track because of the failure of auto-control. In the same way, another weakness is its technicality of development. It requires a radical change in the entire transportation system of the country (Wang *et al.*, 2015). This needs the government to increase the spending on the railway infrastructure, which is the main issue of budgetary resources. Meanwhile, Japan Train Control System has also problems. One of them is the errors in technology, which occur due to technical faults in the entire system of the railway. It also causes collisions between trains and delays in the arrival of trains to specific destinations. In addition to this, infrastructure and track managers need to remain in coordination with the technical staff, and any ignorance and failure with the coordination can cause significant accidents (Wang *et al.*, 2015).

2.5 Rail Transportation Security

The two main characteristics of rail transportation are accessibility and efficiency which are required to provide comfortable rail services. However, these same characteristics also make them vulnerable to all forms of attack. The rail system becomes difficult to effectively secure with a high cost of protection. It raises issues of the required security efforts and needed resources to protecting potential targets versus pursuing and fighting terrorists. Effective securing of the rail transport system may be hard but effective measures need to be taken to deter any criminal and terrorist attacks. Implementing an effective system of deterrence,

protection, and response to effectively secure the rail system without undue interference with travel and commerce is a major concern to managers of rail systems.

Recent attacks on-train facilities and passengers in different cities of the world have turned attention to the security risks in the rail transportation system and the need to prevent, eradicate and manage the risks and the consequences. There has been an increase in terrorist attacks over the past decade in different parts of the world including Spain, India, Pakistan, and Columbia, and the UK resulting in over 200 incidents and over 400 deaths between 2008 and 2013 (Jordan and Horsburgh, 2005).

Terrorist actions can have grave consequences on passengers and rail systems as demonstrated in Spain, Madrid (Jordan and Horsburgh, 2005). With the emerging increase in cases of insecurity among the different transportation system, none is considered as the safest since terrorists evolve with technology. Train transportation provides an ideal opportunity for a terrorist attack because it is public, used by millions of people and has little security and checkpoints like that at airports (Jenkins, 2001). Records show a total of 181 terrorist attacks on trains and rail-related targets such as stations worldwide between 1998 and 2003, an average of 30 per year, resulting in a total of 431 deaths (Jordan and Horsburgh, 2005).

Moreover, to respond to the growing needs of commuting daily, the impact of the ever-changing technology is to be given serious consideration in the provision of security to passengers and facilities (Jacyna *et al.*, 2015). Security issues in rail transport are diverse and complex due to the threats posed by terrorism and other forms of crime, and the challenges of ever-changing technology. Transit security programs may therefore implement or operate using different strategies, measures or solutions, at different times to meet specific needs of the moment. It is also argued that there is a need to investigate and understand past terrorist attacks perpetrated against railway systems and acknowledge preferred tactics, means and

procedures, to provide pre-emptive answers to be adopted in case of attack. This implies that transit security may be subjected to changes to meet the challenges of critical circumstances. It further reiterates the unpredictability of future attacks and the need to strategically plan for emergencies (Corning, 2002).

Due to the unpredictability of the future organizations should plan for emergence and re-emergence (Corning, 2002). Corning, (2002) further emphasizes that organizations should have strategies to cater for emergence. Emergence describes the evolutionary and random changes of relationships between agents and different organization systems, such interactions facilitate the development of new systems. Emergence, therefore, cannot be managed or estimated (Seel, 2006).

The technology of Dubai Metro Trains is advanced, but terrorists keep on evolving with changing technology. Dubai Metro Trains, therefore, should keep abreast of terrorists in regards to the modern sophisticated technology. The organization should plan strategically for continuous growth. However, when designing for security management systems, in reality, there exists a mismatch in design.

This research sets out to critically investigate the deferred model for evaluating and improving the Dubai Metro train security management system that it operates with. In general terms, the model of managing and securing the safety of the metro railway systems worldwide has not been adequately and appropriately designed to thwart all sorts of challenges, including attack from terrorist, in their operating systems. For example, looking at the past, the United States has not had any major attacks on its railways. Metro operated railways do have the same levels of security, but unfortunately, there is not enough of it where it needs to be. The paramount objective of this research is to critically analyze and evaluate to identify the significant vulnerabilities to Metro railway security systems in Dubai

and decipher ways and means by which to improve the Model for Evaluating and enhancing the security of the systems. From the year 2006 to 2017, there were approximately 200 terror attacks on the Metro Trains, depots, buildings, stations, subway systems, to name a few across the world. This includes countries with the most sophisticated equipment to detect terror attacks such as Germany, Spain, the UK, and India. An estimated death of more than 1,000 injuries per year since early 2000 was reported. A summary of the deaths and incidents per year are summarized in Figure 1.1 below based on the number of fatalities, found from 1968 to 2017.

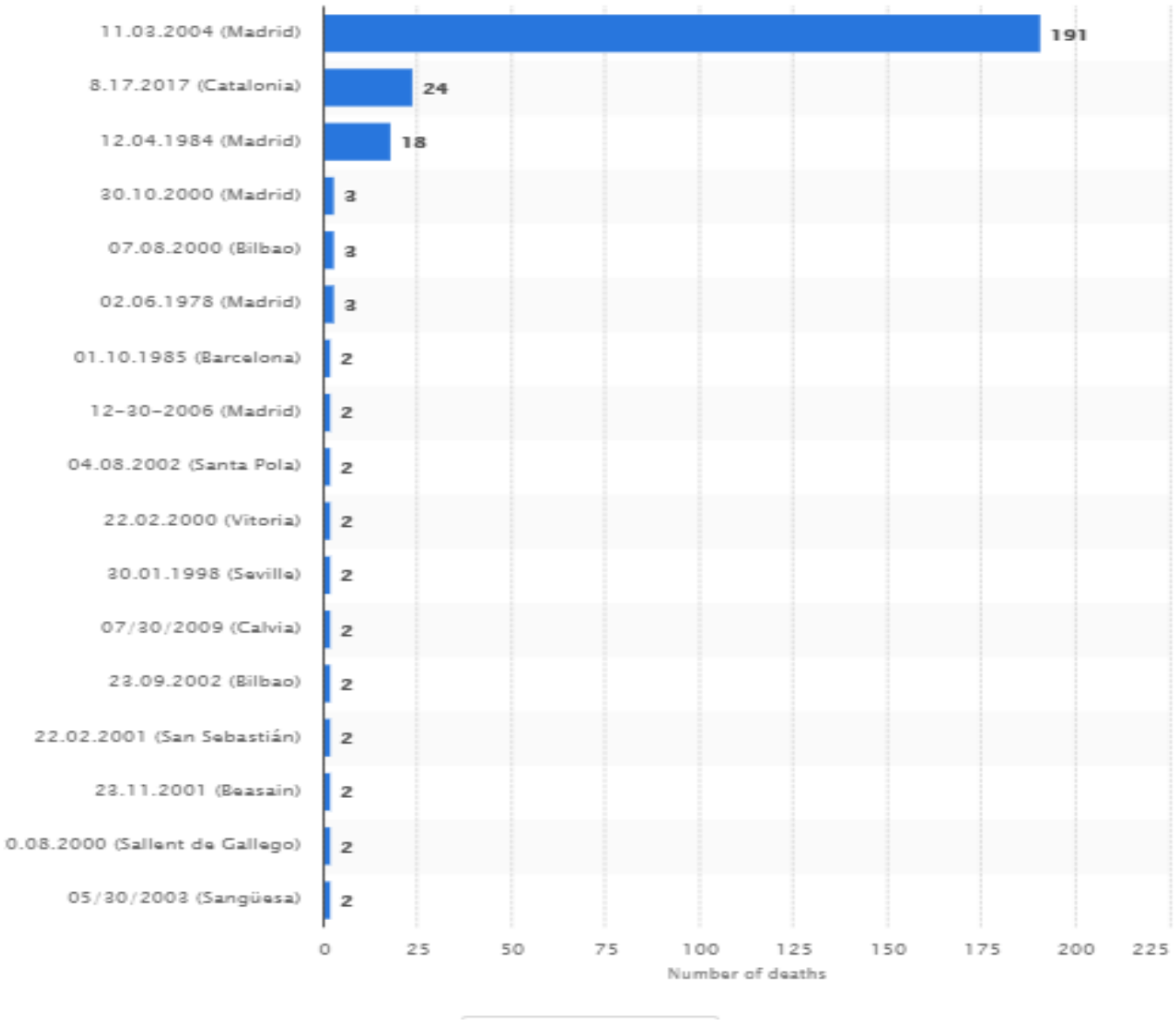


Figure 1.1 internationally number of terrorism casualties between 1968 and 2017 **(Statistica, 2019)**

2.6 Terrorist attacks on train transportation

Terrorists see transit and passenger rail as an attractive target for their plans and purposes due to the convenience and many infrastructural features. These features designed for public convenience, offer terrorist risk-free and unsecured access to lots of people at the same time in confined places such as inside the train or the station with minimal security (Jenkins, 2017). Jenkins (2017) study of the challenge of protecting transit and passenger rail also posit

that terrorist attacks on passenger rail in recent times have raised some concerns and highlights the need to understand the unique attributes of the terrorist threat, how security measures against terrorism have evolved over the years, and their overall effectiveness

In another perspective, Siqueira and Sandler, (2006) study on terrorists versus the government argues that three main factors come into play in the rise and sustenance f terrorist groups. These factors are the responsiveness of grassroots supporters, the effectiveness of the government's counterterrorism campaign, and the attraction of foreign sponsorships of terrorist groups. The paper contends that governments need to focus on effective counterterrorism campaign and find a way of cutting off grassroots support and external financing of terrorist groups

The paper shows that the cases, in which the government of a nation has not been involved in paying heed to how the terrorist groups are financed by outside agents, the efforts are out for the counterterrorism actions and provision of social programs. Moreover, limiting the basic support for such groups becomes insufficient for the maintenance of terrorism within tolerable limits. As per Goldenberg (2008) such inconsistencies result in issues of controlling terrorism within the acceptable limits. The tendency of ignoring the financial components of terrorist groups results in severe problems in the effectiveness of measures against terrorism. A combined effort of government counterterrorism campaign, cutting grassroots and financial support and putting in place a robust security system is required to effectively manage terrorist threats and attacks.

Gwilliam, (2003) study on urban transport in developing countries highlighted the deteriorating environmental safety and security conditions which are endemic in most cities. The paper emphasizes the different and weaker policy and institutional contexts of train systems in most cities which in turn impact the occurrences of terrorist attacks and effective

train security in the cities. The paper refers to these institutional contexts as institutional impediments which have to be considered in planning for security. This demonstrates that the impact of terror attacks on train transport management, passengers and society are different due to the different prevailing institutional environments.

Specific to Europe, it has been identified that an increased level of the terrorist threat has been observed in the past decade. In terms of general transportation systems, (Goldenberg and Arndt, 2008) have indicated that as primary locations for terrorists are the ones with dense crowds. Goldenberg and Arndt, (2008) have highlighted that transport has been ranked in second place concerning the sectors which were targeted by terrorists and further attacked. As noted by the Global Terrorism Database, between the years 1992 and 2014, transport systems become the target of more than 3600 terror attacks. An increase was recorded in the year 2013. Within these attacks, terrorists have utilized the means of bombing the railway systems (Garrick *et al.*, 2004). Regarding the 7/7 bombings that occurred within the London Tube, around 56 people were killed, and approximately 700 were reported injured in this context. The major impact observed is damaging and harming the lives of people and present danger to them and the property of the railway's system. These are highlighted as the generalized effects of terrorism on the railway systems by (Samitas *et al.*, 2018).

People develop a sense of fear while visiting railways stations after hearing different incidents on the news, or the ones who had been involved in previous experiences. It becomes difficult for people to use that medium of transportation which has been depicted as the most influenced places in terms of terrorist attacks (Think-Railways, 2015). In their daily lives, many people have to use trains in a usual manner; however, this sense of fear amongst passengers restricts their usage and leaves a negative image of the train transport management on the society. This is because people would start to accuse the management in terms of not taking up the right precautionary measures for preventing such situations

(Science Daily, 2015). The fear amongst passengers after terrorist attacks is psychological and it has been observed after the terrorist attacks on Mumbai, London, and other countries' train systems, but also in the case of 9/11. The 9/11 attack is known as the greatest terrorist activity in world history which although affected the airport security and World Trade Centre of the U.S.A, but simultaneously local and international passengers were afraid of travelling (Earl, 2009). At the same time, tourists also lessened their demands not only for going to the U.S. but other regions are well.

Consequently, the terrorists' acts on the Mumbai and other countries' train systems contributed to and continued to influence passengers' negatively in terms of reducing their travelling via rails on large scales which, ultimately economically affected countries' governments and private associations since the demand for rail travel had reduced (Kollias, Christos, Stephanos Papadamou, 2011; Oh, Agrawal and Rao, 2011). The influence of the different terrorist attacks could also be felt after several months and years even especially when passengers pass through the procedures of extra checks with security at the railway stations (Cooper, 2001). Besides the emotional impact, the management has to undergo the expense of the physical damage that is produced towards the railway stations. This increases costs, further creating more problems to deal with extra security measures that also increase the need for funds in this context (Railway-Technology.com, 2010).

In South Asia, it was indicated that the increased number of terrorist attacks had been identified in terms of railways, involving 42 per cent of all attacks. This included 21 per cent in India and 17 per cent in Pakistan of the railways that were affected by attacks. Russia has been ranked at the third position following India and Pakistan (Weimann, 2008; Webber and Kruglanski, 2016). In the year 2013, the terrorist’s attack that had happened within Volgograd, Russia, this had raised several security concerns. This was specific to the Olympic Games to be held in Sochi, another city within Russia. This had identified the

significance of how concentrating on this situation to take the relevant measures. In terms of mass transit, the city became focused on analyzing the security issues that had been associated with the train stations and transportation systems (Baev, 2006).

Based on these studies that have reported a continuous increase in the number of terrorist attack highlights, identified major issues are being encountered by the train security systems because proper measures are still not yielding effective results (Kevin Siqueira and Sandler, 2006). This is why the increase in these attacks is observed as always on the ascendancy. In specific regard to the encounters by the developed world regarding the risk within railway travelling, it has been reported that the risk associated with the railway is more than the death risk within the medium of air. Around eight per cent (8%) of risk has been accounted for the criminal acts and terrorist activities when it comes to the overall statistics of the death risk within air travel. However, 88 per cent of risk has been accounted for in this context when it comes to subways and railroads. This shows that increased risks are still faced in terms of railway stations (Krysinska and De Leo, 2008).

2.7 Social and Technological Drivers of Terrorism

Researchers have generally identified terrorism as an enigmatic facet that is difficult and complicated to understand due to its underlying social and technological factors (Brockhoff et al., 2015). However, Cooper (2001) conducted a study to find the best definition of terrorism by adopting a qualitative (comparative and content analysis) method. This is because it was observed in the identified research that the term ‘terrorism' had been a puzzling phenomenon to be defined by professionals since it is it considered in different aspects, including social, cultural, socio-economic and political and thus it can be originated from a variety of sources. On the contrary, Cooper (2001) stated that the development of an operational definition of terrorism was essential per different agencies. These agencies include the United States

Department of Defense (USDOD), the Federal Bureau of Investigation (FBI) and the Department of State (DOS), as the previously provided definitions carried different themes in different situations, such as premeditation terrorist acts motivated by political or social agenda.

Cooper (2001) has defined terrorism as the unlawful use of violent activities to pursue political aims, and these activities are mainly against civilians. Similarly, it is also known as the violence or threat of violence used to inculcate fear to threaten individuals, societies, and governments in the pursuit of their target aim in terms of political, religious, or ideological change. However, this study was not efficient to identify that terrorist activities follow several fundamental premises or factors (that motivate people to adopt this kind of behaviour). Several researchers conducted studies on terrorism (Cooper, 2001; Arana & León, 2008; Boehmer & Daube, 2013) and identified that terrorism history had been an inescapable concept. Modern terrorism primarily began with the French revolution due to some common roots, such as clashes of different civilizations, cultures, religions and a rapid change in the world in terms of increasing globalization.

According to Goldenberg and Arndt (2008), common factors or motivations are commonly called rational motivation, psychological motivation, and cultural motivation. Rational motive tilts people towards thinking about their specific goals, possible alternative solutions to achieve them and conducting a cost-benefit analysis for all the available options. Furthermore, Goldenberg and Arndt (2008) did a study to introduce a new Terror Management Health Model after knowing the key aspects.

A qualitative study by Goldenberg and Arndt (2008) identified that psychological factors could also be associated with the motivation of terrorist behaviour among people which primarily involve individuals' dissatisfaction with their life as well as accomplishments and

cause vulnerabilities. This kind of motivation does not enable them to distinguish between their right and wrong decisions which develop terrorist behaviour among them (Goldenberg & Arndt, 2008). When considering the psychological motivation factor, it has been found that terrorist groups with strong psychological (internal) motivations find it essential to justify their existence, for which they commit violent acts to maintain their self-esteem as well as legitimacy, mainly when working in a group. However, the identified study was majorly based on assumptions and suggestions rather than evidence which further required evidence-based motivations for terrorist behaviours. Goldenberg and Arndt (2008)study on terror management, therefore, elucidate how the conscious and non-conscious awareness of death can influence the motivational orientation that is most operative in the context of health decisions.

The third motivation for terrorist behaviour is the cultural motivation that mainly occurs due to cultural differences which are often not accepted by individuals (Goldenberg& Arndt, 2008). Cultural differences majorly appear due to high tourism activities and travelling (Lepp& Gibson, 2003). Thereof, tourists are highly targeted by terrorists that affect the region or place, socially, economically, culturally and demographically (Arana & León, 2008). At the same time, culture motivates people to undertake those actions that seem unreasonable to obtain their goals. Cultural motivation further involves the concept of the region that often causes developing terrorist behaviour since, in the name of religion, some people become extremists. This eventually affects the culture.

Weimann (2008), study argue that the most influencing motivation for terrorist behaviour is the improvement in advanced technology, such as the excessive use of the internet which often tilt people towards illegal and wrong activities, eventually affecting the decision-making process through multi-channel availability. All kinds of motivations for terrorist behaviours reflect that these factors fundamentally and ultimately change the regions and

their internal systems. However, these motivations alter the terrorist behaviours differently which create various types of terrorism (Weimann, 2008).

Commonly, researchers such as Brockhoff et al. (2015) stated that different types of terrorism are noticed when a terrorists' activity occurs. Some of the most general types of terrorism are called state-sponsored terrorism, dissent terrorism, terrorist and left and right-wing terrorism, religious terrorism, and criminal terrorism. Of the researchers including According to Brockhoff *et al.,* (2015) and other analysts, state-sponsored terrorism primarily deals with the terrorist acts against states or governments by other state or governments while dissent terrorism involves specific terrorist groups who are against their governments. When it comes to left- and right-wing terrorism, then the political ideology becomes a key factor of undertaking illegal activities and attacking a country, whereas, religious terrorism fundamentally drives from religions. The concept of right-wing terrorism consists of extremist groups which include militias and gangs whose purpose is to combat liberal governments against the advancement in traditional social orders.

On the other hand, there is also a type of terrorism that has no specific goal apart from inducing fear in the hearts of people. Religious terrorism is one of the significant types of terror which is appeared due to religious ideologies as well as grievances (Kay et al., 2008). Commonly, religious terrorism is included in those types of terrorist activities in which all kinds of tactics (suicide bombings and other bomb blasts) are used without any consideration of severe devastating and detrimental impacts. This is because the terrorists are taught and motivated by different organizations to use extreme, destructive elements of even self-sacrifice for bringing change in the region and fulfil their aim of life for which God has sent them (Kay et al., 2008).

2.8 New Security Measures for Managing Terrorism

Terrorism together with vandalism and criminal activities has made the top of the list of threats affecting public transportation systems, hence negatively affects the quality of urban life. As mentioned at the beginning of the chapter, trains, stations and underground metro have always become targets of terrorist attacks in urban centres. For example, the Parisian underground train was targeted by Algerian extremists in the year 1995 (Andersson, 2013). During their decades-long struggle against the British, Irish Republican Army (IRA) targeted passenger trains as well as London underground several times. As was experienced in these cases too, securities concerns may be linked to land transport particularly train and metro systems as they are complex and diverse.

With regards to rail transportation and to effectively minimize the damages of terror attacks, prevention and protection are crucial. Past literature and theoretical models have observed that preventions and protection of transportation systems, particularly the railways and airports, is considered as the significant steps that should be undertaken by authorities to keep a secured infrastructure in urban areas (Eick, 2006). This aspect has increasingly become imperative after the 9/11 terrorist attack in the U.S. (Earl, 2009). According to Perea and Puerto, (2013), railway network design often makes them open targets of crimes and security issues that cause terrorism. This is because terrorist attacks often target collective transportation networks. Thus, a railway system is considered the easiest and achievable target, as found in various cases since the 1990s, including the Paris attack in 1995, the Madrid train bombings in 2004, London bombings in 2005, and Moscow bombings in 2010.

Following the Madrid train bombing in 2004, member states of the European Union (EU) issued a Declaration on Combating Terrorism where protection of transportation systems is considered as one of the main objectives of preventing terror attacks (Earl, 2009). There have been calls to strengthen the security of all transport systems because of recent bombings and

other terrorist attacks. The suggestion is to enhance the legal framework and to improve all prevention mechanisms (EC, 2004: 11).

In this context, all members and associated states declared their wish to be involved in providing security to the citizens. They are asked to mobilize different types of resources (i.e., military) efficiently: Objective 4 of the EU Strategic Objectives to Combat Terrorism pledged to: "(1) secure international transportations with appropriate border control systems, (2) appropriate considerations of counter-terrorist activities and integration into the work of relevant EU bodies (transport, border controls, identity documentation etc.), (3) the development of EU transport security standards which should be aligned with relevant international organizations and other third world countries, (4) the development and implementation of a common EU approach to passenger information exchange and analysis, (5) to effectively encourage and support the compliance of non-EU states with ICAO and IMO standards (EC 2004: 14).

A fundamental framework constructed by the EU-led crisis management also implied the inclusion of prevention for an asymmetric threat at the governmental level by assuring individuals that the responsible authorities are involved in operations supported by different levels of information gathering as well as sufficient intelligence (Goldenberg and Arndt, 2008). Due to the 9/11 incident, this framework envisaged large-scale prevention measures primarily for maritime and airspace travelling, as these were regarded as the most threatened means of travelling (Oh *et al*., 2011; Kollias Papadamou and Stagiannis, 2011). In terms of the personal safety and security of the passengers, it is observed that repeated incidents occurred in metro and train travels as observed by Wan, Li, Yuan, and Schonfeld (2015). Particularly, the case of China suggests that it is significant to sightsee the classification along with the effects of the behaviour of passengers along with their relations to the involvement of incidents (Hudson, 1999; Gin *et al.*, 2014).

By contrast, Mumbai and London train attacks also tilted responsible authorities towards focusing on the prevention-oriented actions at railways. Therein, considering the states' patterns to deal with terrorist attacks, prevention is considered as the dominant concept of this study to improve the train system security (Boehmer and Daube, 2013b). Today terrorism is regarded to be fundamentally rooted due to the lack of engagement of significant law enforcement agencies and state authorities in the protection of human rights and humanity. Thereof, protection, such as force protection and protection of people's lives, is an essential element for any crisis management operation. After the several terrorist attacks, including the suicide bombing in different regions of the world, most of the managers and decision-makers found that despite high preventions, if such sudden situations occur then it is a prime duty of authorities to protect the affected people and those who are in panic (Kollias, Christos, Stephanos Papadamou, 2011). Besides, Berche *et al.*, (2009) emphasized the fact that attacks at public transportation have been a primary concern for both authorities and solidity. Many of the security measures have been adopted in facilitates public transport. Berche *et al.*, (2009) study has revealed the principles of Crime prevention through environmental design (CPTED).

In the case of a terrorist threat, the concept identified by the EU reflects that protection can be adopted in such a way, which minimizes the vulnerabilities of material, assets and, personnel as targeted by the terrorists (Goldenberg and Arndt, 2008). In these categories, infrastructure is inescapable, which is often affected whether the attack is on railways, airports, and other places of a country (van Voorst tot Voorst, 2011). Thus, this study focuses on the protection concept in the case of the security of the Dubai Metro train system.

A study conducted by (Paraskevas and Arendell, 2007b) incorporated the fact that touristic destinations, as well as tourists as soft targets, are highly targeted by terrorists to fulfil their purposes of affecting profitability, governments, and peace. Therefore, now state authorities

should not be concerned about who will become the victim. Instead, they should be concerned with how and when the terrorist attack may hit. In this regard, (Paraskevas and Arendell, 2007b) conducted a qualitative study. Within this context, 16 experts were interviewed. Based on the results, they concluded that crisis management frameworks proposed by several researchers are to undertake rational decisions before any severe crisis to prevent and mitigate the threats of terrorist activities, particularly by securing railways and travelling places where the number of tourists is high. For this purpose, both Destination Management Organizations and Infrastructure Development Authorities need to coordinate in addressing the threat of terrorism (Ouyang, Zhao, Hong and Pan, 2014). Based on the analysis of interviews with 16 experts on terrorism and tourism, the study offers a framework for the development and implementation of a destination-specific anti-terrorism strategy.

Similarly, Zhao, Hong, and Pan (2014) projected that vulnerabilities of railways often become a root cause of attracting terrorists, which has experienced by Chinese society at a small scale. Later on, its management focused on the protection and prevention of such a complex network. These two concepts (prevention and protection) are significant for states for obtaining the trusts of travellers and train passengers. It is argued that individuals are needed to be assured of the safety and security of the selected transportation system.

2.9 Police Training and Preparedness for Terror Attacks

The attack on the World Trade Centre in New York, in September 2001 (‘9/11’) and other attacks such as the bombings in Bali in 2002, Madrid in 2004 and London in July 2005 have stimulated an unprecedented government and public concern of the imposing threats and increased the interest in the study of terrorism and how to forestall and manage threats.

Governments have taken the position that the situation is one in which the ‘rules of the game’ have changed which justifies increasing the powers of the police and security services with

new police policies and training (Blair, 2005). The police have been given many powers and relevant training on counterterrorism to manage terrorist threats and attacks. Some of the training packages include Recognition of Terrorist Threats, Recognition of Firearms and Explosives, Threat Recognition Training, Counter-Terrorism Search Training, Counter Terrorism Response and Simulation, Emergency Management Training, and First Responder Training.

Terrorism has been a growing concern and global phenomenon for everyone but particularly the security operatives such as the police who need to be adequately trained to be able to respond to its challenges to society. The prevalence of terrorism over the years has brought some challenges for police organizations in finding ways of responding appropriately to the tactics of terrorists and the impact of any terrorist attacks.

There is therefore an obvious need for special training on handling terrorism and managing the resulting emergencies of terrorist attacks. Police staff needs to be provided with the right skills and attitude to effectively engage with these contemporary criminal tendencies.

The training of Police officers has long been an interesting subject that stimulates discussion in various domains (Bryant et al., 2013). Considering the dynamic problems and situations daily faced by police officers on duty and the expectation of the society for them to perform at the highest level of Bloom's Taxonomy (Cleveland, 2006; Werth, 2011), their training should have the potential to benefit the policing community and enhance public safety. Their training needs to facilitate the development of higher-order thinking skills as they are expected to recall and understand several tasks, and are also required to analyse and evaluate a variety of problems daily (Cleveland, 2006).

The standard paradigm that underpins traditional police training is the notion of acquisition and transfer (Heslop, 2011). However, new ideas based on pedagogic research have

highlighted the new notion of '"participation" and "becoming"' focused on explaining how knowledge is developed (Heslop, 2011, p. 327). Training should therefore be developed and delivered to maximize its impact.

The new phenomenon of terrorism may have presented the need for a problem-based learning activity where police officers are given a real-life problem and are expected to outline the key issues, identify available resources to address the problem, and then generate an action plan for solving the problem (Cleveland, 2006; Pitts et al., 2007; Werth, 2011). This form of training is expected to develop the needed critical thinking and communication skills that are at the core of a police officer's everyday job responsibilities (Cleveland, 2006).

To create a workforce full of adaptive and flexible employees training is vital for both management development and career development of the employees (Ostroff, 1991; Pitts, 2007; Challenges *et al.*, 2009; Mitchell *et al.*, 2009; Noe, 2010; Myers, Watson and Watson, 2014). As far as the training of police forces is concerned, training for police forces does not only mean providing instructions to others and assist them in practising any action by implementing different policies (Stern and Wiener, 2006). Conversely, training is also associated with the attentiveness of people or responsible authorities towards specific security issues and uncertainties.

Training of police officers have become crucial for police forces worldwide due to the growing risks of being exposed in front of police and other intelligence agencies and the need to lessen the risk of terrorist activities. This initiative of preparedness for security issues was first identified by the EU-led crisis management (Goldenberg and Arndt, 2008): "The European Council underlines the role of the Police Chiefs' Task Force in coordinating operational measures in response to, and prevention of, terrorist acts. The European Council calls on the Task Force to review how its operational capacity can be reinforced and to focus

on proactive intelligence" (EC 2004: 6). In this initiative, military and police forces were primarily informed about the terrorist threat using different relevant and illustrative scenarios. At the same time, they have informed about the key possible preventive as well as protective measures related to the prevention of the terrorist attacks, particularly on the transportation systems, including railways, and airspace (Kollias, Christos, Stephanos Papadamou, 2011). The Civilian Headline Goal has further supported this approach to the deployment and development of different civilian capabilities, in which different departments were included, such as Police under the specific training methods per the Rule of Law and Civilian Administration and Civil Protection. In this way, it was aimed at preventing and countering the terrorist attacks and conspiracies to damage infrastructure in member states of the EU (Goldenberg and Arndt, 2008).

In this framework, detailed modalities procedures and criteria of developing the appropriate level of interoperability in the capabilities of military, civilian and police are considered the main objectives of crisis management (Goldenberg and Arndt, 2008). Consolidated ongoing publications deepened this aspect and analyzed the improvement in the training of military, police, and civilians' capabilities.

Consequently, it was found by most of the researchers that a database of assets and capabilities is highly valuable not only to protect and prevent infrastructural damages from terrorist threats but also to deal with their preparedness against such attacks (Oh *et al*., 2011). After knowing the existing capabilities and potentials of improvements in police and military forces, it becomes possible to tilt their special attention towards the use of all instruments for assisting victims. In this context, Goldenberg and Arndt's (2008) conceptual framework identified main issues to train police and prepare them for security issues and uncertainties by improving their potential. On the other hand, this framework implies that what specific measures could be involved in EU-led crisis management for the development of appropriate

cooperation programs (Goldenberg and Arndt, 2008). They argued that these programs help increase the trust of police among the public, which is necessary to support future planning activities related to the security and fight against terrorism. It somehow favoured the continuation of relevant working groups or collective practising somewhat independent exercises of police and military staff. Thus, for developing a visible and effective response to security threats and for the prevention and protection of civilians, capacity building has been considered a must. Capacity building for immediate action and reaction in the regions affected or expected to be affected by terror attacks is required, particularly in dealing with terror attacks on the transportation system.

The primary reason behind focusing on capacity building in the police training is that it deals with all aspects of prevention and protection, including maximum and efficient allocation of resources, sharing and pooling assets, processing of appropriate initiative, and contribution to the Community Civil Protection Mechanism (Goldenberg and Arndt, 2008). Ratcliffe and Guidetti (2008) utilized a mixed-method approach by conducting semi-structured and formal interviews with 20 participants. In their investigation, they posited that the New Jersey State Police (NJSP) had brought revolutionary changes in their training practices by adopting a new paradigm of intelligence-led policing. In this paradigm, tenets were changed towards police culture through the improvements in incoordination. Practical implications of these changes led the police force towards successful preventive and protective practices during roadblocks (Ratcliffe and Guidetti, 2008). This, study shows that during security threats, this kind of change can also be successful.

In a related study conducted by Stern and Wiener (2006), the terrorist attacks of 9/11 were, and it was found that the Bush administration adopted a specific strategy called the "new National Security Strategy" in 2002. In this new strategy, uncertain capacities and intentions were focused on dealing with future risks before the threat becomes imminent. Furthermore,

the training of the military and other armed forces was provided training to lessen the impacts of weapons of mass destruction. In this way, the training of police and other forces also became a precautionary principle against the terrorists' activities that may affect infrastructure. This kind of strategic training initiative also proved an expensive intervention with fewer opportunity costs, and it was found essential for the development of sound policy as counterterrorism measures and national security policies (Stern and Wiener, 2006). In brief, training of police and preparedness of armed forces to increase the security of transportation modes in the world is also a vital aspect of a deferred model in a practical manner, which has not been effective in some regions, including Dubai, which need improvements as deferred actions.

Similar to the precautions and preventions regarding the Dubai train system, police training and preparedness for security issues have also faced ambivalent circumstances, i.e. the research gap. Therefore, to alleviate the research gap, it is crucial to inquire about the forewarning behaviour and police training whether these methods are adequate to secure the Dubai Metro Trains. Similar to the previous section, in this part, there is an ambivalent situation regarding the significance of police training and preparedness for tackling security issues. For the researcher to reach a decision and mitigate the research gap, it is essential to obtain the answer to the question that whether only police training and their preparedness or alerting behaviour is enough in terms of securing Dubai Metro Train.

2.10 Security Management Systems Design and Evaluation

Patel (2006) argued that design is normally established on a misconception of principles, of both theories of security management systems and IS which have a shortage of direct relevance for design. The literature communicating on safety management systems including technology, employee training, and employee preparedness prescribes diverse and self-

governing safety security management systems that meet the needs of the organization (O'Reilly and Finnegan, 2013). As argued by Gray, (1989) each system design has its shortcomings, so there are no specified rules for system design and analysis. Security management systems fail primarily because of design, which leads to institutions incurring losses. Organizations, therefore, are required to provide insights on how to design their security management system to improve performance (O'Reilly and Finnegan, 2013).

The definition of a security management system is broad and difficult to describe, first, we classify railway security management system design and evaluation to consist of human resources and modern technology with the human resource is closely established in the section of security management systems (Brown, Reich, and Stern, 1993; Mendelson, Turner and Barling, 2011). The classification follows the perceived threats of the security management system namely: human resource and technology.

Since security risks are emergent and keep on evolving, logically designed security management system, are required to grow with the emerging security threats. This growth is enhanced by the logical design known as deferred design (Patel, 2006). The theory of deferred action is a well-established theory that could address a mismatch in the design challenges of IT systems based on new requirements as circumstances and context of the system change. The theory is embraced in the study of Information Systems (IS) (Marriot School of Management of Brigham Young University, 2011).

The theory of deferred action when applied in organisations allows teleological design in the context of emergent situations as it imposes purposively designed structure on the reality of the moment. It can also help in shaping both the imposed design and reality in an emergent context. Planned actions are usually based on established structure and processes which can change in response to the impact of emergent events. This raises the issue of predictability

and unpredictability which deferred action addresses but cannot be managed by planned action alone.

The model will help describe how the management of Dubai Metro can efficiently plan and prepare for the crisis while adopting modern technology to continuously improve the security management of Dubai Metro trains to achieve transformative growth.

2.11 Complex-established Design

Design systems for large scale security management are inherently intricate due to their relations with many functional requirements. This complex design considers all interactions that lead to effective and efficient designs; however, simple designs are faster, easy to use and resource-efficient. Researchers are obligated to simplify complex designs without affecting the performance of the main product (Steward, 1981; Sterman, 2002; Design *et al.*, 2003; Koh, Caldwell and Clarkson, 2013).

2.12 Dubai Metro Security System

The disruptive impacts on the safety and efficiency of transport systems due to man-made calamities or natural disasters are a major concern to the government and management of Dubai Metro. The ability to meet the security needs of the customer is therefore of vital importance. In ensuring this, a secure environment for passengers, staff and the facilities of the Metro is created with the establishment of two operations control centres and the incorporation of advanced video surveillance technology using 3,000 cameras to monitor the network including platforms, trains, stations and their surroundings.

The government has set up a dedicated Police team in managing security issues in Dubai Metro with the recruitment of professionally trained security staff for daily patrol of stations and trains, 24/365 access control, management of security risks, and enforcement of railway

bye-laws. Furthermore, State-of-the-art safety equipment will be used such as CCTV in stations, trains, depots, track-side and sub-stations, Emergency Call Points (ECP) on station platforms & trains, intrusion alarm systems and smart card operated access control system.

In a study related to the aspects of passenger safety within train transportation Preston (2008) analyzed rail franchising within Great Britain in terms of the passengers during the 1990s. The study had indicated that there had been issues in three aspects. The first problem was found amongst the commercial and social targets. The second issue had been the involvement of risk and uncertainty within the train systems. The third problem had been the vulnerability of strategic behaviour, which could include low-balling, backloading, and chiselling. The study had highlighted that franchising comprised of a few relevant characteristics; for instance, the increase in competitive pressures. However, a few irrelevant features had been involved as well, which were increased rates of failures within the franchise. There was also a revolting characteristic of strategic behaviour in this context. The study had further recommended that proper reform should be done in terms of identifying the differentiation amongst the commercial and social franchises (Preston 2008).

In his study, Preston (2008) had further identified that, in a generalized manner, safety measures are applied within the transportation system. This relates to the entities of health and safety executives, and the different rail safety and security standards are implemented within a region. These safety and security standards are different from region to region based on the encountered history of terrorism and as such attacks on the concerned area in this regard. Preston's study has also focused on the importance of safety and security measures when it comes to the management of the train transportation system. In a similar study, Liu and Moini (2015) highlighted that evaluating safety performance is highly essential in terms of transportation agencies. This was identified concerning the analysis of the quality of services and depicting the operational efficiency as well. Also, Towhata (2015) have

indicated the improved mechanism that can be deployed to encounter the damage done by the earthquake. Towhata (2015) have designated geotechnical engineering that can be used to cope with the loss, deformation caused by an earthquake.

The above-mentioned study of Liu and Moini, (2015) had further indicated that it was focused on showing and contrasting safety performance amongst four modes of transportation, which included the highway, aviation, transit, and railroad. Their study, for instance, was based on the transportation medium within the United States. They had utilized the national data in terms of the years from 2002 to 2010. The study had used gathered data and the details indicated by transportation agencies to meet with the necessities of the federal reporting, and further, it does not include the additional data. The study had been more focused on understanding the comparison amongst the defined modes of transportation by concentrating on the security measures and as such aspects, instead of indicating the factors that would be directly related to terrorism.

In Liu and Moini's study, passenger safety and the security management systems of the mentioned transportation mediums were examined in the sense of which approaches are better to maintain security. The study had analyzed different perspectives regarding transportation safety performance. Based on these perspectives three types of different metrics were presented in this context: number, ratio, and rate. The study had implemented all three of these metrics were linked to the identified four mediums of transportation. The study depicts the technique utilised for differentiating the part of fatalities or injuries in terms of a specific transportation medium concerning its portion of personal (concerning the highway medium) or the passenger (concerning the transit, aviation, and rail mediums) miles that are covered relative to the entire multimodal passenger transportation systems (Liu and Moini, 2015).

The study of Liu and Moini, (2015) indicated that the shift-share technique had been regarded as a feasible and practical method in terms of accomplishing the constant comparisons of categories in this context. In terms of safety, the research indicated that rail and aviation had been demonstrated as the safest mediums in terms of travelling from city to city. The study further suggested that transit is much more reliable in comparison with automobiles in terms of local travel. The studies mentioned above have indicated the focus on passenger safety, and security measures within the transportation system trains being in specific as per the centre of the present study.

Terrorism had not been highlighted as a significant factor in those studies, which identify the aspect of lack of literature in this regard. However, there exist limited studies in the literature that analyze transportation management vis-a-vis terrorism. Among the existing literature, Oh, Agrawal and Ra (2011) specifically focus on the terrorist attacks within different areas in different modes of transportation. They highlight better security measures that should be taken for future prevention. This also refers to the fear that is developed by different passengers as a psychological impact even if the occurrence had not happened in the same region (Oh, Agrawal and Ra, 2011). This also has a negative influence on the tourism industry. Different news articles and periodicals contribute to highlighting the terrorist attacks and the issues of management within the train systems, but more research studies within the areas of transportation and security should be conducted (Liu and Moini, 2015).

Terrorists consider passenger rail and metro as an attractive target, providing easy access to the crowded place in a confined atmosphere where the attackers have faced minimal security risks. Despite the existence of several studies on terror attacks, researchers have not inquired about the fundamental weaknesses or factors influencing terrorists to attack a given train system. The question of what fundamental weakness has caused the threats for railways, as

found in Mumbai, Madrid and other regions of the world must be asked by the researchers or responsible authorities.

2.13 Components of Dubai Metro Security System

The management of the Dubai Metro line and the security system is mainly the responsibility of the Dubai Police Department and the Roads and Transport Authority (RTA). The operational activities and strategic decisions of these two departments are very important in the investigation and evaluation of the Metro Security system. The Police department is charged with the responsibility of improving the safety management of Dubai Metro trains, with full access to the security systems used by Metro trains. The department evaluates, monitors and approves any security plans by Metro systems. The department is offered special training by the DPD HR training department. The type of training the police undergoes preparing them for effective management of emergencies in train security should be investigated.

The Roads and Transport Authority (RTA) has the responsibility for all transport projects and strategic plans for transport within Dubai. There is a strong working relationship between the RTA and the Dubai Police Department. Having a good understanding of this relationship and the impact on the management of security systems and emergent crises should be explored and investigated.

2.13.1 Dubai Police Department

The Dubai Police force is made up of over 10,000 police for Dubai City. The Dubai police force is the most advanced in the UAE and the world. The force has adopted modern technology in its efforts to keep Dubai a safe city. The force has declared Future Societies 5.0 projects; this project aims to integrate technological advancements in the police force. Future societies 5.0 are integrated into artificial intelligence which will enable law enforcement

officers to establish a safer city through robot police officers, AI surveillance and predictive policing innovations. Artificial intelligence will focus on road and rail transport safety, security enhancement with a proper criminal investigation, management of the crisis, and futuristic police stations. AI methods are meant to be used in all police departments by the year 2031, these departments are security, traffic accidents, predicting crime, and developing the best equipment to serve the needs of the tourists and the locals. With all these technological advancements there is a need to provide law enforcement with the necessary training and skills.

Maintaining a secure city is among the strategic objectives of DPF. Dubai police force has been at the forefront in managing their human capital effectively and efficiently, enhancing the force performance, and managing both technical and physical resources efficiently and effectively. The law enforcement officers are mandated with providing security to the Metro passengers one of the reasons the researcher had to collect data from the department. However, lack of essential skills acts as a barrier in managing the metro train passenger security. Communication flow among the ranks is efficient; communication is the key driver to enhancing a safe and secure city.

In the force, knowledge management strategies have been successfully implemented after the (Seba, Rowley and Delbridge, 2012) study on knowledge sharing at the Dubai police force. This has created a learning culture and the individuals are interested in sharing knowledge. There is a department responsible for knowledge management and every year DPF have internal competitions that award the best improved departmental projects. Leadership in the Dubai police force is highly engaged with their employees and the public.

The officers are tasked with improving the safety management of Dubai Metro trains. The officers must integrate the state regulations when restructuring the traditional system; this

remains the barrier towards improving the security management system. First, they must look into the legal environment for the functioning of the management system. Second, there is a need to increase the effectiveness of measures that reduce the negative impact of the "human factor" on the safety of transport. Given these and some other circumstances, many experts are confident in the inevitability of improving the current transport safety system. The officers have full access to the security systems used by Metro trains, any security plans by Metro systems are evaluated by DPD before approval. Monitoring of security systems is tasked with DPD together with the concerned departments. The employees concerned with safety are offered special training provided by the DPD HR training department. Volunteer security awareness training is provided by DPD to improve the security of Metro systems from terrorists. Military training is offered to Metro train operators and school students (passengers) to give them technical expertise. The police also conduct frequent patrols to reduce traffic crises thereby reducing the chances of accidents. The perceptions of junior and senior staff of the DPD are important in identifying gaps in the Metro Trains security management.

2.13.2 Roads and Transport Authority (RTA)

The Roads and Transport Authority commonly known as RTA is mandated with transport, planning projects and strategic plans for transport within Dubai. The administration of the authority is divided into five agencies; The Public Transport Agency, Traffic and Roads Agency, Rail Agency, Licensing Agency, Dubai Taxi. Only RTA is authorized to offer transport around Dubai city. Their services include Dubai bus, Dubai Metro Trains, Dubai Taxi just to name a few. RTA has over 1,300 buses which carry over 5,000 passengers within a month across the 110 routes. The Metro Trains are on the brighter side driverless transport installed throughout the city handling more than 130 Million passengers throughout the year. RTA is advanced technologically using smart technology to operate the different agencies.

Apart from the regular precautions, RTA has proactive roles of sensitizing passengers about their roles in ensuring that they are safe and secure. The initiatives to sensitize passengers are; the passengers should position themselves as part of the safety and security community, the Metro guides that provide information on using the Metro which also has security features. There is also the culture of safety and civility, and passengers know that they should report anything that seems out of order, or out of place. The expectations of behaviour among passengers are very high, and this is a part of the contribution that passengers make, having a safe and civil culture on the metro. These behaviours are supported by signage, but mostly they are supported by the passengers who continued to reinforce those behaviours and culture.

The RTA systems are capable of predicting a Metro Train security breach. The RTA employees are capable of designing automated systems to predict problems based on things that happened before, or based on the ground experience, or the intuition that comes with the job. So, the RTA staffs need to continue to develop safety and security systems as well as automated systems that are based on data inputs and outputs. There is a very strong partnership between members of RTA and the Dubai police force.

2.14 Research Gap

The literature review above indicates the existence of a rich literature on train transportation and the safety and security of train systems with a particular emphasis on terror threats and other forms of insecurity that could be a risk to the passengers and employees. However, a critical reading of reviewed studies reveals certain gaps in the literature. In light of the reviewed literature above, this study offers brand new research which aims at contributing to the fields of management and engineering. As the title of the thesis suggests, the study differentiates itself from previous research studies. Research papers or studies that have been

reviewed in the literature review part of the chapter provide us with limited knowledge of only specific security gaps in the system. Thus, they do not offer a complete understanding of the selected phenomenon that is, the suitable models to improve the Metro Trains Security Management system. By providing a deferred model for evaluating and enhancing the security management system for the Dubai Metro Train Management, this study will offer recommendations to improve the security of metro train systems against any probable security risks. As reviewed here, some other studies have contributed to the literature of the deferred model and train security systems.

A study related to the security system of trains by A.J.D. Santos *et al.*, (2005) revealed that passengers should be tracked by using radio frequency systems to ensure security. Since Santos and his colleagues proposed to use this specific technology, their study did not evaluate the system. Thus, the lack of such comprehensive research that includes evaluation of security systems the management of train systems is the main motivation of this study. Similarly, Gwilliam, (2003)has focused on the consequences of terrorism on society and individuals. However, it has not addressed how the railway authorities should keep themselves prepared for confronting terror attacks that may cause harm both for communities and individuals. Therefore, due to limited information on an effective and efficient system that can reduce terrorism and improve the safety and security of passengers; this study will particularly address how to improve the security management to avoid any terrorist threat in the Metro Train System in and in particular the Dubai Metro trains.

As reviewed here, research conducted by Abrahms, (2011) underlined that terrorism had become a growing security threat for train transportation all over the world. Abrahms concluded that the railway authorities must take all necessary preventive measures to deal with a terrorist threat. Although the study by (Abrahms, 2011) emphasized enhancing the security of train systems by using advanced technology, it did not point to any action model

including a deferred action model. On the other hand, this study further elaborated that terrorism results from poor management of the security system. This is one main reason why research work has been initiated on the deferred model. It is argued here that the deferred model will be useful in evaluating improving the security system management unlike the other approaches for the security management of the metro train systems.

Similarly, Paté-Cornell, (2002) study demonstrates the risks mitigation models and weaknesses in systems and the most cost-effective model for implementing. Destructive incidents occur due to poor tracking of railway infrastructure; it means that trains do not have such complex security systems that examine any change in the rail lines while the train is operating. In this context, Paté-Cornell, (2002) addressed only the weaknesses of train infrastructure. Hence, the study has helped the researcher understand the reasons for terrorism, but it has not provided any plans or strategies that should be developed to address the security concerns of train transportation systems.

Given the gaps in the relevant research literature, compared with the previous studies, this research study has focused on improving and enhancing the security system management of the Dubai Metro. In this regard, it will become one of the pioneer studies in the literature. According to Arsuaga *et al.*, (2018) train, security control systems are widely used in regions like Europe and Japan. Both countries emphasize ensuring security issues by improving the infrastructure and adopting advanced telecommunication technology. But, the literature is limited in terms of case studies from developing economies. Furthermore, Crosbee, Allen and Carroll, (2017) focuses on advanced technology but ignores the human resources factor. To integrate the human resources factor with technology to improve the security systems in metro train transportation, training of police is discussed as a factor in dealing with security threats. This is another original contribution of this thesis. The thesis argues that the security of train transportation system not just relies on technology but also expert human resources to

control the system. As far as the prevention of terror threats are concerned, a combination of advanced technology and high performing personnel equipped with the necessary skills and knowledge is required. In this context, the thesis puts special emphasis on the professional training aspect of human resources in dealing with terror threats in the metro train system.

To conclude, here it is argued that the literature is available, but the literature lacks a comprehensive model, namely the deferred action model, which integrates technology with the human resources factor. This thesis will integrate the deferred model in evaluating and improving the Dubai Metro Train security management system.

3.0 Chapter Three – Theoretical Framework

3.1 Introduction

Chapter three examines the theoretical background of security systems related to prevention, deterrence, detection and management of criminal and terrorist crises. The chapter, therefore, presents the theoretical framework of the research with the critical examination of theoretical bases and theories of security systems that may enhance the effective examination of the study phenomenon. Some social, terrorism and criminology theories highlighting causes of crime, driving factors and prevention and management of crime and terrorist crises will also be reviewed to identify and select the most relevant and appropriate theoretical lens for the prevention, deterrence and management of terrorist attacks on Dubai Metro Lines and the security of rail transportation systems.

3.2 Theoretical Explanation of Crime and Terrorism

Countermeasures are measures, techniques, procedures and technological systems based on some theoretical explanations designed to deter, prevent, detect and determine the appropriate punishment for any criminal or terrorist act (Kotulic and Clark, 2004).

Countermeasures can be grouped into measures that are centred on the criminals and measures that are centred on the crime (Beebe and Rao, 2005). Measures focused on the criminals address and highlight driving factors that are sociological and biological which lead a person to a crime. The measures suggest there is a societal influence on criminals based on sociological theories including social learning theories (Burgess and Akers, 1966) and social bonding theories (Hirschi, 1969).

Measures focusing on the crime on the other hand address and highlight the non-sociological factors based on the situation and circumstances of the crime that impacts the reduction of the likelihood of committing a crime. These measures are therefore designed to influence the

perception of the criminal concerning the crime situation to be too risky and without reasonable benefit which makes it worthless to pursue (Clarke, 1980).

Security theories are also based on three main explanations which reflect the main perspectives of criminal activities. One explanation argues that a potential criminal who has a high perception of the net benefits from the crime and thus influenced by it may be deterred by the certainty and severity of punishment for committing such a crime (Straub, 1987, 1990). The other explanation notes that crimes are committed based on the motivation they derive from goals and intentions. This makes the understanding of the motivation for criminal activities a necessity in the planning and management of security measures and countermeasures (Smith and Rupp, 2002; Denning, 1998; Chantler, 1996). The third explanation focuses on the effectiveness of information system countermeasures which may be a function of the balanced implementation of technical, formal and informal controls (Dhillon et al., 2004).

Most security theories have focused on environmental, physical and information security, while some have opted to focus on countermeasure activities and relationships between the various factors of security, and their collective effect on criminal and terrorist activities. The situational crime prevention theory for example addresses the physical crime situation and examines how the potential crime situation may be used to reduce opportunities for potential criminals. In the case of train security and criminal/terrorist attacks on the train, situational crime prevention theory suggests the situation of the train such as its structure, environment and operational use of the train can be used to formulate and implement security measures. The theory recognizes the use of many opportunity-reducing techniques as a deterrent, prevention and detection measures, which can be classified into four categories with direct impact on potential criminals' decision-making processes (Cornish and Clarke, 1986). The first category considers the increased perceived level of the efforts put in by potential

criminals to commit the crime, while the second category considers the increased perceived risk of being caught which may be used to deter the terrorists; the third category attempts to reduce and if possible, eliminate any rewards, while the last category attempts to remove any excuse the potential criminal may have (Clarke, 1997). Some criminological theories have in most cases focused on the examination of the motivation of the criminals/terrorist place (Foucault, 1977: Cornish and Clarke, 1986) but at the same time, some theories have also suggested the critical look at crimes and criminal activities based on the social environment that may be influencing the crime (Hirschi 1969; Bursik 1988).

3.3 General Deterrence Theory

General Deterrence Theory (GDT) posits that criminals with a criminal mind of committing a crime may be made to change from committing the crime using some countermeasures activities (Straub and Welke, 1998). The theory explores the dimensions of countermeasures and how these can be applied in deterring criminal activities. It enables the review of activities on information security by management and the activities of the criminals (Nance and Straub, 1988). The security actions based on the theory are designed to deter, prevent and detect criminal activities (Straub and Welke, 1998).

The theory assumes that designing deterrence activities can influence decision-making with the ability to alter or reinforce how decision-makers view and consider necessary factors before any criminal act (Kelvin Cgilton, 2009). This implies that General Deterrence Theory (GDT) is an important proactive theory aimed at preventing crime using countermeasures.

The theory enables a systematic approach to combat crime as it helps to create an appropriate environment that discourages any crime.

The important role played by organisational, administrative controls and policies in the effective management of crimes have been highlighted by several crime prevention theories

(Hollinger and Clark 1983). It, therefore, implies that organisational controls using organisational resources and effective utilisation of these internal resources can effectively manage criminal activities. GDT builds on this notion and postulates that organisational policies can formulate countermeasures and the platform to facilitate the spreading of positive information to create awareness of the adverse impact of crime and terrorist attacks, and the consequences of criminal activities. The theory, therefore, highlights the importance of staff selection, recruitment and training in the prevention and management of criminal activities (Hollinger and Clark 1983).

It, therefore, posits that organisations managing crime would need to hire the right staff, with the right training and right organisational policies and control designed to influence the criminal's perception positively for effective deterrence and prevention.

GDT, therefore, suggests that effective crime control may require a holistic crime management system. It shows that these stages of criminal activities need to be considered and addressed to effectively manage crime (Wilhelm, 2004). GDT, therefore, suggests that focus on all the stages should be balanced and stages fully integrated using appropriate technologies (Wilhelm, 2004). The theory thus opined to have four interlinking components which can enhance the effective management of criminal activities.

3.4 Theoretical Background to Security System

Some security theories based on criminology focus on the power of authority (Foucault, 1977) or the factors and forces that motivate criminals (Cornish and Clarke, 1986), while others focus on how social conditions and environment influence crime (Hirschi 1969; Bursik 1988).

3.4.1 Social Disorganisation Theory

The social disorganisation theory is another theory that seeks to manage criminal activities by examining the impact of the social communities with the argument that crime occurs due to the disorganisation of the community. It argues that a mixed culture is usually created during the mass movement of people in and out of a city and also creates a new platform of educational and technological backgrounds that provides a new sense of economic power and motivation (Kubrin and Weitzer 2003). The theory posits that the development of communities and the social organisation of societies also define community values based on collective moral ethics and codes of conduct. These values may have a big influence on crime if exploited effectively. The theory, therefore, posits that the impact of the community should be examined for effective control of crimes and criminal activities of members of the community (Triplett et al., 2003; Kubrin and Weitzer 2003; Bursik 1988).

The social disorganisation theory based on the assumption that economic and social developments in terms of economic prosperity, cultural values and family ties, focuses on how social and economic conditions in the society can influence crime and thus may be used to control crime (Triplett et al., 2003; Sampson et al., 2002; Anderson 1999). The theory highlights the importance of social relationships and communal regulation of a criminal activity which may be used to control and manage criminal activities (Bourgois, 1996).

The theory highlights the importance of creating awareness in society to discourage criminal activities and help combat any crime in the community. The community and the society therefore can be used to play a big role in preventing terrorist attacks in the society and on the rail transport network. Communities may therefore informally adopt social controls aimed at combating crime and criminal activities in the communities (Silver and Miller, 2004).

3.5 Classical Sociological Theories

The classical sociological theories relate to works presented by the classical sociological theorists. These theories are considered traditional theories since in their time they play a significant role in the development of sociology. The following conventional methods are reviewed for the development of an analytical framework for this study.

3.5.1 Marxist Theory

A study that was focused on the Marxist theory by Manza and McCarthy (2011) reviewed the concept of Marxism. The resurgence of Marxism was observed during the 1970s and 1980s, which had a considerable influence on American sociology in different ways. This sociological Marxism had been regarded as an intellectual movement called as neo-Marxism and had an impact on sociology. As far as terrorism and violence are concerned, the Marxist theory argues that the usual requirement of the public is to have such a society that should be free from violence and that oppression and discrimination should be eliminated.

Even so, the conceptual framework presented by Marx indicates that the struggle to have such an environment does not exclude violence. Such claims that are depicted by predictable politicians, and at the same time would promote wars, different sorts of nuclear weapons, and as such, have been described as hypocrites in this context. The people who identified themselves with the theories presented by Karl Marx and Friedrich Engels are termed Marxists (Meyer, 2004). Among the Marxist sociologists, the most famous ones are Louis Althusser, Pierre Bourdieu, and Antonio Gramsci.

Marxists have indicated within the mentioned scenario of wars of national liberation and as such, violence could not be avoided. However, in terms of terrorism, and referring to the plantation of bombs by targeting specific governments or civilians, performing assassinations, this concept has been regarded as highly unacceptable by Marxists. This shows the differentiation between the aspects of violence and terrorism, which is why both

should not be used interchangeably. The violence that is created by terrorists can be identified as an impact on society. Terrorism is related to the fundamental aspects of Marxism as mentioned in the study of Meyer (2004). Marx identified that terms of the actual reason for initiating oppression, wars, exploitation, and war had not been because of having bad rulers or bad governments (Manza and McCarthy, 2011).

Marx had stated in terms of his theory that the primary cause had been dividing the society into different types of classes and depicting the factor of ownership and the controlling procedure of a minority class, which had been living of the labour from the majority in the society (Manza and McCarthy, 2011). The process of taking over a ruling class and a running economic system based on which the class is developed that cannot be accomplished through the mass killings of people or even frightening them. That can only be achieved through the struggling period of a new class that is indeed the principal base of a new and developed economic system. However, there exist instances even Marx himself supported terrorist acts when they serve the purpose of revolution. For example, Marx supported the Fenians' attack to blow the locked doors of a prison where their comrades were held in custody.

3.6 The theory of deferred action

Countermeasures on terrorism that may be applied to terrorism on train and security are mostly based on addressing societal influence on criminals. These measures are based on sociological theories including social learning theories (Burgess and Akers, 1966) and social bonding theories (Hirschi, 1969) which all focus on the criminal and how to take away the social influence and discourage the criminal from committing any crime.

The theories are focused on deterring and preventing crime but are not concerned about how crimes may be managed and the security system to be put in place for such activity. Measures

focusing on the crime are therefore designed to influence the perception of the criminal concerning the crime situation.

The focus of this research is to explore ways terrorist attacks on the train can be managed and how the resulting emergencies can also be managed effectively to contain any loss. Theories that can address the management of crises resulting from terrorist attacks based on organisational planning and preparedness are therefore required to investigate the management of security on the train.

The theory of deferred action which is a design and action theory informs the theoretical framework of this research. The three meta-design dimensions of the theory which include existing planned action based on rational design, emergent social/technological and other crises situations and deferred action or modalities (Patel, 2007) will form the pillars of the research investigation.

The theory enables the design of social systems such as rail security systems that are emergent, to grow with and be adapted to the emerging social systems to be used purposefully in meeting current challenges. The theory thus provides the mechanism which allows the design of the systems based on the current situation and an ongoing basis. The theory of deferred action surmises that organizations coherently determine their short, mid and long-term goals and consistently plan how to achieve them. A plan, in this case, is an artefact that is constructed to support/assist the realization of the business future, for instance, business plans or emergent system designs (Patel, 2006). However, since consistent behaviour is moderated by emergent behaviour, the emergent behaviour requires to be actively accommodated in the coherent plan. The theory further assumes that reality is emergent and takes priority over the initial plans; the coherent plan hampers these

representative actions. Therefore, coherent plans cater to reality yet the teleological duty of the security system should not be diverted by the emergence.

Since security risks are emergent and keep on evolving, logically designed security management system, are required to grow with the emerging security threats. This growth is enhanced by the logical design known as deferred design (Patel, 2006). The theory of deferred action is a well-established theory that could address a mismatch in the design challenges of IT systems based on new requirements as circumstances and context of the system change (Patel, 2006). The theory is embraced in the study of Information Systems (IS) (Marriot School of Management of Brigham Young University, 2011).

The theory of deferred action when applied in organisations allows teleological design in the context of emergent situations as it imposes purposively designed structure on the reality of the moment. It can also help in shaping both the imposed design and reality in an emergent context. Planned actions are usually based on established structure and processes which can change in response to the impact of emergent events. This raises the issue of predictability and unpredictability which deferred action addresses but cannot be managed by planned action alone.

The three meta-design dimensions and constructs of the theory focus on existing planned action based on rational design, emergent social/technological and other crises situations and deferred action or modalities (Patel, 2007) which can form the pillars of the research investigation. The three-dimensional analysis is aimed at providing a good understanding of the phenomenon of emergent situations like train transportation's terrorist crises, and the development of evolving train transportation security system (Patel, 2007).

The theory will help explain how the management of Dubai Metro can efficiently plan and prepare for the crisis while adopting modern technology to continuously improve the security

management of Dubai Metro trains to achieve transformative growth. It will allow an in-depth evaluation of existing planned action of the Dubai Metro security based on rational design, structure and processes of the rail transportation. Using the theory will also allow the evaluation of emergent situations and risks/ events, the underlying factors, and the impact on the security of rail transportation. The theory will also enable the researcher to evaluate deferred action and modalities to meet the challenges of current realities.

The theory of deferred action will therefore be the theoretical base for this research.

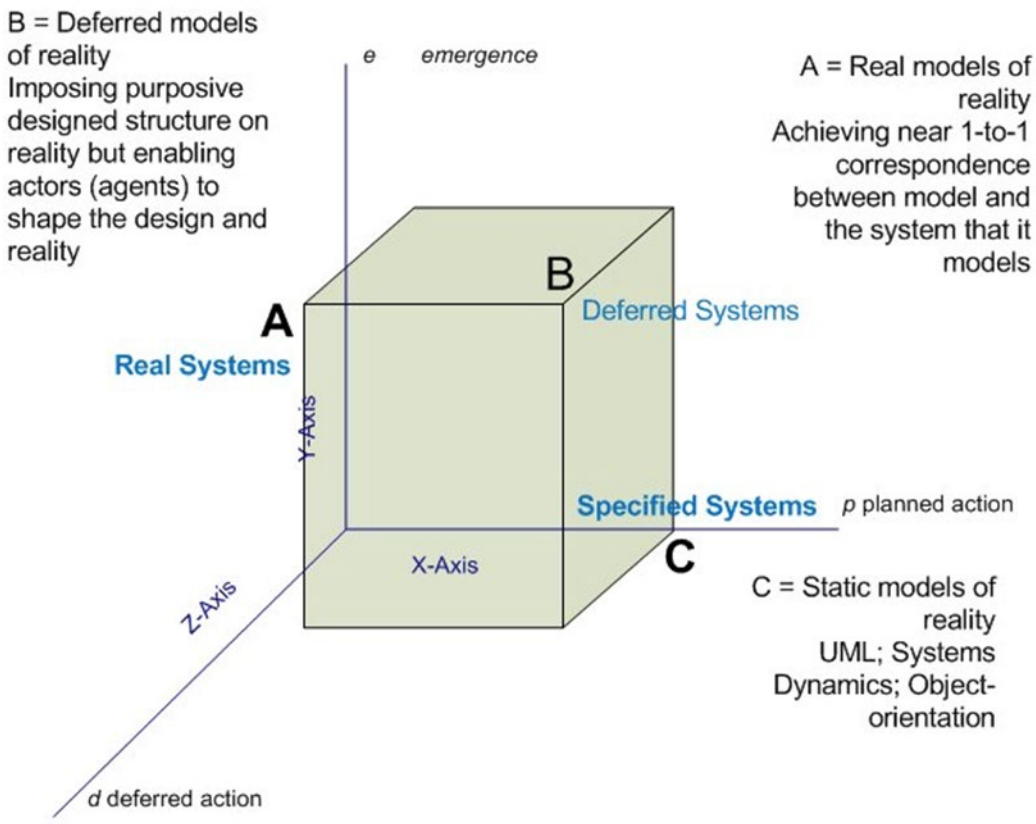
3.7 Theory of Deferred Action: Dimensions, Constructs and Models

The theory of deferred action surmises that organizations coherently determine their short, mid and long-term goals and consistently plan how to achieve them. A plan, in this case, is an artefact that is constructed to support/assist the realization of the business future, for instance, business plans or emergent system designs (Patel, 2006). However, since consistent behaviour is moderated by emergent behaviour, the emergent behaviour requires to be actively accommodated in the coherent plan. The theory further assumes that reality is emergent and takes priority over the initial plans; the coherent plan hampers these representative actions. Therefore, coherent plans cater to reality yet the teleological duty of the security system should not be diverted by the emergence.

The theory of deferred action can be useful in the analysis and design of systems in the form of their dimensions, constructs and models. The three dimensions which can also be regarded as constructs for design and developments are planned action (rational design), emergence and deferred action as shown in Figure 1 below (Patel, 2009). The three dimensions/constructs can be combined to provide different design models of reality to design different systems.

The planned action construct reflects on organisational behaviour which assumes stable organisational structure and processes based on some form of formalism as a practice. Organisations, therefore, have long term planned actions that are predetermined based on some goals and predictions. On the other hand, the emergence construct reflects on off-designs that are outside rational analysis due to the occurrence of unplanned and unpredictable human events (Patel, 2009). Emergence is described as the phenomenon of the process of evolving, of adapting and transforming spontaneously and intuitively to changing circumstances and finding new ways of being (McMillan (2004). Furthermore, the deferred action construct may be regarded as the synthetic outcome of relating planned action and emergence which is the synthesis of planned and situated action such as management's reactions to an emergent terrorist crisis on the Metro lines. Deferred action, therefore, relates current emergent action with planned action (Patel 2006).

Figure 2- Design Dimensions of Deferred Action Theory (Patel, 2006)



3.7.1 Planned Action

Planned action is a bounded rational design, programmed to achieve specific future outcomes, by designing new and strengthening existing systems. New systems are developed based on existing knowledge. Planned actions are crucial for revenue generation in an organization. Point C in Figure 3.1 illustrates planned action if emergence systems do not influence them. Such systems are known as specified systems.

Planned actions may be strategies by the management for increased employee productivity leading to increased revenue generation such as a four-year conventional systems design of ERP systems. Planned action is action established and approved irrespective of reality. Planned action neglects the idea of emergence as it presumes a stable organisational structure. Planned action assists the actors in predetermining the structures and the requirements of the system. Coherent planning is vital as planned actions as they focus on the future and independent of emergence. Implementing planned actions requires designers that are

reflective and can design the artefacts to fulfil what they anticipate to know and other designers who come to realize the actual design elements in time (Patel, 2006). Future unreliability limits the scope for reflective designers, to sum it all planning is vital in cases of emergence. Planning action is necessary for designing the Metro line information Security System.

3.7.2 Emergent

Emergence is the relationship between agents and security management systems as a result of unsolicited environmental reactions (Patel, 2006). Emergence is an appropriate design feature that is situational, unforeseeable and unknowable. Emergence governs the design process and designed artefacts. Emergence needs features such as present, contextual, situational to be considered in the design.

The researcher cannot specify emergence as it is out of rational analysis confines (Patel, 2007). These unpredictable limitations are 'off-design in the perception that they are inherent to human's natural interaction and action processes (Patel, 2006). However, emergence can specify planning failures, which permits designers to rectify crisis in reality (Patel, 2006). Emergence Systems are hard to specify if they are affected by planned action as illustrated by points A and B as Figure 3.1 demonstrates. Therefore, when designing for emergent organizations, there is an interconnection between dimension 1 and 2.

3.7.3 Deferred Action

The outcome of linking the planned action and emergence for designing the MetPass security system is known as deferred action. Agents assume deferred action; inside planned action is decided and validated in the emergent context (Patel, 2006). Deferred action is crucial to design a successful Metpass model. Deferred action evinces emergence, location and time in planned action. It introduces planned actions in emergent situations (Patel, 2006). Emergence is uncertain agents, therefore, should be permitted to respond to the emergence in specific

organization situations. Deferred action allows agents to design systems within their context use. Accordingly, systems at points A and B in Figure 3.1 should give agents the deferred action capability.

The IS product is idealized as a continuous design development action, instead of a product determined by time. The dimension's interconnection is given in more details in Table 1.

Table 1- Design Dimensions

Dimension	Illustration
Planned action	Planning is vital to achieve organizational goals, to build systems that are based on the goals of the organization
Emergence	Individuals responses to the dynamic environment generate emergent situations Emergence needs system and organization design to be persistent
Deferred Action	Deferred action occurs inside planned action in response to emergent systems. Deferred action blends planned action and emergence
Merging of the two dimensions produces four systems: Deferred systems (A), specified systems (B), autonomous systems (C), and real systems (D) as shown in Figure 3.1. The four are also common types of designs, systems, and organizations.	

An excellent example of an organization with the three dimensions is Google. This demonstrates a successful application of the deferred action.

3.8 Application of the Theory of Deferred Action

This section will look into articles and studies that applied the theory of deferred action, the underpinning theory, their objectives, key findings. Patel, (2012) applied the deferred action theory to develop IS for organizations in environments that evolve with time (dynamical). The author expounds on the theory of deferred action to create an idea and design organizations. He further defines the theory as social actions that are deliberate since organizations are systems that adapt based on the complexity of the environment in which they operate. The study was descriptive, and it involved a theoretical discussion whose perspective the deferred action restricts the emergence of systems and organizations. The author maintained that organizations are emergent. Structure, systems, and information that form the organizations are emergent. The author infers that it is crucial to discover satisfactory models for emergent IS, he put weight on the theory of deferred action as the most suitable for modelling organizations. The study has its gaps; this is a theoretical discussion; the other acknowledges the need to observe emergence substantially. Thus, the effects of system designs of IS or deferred action requires to be addressed for further development of the theory.

The theory of deferred action has been applied in knowledge management systems (Patel and Ghoneim, 2011). Their study was established on the emergence of knowledge in the construction of information systems. The researcher applied the theory of deferred action to refer to emergent systems that are designed using emergent knowledge. The study was conducted in the UK to examine knowledge management virtual systems in a telecommunications organization. The finding from the study is that individuals are adaptive to their environment. This study reveals the importance of tacit knowledge sharing in a social setting. However, this study has its gaps the study focused solely on knowledge sharing of members in a telecommunication company; there is a need to conduct an analysis of

knowledge management in other sectors further using the theory of deferred action for a better understanding of the system's requirement. This gap will be addressed in our study.

Truex, Baskerville and Travis (2000) conducted a study to reconsider the process of information system development using the methodological concept of rethinking. Their study aims to use the deconstructing approach as the primary belief of IS development. As (Royle, 2000) defines deconstruction as a critical process of dismantling meanings that are constructed socially through texts and narratives. The deferred concept in this study was the development of the methodological system. In their study, the authors find out that emergence is a continuous process that never attains a steady state. The authors defined emergence as the deferral concept. Their study, however, had its gaps, the study focused on the methodological process using the theory of deferred action to dismantle a method.

Patel, Eldabi and Khan(2010) applied the theory of deferred action to address and understand the problems of emergence in designing artificial complex adaptive systems such as IS and organizations. The study involved a theoretical discussion on constructing an analytical proto-agent model. The model's aptness as the agent-based evaluation was assessed. The authors learn that decision-makers like the shareholders, managers and employees are similar to complex computer systems. They have characteristics and behaviours that define them; (a) they evaluate the current situation (b) they execute the chosen action (c) they evaluate the results and actions and modify the policies based on the results. The study within the deferred action theory framework identified the principal agents, the environment, behavioural rules, the goals of the organization, and random occurrences provide the characteristics of the simulation. The study presents a simulation model established on the theory of deferred action. The authors, however, point out that there is a need to run an actual simulation for thoroughly established analysis.

Ramrattan and Patel, 2010b) conducted a study to investigate the contextual obstacles in developing a web-based IS for emergent organizations. Their study invokes the deferred action theory; the authors argue that the theory fosters knowledge that may comfortably integrate the emergence design dimension. Their research study aligns theory to practice. Their study aimed at extending theory to advance an emergent development tool. They had observed many emergent development tools were susceptible to insufficiency. Research data were collected concerning the development of the students Web-based Information System (WBIS): interviews, emails, journals and work documents. Their study surmises that the organization which they are investigating is emergent as all the social characteristics of the organization are emerging continuously. They did not discover any predefined model. The organization, therefore, demands more multimedia features and a customized web system. Through extended use of the theory of deferred action, the authors developed a WBIS tool for emergent organizations and web developers. The deferred action theory provided this study with a framework to develop a web-based solution for emergent organizations. Their research is an active one, and the study thereby emphasizes the needs of this specific organization. Hence, extending the findings and conclusions of this study to other different emergent organizations is unattainable. This study requires scientific value aside from the organizational development value.

A study to explore the growth of organization based on IT and IS from stable to emergent organizations (Truex, Baskerville and Klein, 1999). The authors refer to organizations as being emergent that is, in simple terms, they describe organizations are in a continual process of transition. This article is a descriptive, analytical framework that explores the responsibilities of the evolution of IS and IT to sustain emergent organizations. The authors' conclusions were that IS of an organization are at a constant change as organizations are as well dynamic all through. The study argues that IT systems should be integrated with the

organizational changes to sustain them in their stages of emergence. Hence, the emergence of IT organizations treasures continuous analysis and large investments to maintain continuous change processes. We consider this as the near beginning study on emergent organizations and emergence concepts, which are among the pillars of the theory of deferred action. This study's nucleus is on the development of IS to keep abreast with the organization's emergence stages. The study is entirely a descriptive, theoretical analysis. The study needs factual/empirical mediation, at least some typical cases of development of IS throughout the emergence stage of various types of organizations.

In (Patel, 2005) article demonstrating that the design of a knowledge management system (KMS) should have both implicit and explicit knowledge, he employed the theory of deferred action as it is the most appropriate framework to analyze KMS sustainability. The theory of deferred action is employed in designing the KMS. The analysis was stretched to system analysis technique to identify the models of deferred action. The author discovered that specific features of knowledge like embeddedness plus social and tacit qualities require looking into other aspects apart from the planned action basis. This study summarizes that planned action measures only explicit, tacit knowledge, hence, eliminates human action. In this consideration when designing KMS, designers need to incorporate human action. The author argues the crucial roles that deferred action present in developing sustainable KMS. This will be employed in designing sustainable security management systems for Dubai Metro Trains; these security systems are based on policies, procedures and human action. This article displays the significance of a model that incorporates planned action with the emergence and deferred action for designing sustainable security management systems for Metro trains.

Patel and Hackney, (2010) employed the theory of deferred action to consider conceptual and contextual issues regarding the designing of information system models as representing

information needs. Their article cites the theory of deferred action to describe system constructs in the emergence and how they can be modelled informal systems. The study employs a theoretical analysis of emergence from general systems thinking as a crucial attribute of system analysis and design. A research design method is adopted. The study underlined the lack of theoretical understanding of emergence in systems analysis and design. A four-dimension analysis of the system is proposed based on the deferred action theory. The authors note the need to carry out extra research to applying the theory of deferred action in design science to contribute to the knowledge of systems analysis.

Wasesa, Stam and van Heck, (2017) conducted a study in a business setting to investigate the effect of agent-based inter-organizational systems (ABIOS) on the performance of business networks. Their research presents a theoretical, conceptual model to analyze the impact of ABIOS on information architecture. This framework helps researchers to understand the effects of structural adjustments on the performance of the business network. Their study involves a cross-case analysis of three main logistic cases namely; warehousing, freight forwarding, and intermodal transportation. The authors discovered out that the application of ABIOS requires harmonization with the information architecture and the coordination structure. As per their study, such structural alignment stimulates improvement in the performance of business networks. Although this study does not employ the theory of deferred action and only deals with a case of the logistics sector, by analyzing smart business systems with a particular focus on ABIOS the article provides excellent insights for our analysis of Dubai Metro trains security systems.

Patel and Irani, (1999) in their study to examine deferred systems design works in the IT environment in real term computers such as the electronic mail, WWW, as well as, in simple computer application systems. The evaluation framework is the evolutionary IS where there exists a complex interaction between the use of IT and its changing organization setting.

They refer to such systems as tailorable information systems that require deferred systems design reasoning. The study conducts a quantitative evaluation of IT/IS investments in dynamic business environments. The study states that standard IS/IT methods are insufficient for tailorable systems. Hence the authors propose a deferred system approach as a better system of IS/IT investments evaluation. Tailorable technologies and deferred systems design present more plasticity compared with systems development life cycle, which often does not cope with dynamic organizations. The article may look old dated in 1999; however, it is one of the frontrunner studies that deferred action design studies spring. In this sense, this article could be criticized as being one that forms an idea of outdated IT-based organizational systems. This study is, however, fascinating as it presents the initial conceptual and theoretical discussions around the deferred action theory.

Another article explained how privatization strategy should be planned given the emergent reality of numerous stakeholders interests which are ignored (Bastola and Nyame-Asiamah, 2016) . The article draws upon the theory of deferred action to develop a context-based privatization model. Their study was a qualitative case study to construct and explain privatization strategies using the deferred based model. The article argues that the Deferred-based model allows considering the emergent reality of more extensive stakeholders' interests by presenting, "a path for incorporating the privatization for profit intentions and everyday customer demands for quality." The article conceptualizes a privatized public sector provision as a deferred action model. This is a unique approach to employ the deferred action theory in a situation other than situations involving IT/IS design. However, this theory was developed to fill the gaps in traditional IT/IS systems, applying the theory into a soft business decision-making case depreciates the explanatory power of the theory.

A study was conducted by Iivari, (2017) to analyze the "emergence" concept in the context of IS and to discuss the implications of IS research. The author reviewed existing literature on

endogenous emergence in IS that is computer science and software engineering with IS as the review perspective. This is a qualitative study that is based on the literature review to inquire about the main arguments regarding endogenous emergence in computer science and software engineering. The study discovers that the existing literature assumes that emergence is an outcome of exogenous. However, the study concludes, "complex design agency, largely omit endogenous emergence, rising from the complexity of the IS and its operational interaction with their environment." By analyzing concepts such as exogenous, endogenous and emergence in IS system theory, the article presents a good review of respective literature. The emergent themes and models from the literature review will provide a ground for the current study of IT-related systems as part of a deferred action model.

The final article to review that applied the deferred action was by (Ullah and Patel, 2011) their article was aimed at conceptualizing multiple dimension resource factors in creating an emergent context that drives Shariah-compliant financial services (SCFS) to adapt or migrate. This article reviews the service design and SCFS design literature to explore emergent explore the emergent factors of SCFS based on a three-dimension model namely; geographical, sectoral, and service portfolio dimensions. This study introduces the idea of addressing emergent contexts including deferred action. A service design methodology is applied to address the concept of consideration in SCFS designs. System designers and project designers frequently use design methods and principles. In this study, the authors employ the (March and Smith, 1995) framework design science to address emergent ideas for SCFS designs to adapt in. The researchers discovered the significance of context as an element of service design in general and SFCS design in specific. The article proposes an expansion in SCFS within the emergent context and suggests constructing a unique "code" or "address" of emergent context. These particular codes and addresses work as identifiers of emergent context, which allow predicting changes in the emergent context more effectively

and suit the service design accordingly. The article is an attempt by Ullah and Patel, (2011) to apply the logic of deferred action into emergent contexts by choosing the Shariah-compliant financial services case. Patel being the leading figure of deferred action theory in his studies to apply deferred actions and emergent contexts in different sectors have given the researcher case relevant for our research and other studies.

S/N	Research Title	Aim/Purpose	Methodology	Findings
1.	Nandish and Ghoneim, 2010, Managing emergent knowledge through deferred action design principles The case of ecommerce virtual teams	To examine empirically the relevance of the theory of deferred action for knowledge management systems (KMS) design in practice	Study adopts a case study approach to examine knowledge work and knowledge management in virtual teamwork in a large UK telecommunications company to understand the occurrence of emergent knowledge and how it is managed by virtual team leaders.	Shows that a complex system adapts to its environment through self-organization. Shows virtual team to be self-organizing and adaptive to its environment.
2.	Mark Ramrattan, 2010, Developing Web-based Information Systems for Emergent Organisations through the Theory of Deferred Action: Insights from Higher Education Action Research	Its three main correlated constructs are used to explain the web developer‟s WBIS development process.	Developed and used an analytical development tool through Theory of deferred action (ToDA).	The resultant deferred system model is the basis for investigating WBIS in an emergent organisation. The constructs of ToDA assisted the web developer to more accurately inform the manager.
3.	Elliman and Eatock (2005),	Aim is to develop the online E-Arbitraton-T system capable of handling workflow for	They applied the deferred design principle, to manage the open and changing system requirements and	Their research enabled users to make design choices rather than the system developer.

		any legal arbitration case, therefore meeting the emergence criteria	making their system an open system.	
4.	Dimitrios Stamoulis, Panagiotis Kanellis, Drakoulis Martakos, 2014, Tailorable Information Systems: Resolving the Deadlock of Changing User Requirements	It examines the concept of tailorability, to stimulate thinking through the promotion of an alternative vision for the development of systems and the state-of-the-art to pursue	A conceptual architecture model is offered for visualizing the deployment of Tailorable Information Systems in an organization, and a number of enabling technologies are presented.	Operating in a turbulent environment, the contemporary organization is realizing that its information systems are often a cause of disappointment due to their inability to respond to rapidly changing operational and strategic parameters. Ultimately any design decisions should be deferred to the user.
5.	Dron (2005)	To develop systems that are shaped in response to the actions of the users	Invokes deferred systems to design systems that have emergent structure, allowing the system to have changing functionality	Developed a self-organising e-learning web-based system called CoFIN that results in emergent structure which the system needs to reflect
6.	Patel et al, 2009, THEORY OF DEFERRED ACTION: AGENT-BASED SIMULATION MODEL FOR DESIGNING COMPLEX ADAPTIVE SYSTEMS.	Focusing on understanding the effect of emergence when designing artificial complex adaptive systems	Use of an exploratory proto-agent model to evaluate its suitability for implementation as agent-based simulation	Developed proof-of-concept, conceptual proto-agent model, of emergent organisation and emergent IS to understand better design principles

Table : Summary of Theory of Deferred Action Application in Studies

3.10 Strategies related to Deferred Model to Improve Train Security Measures

Over the past few decades, several cases have been investigated by analysts and professionals showing that terrorist' activities rely on the finding of soft targets. As railways and such kinds of infrastructures have been categorized as ‘soft targets,’ therefore, the security of such places is highly stressful (Paraskevas and Arendell, 2007b). In this regard, the response of managers and state authorities at the individual level and citizens' participation collectively can be essential to fighting against terrorism. At this level, different concepts have been analyzed by researchers whereas the adoption of conceptual strategies of a deferred model has highly imperative. This is because the deferred model works on the deferred action theory, which relies on the development of such designs that aim to facilitate the IT artefacts. Later on, these novel designs are used by people and other agencies to act purposefully to achieve state objectives, like security (Newnes, Mileham and Hosseini-Nasab, 2007).

To address the impacts of terrorists' attack, it can be said that the deferred model with conceptual strategies is a field where not only rational designs are developed, but the emergence of rational decisions is also observed. For instance, it allows that civilian, as well as military resources, should be significantly used as strategic actions to improve security measures (Siqueira and Sandler, 2006; Sandler and Siqueira, 2006b, 2009). This is because the responses of military and civilians are directed towards the monitoring and proper checking of each critical and less critical area. Therefore, to comply with the objective of crisis management operation, local authorities can be involved in such actions.

In this strategic framework, the EU has taken several necessary steps to provide essential information and database regarding the railways. The records may help the military to protect the network along with a large population against terrorist attacks (Goldenberg and Arndt, 2008). After the successful implementation of this European Security Strategy, third-world

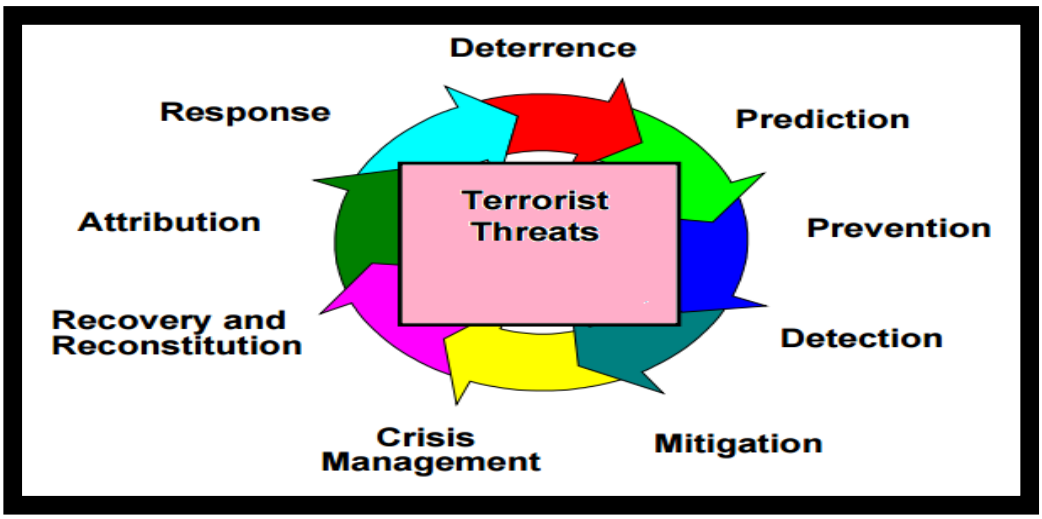
countries have also integrated this more comprehensive spectrum of terrorism control mission. Conversely, this action has been highly recommended for the EU nations for influential outcomes and not proved useful for other regions.

Another strategy (supported by most researchers and professionals is to try to design or redesign a train network, which works with efficacy despite the threats and destructions. This is known as the robustness of the network, and it is followed during the network design phase (Perea and Puerto, 2013). Once, such kind of train network is built, international and domestic attacks might be provoked through distributing the available security resources. Resultantly, the damages caused by the terrorists' activities are minimized despite uncertainties.

In a related study by Roni, Eksioglu, Searcy, and Jha, (2014), a qualitative approach was employed to redesign a railway network system. The findings of the study revealed that a deferred model framework for redesigning railway network. The study suggested that the primary transportation mode in the world, biomass co-firing in the coal-fired power plants is beneficial (Warner and Caliskan-Demirag, 2011). However, it has been further explored in the research that the existing practices can be altered through the efficient allocation of resources, which would be a cost-effective method called 'supply chain network design model.' This implies that a deferred model under the deferred action theory provides a three-dimensional framework, in which *planned actions, emergence and deferred actions* in the future are followed to obtain efficient outcomes (Warner and Caliskan-Demirag, 2011). Although this study does not incorporate the strategies of developing infrastructure against terrorism, affecting the train security measures at a large scale. Still, its importance is inexorable, as it provides strategic and empirical evidence of improving train network designing, which ultimately helps in developing infrastructure and it is essential for combating terrorism (Roni et al., 2014).

Focusing on a wide range of studies, including the work of Boehmer and Daube (2013), the inclusion of advanced technology along with human expertise is one of the key strategies to deal with train security measures in different countries. Eventually, this strategy provides a standard quality and security system in train systems (Oh et al., 2011). Some further strategies were developed by authorities of Mumbai, London and other cities that faced the terrorists' attacks on railways. These are associated with the development of control-type operations. At the beginning stage, Defence Intelligence Organizations might be involved since Bryer (1991) projected in the nineteenth century that such organizations work through the Intelligence Division and support the decisions and actions through increased exchanges of intelligence based on the sensitivity of the information. Overall, a strategic and conceptual model focused in this study to improve train security measures consists of numerous actions or premises followed in the U.S after 9/11, including deterrence, prediction, prevention, detection, mitigation, management, recovery, attribution, and response as mentioned by Earl (2009) (See Figure 2: Strategic Model for Improvements (2009).

Figure 2: Strategic Model for Improvements (2009).



3.12 Conceptual Framework

A conceptual framework is defined as a visual or written product that "explains, either graphically or in narrative form the main things to be studied – the key factors, concepts, or variables – and the presumed relationships among them" (Miles and Huberman, 1994). The theoretical lens that would be used for the examination of security systems in Metro lines and how to improve and adapt the security system to accommodate emergency crises due to terrorist attacks is the theory of deferred action.

The dimensions and constructs of the theory of deferred action will be used as the concepts to guide the investigation and analysis of the subject phenomenon. The planned action dimension/construct which reflects on organisational structure and processes based on some form of formalism as a practice with predetermined long term planned actions based on some goals and predictions will be used to examine existing security systems at the Metro line. This would allow the examination of the present set of security measures including processes, procedures, and technological tools, designed to prevent terrorist attacks and the management of its consequences. How the planned action is centrally undertaken, its future states and adaptability would be examined.

The second construct is the emergence construct which describes the phenomenon of the process of evolving, of adapting and transforming spontaneously and intuitively to changing circumstances and finding new ways of being. It focuses on the capacity provided to the agents to respond to environmental demands in the present situational context and how the response can affect design processes and the designed systems. It will help to examine how planned action or existing system can adapt and accommodate emergent situations. The activities of the police unit and the special security force set up for the metro line in planning, monitoring and managing passenger safety and security will be examined to identify their role in emergent situations. The relationships between the planned action and the emergence

will also be examined to determine the adaptability of the metro security system and how it can enhance the design of emergent system and organisation.

The third construct is the deferred action construct which relates current emergent action with planned action. It reflects emergence, space (location), and time in planned action and thus contextualizes planned actions in emergent situations. It enables agents to modify the security system within the context of its use. This construct will be used to examine how deferred actions of the agents can enhance the improvement of the existing system and help in the design of an adaptable metro security system. It will also identify how deferred action blends action and emergence.

The interrelationships among these design dimensions will be examined to identify how they model designed systems in emergent actuality.

The conceptual framework examines train security systems and procedures as a set of planned constructs aimed at improving the safety and security of passengers and staff at the Metro Line. This planned action construct is regularly reviewed through a planning process influenced by emergent activities and deferred actions. The interrelationships between this set of planned action constructs will be examined to identify the impact of planning and emergent activities on the planned system and the resultant deferred action to produce the desired objectives of safety and security of passengers and staff.

The second set of constructs is police training and preparedness to affect the safety and security of passengers and staff. The impact of planning for police training on policing on the Metro line and the influence of emergent activities is examined to identify the development of deferred actions that may affect improvement on passenger safety and security.

3.13 Constructs of the Conceptual Framework about Research Questions / Objectives

The conceptual framework is based on three main constructs namely Train security systems and procedures; Police training and preparedness; and Deferred action, all related to the three main constructs of the theory of deferred action (Fig 3).

The Train security systems and procedures construct represents the existing security system of the Dubai Metro line. This construct representing the planned action dimension of the theory will enable the examination and evaluation of the present security system to identify its effectiveness in providing safety and security of passengers, staff and the facilities of the company. This examination will help provide the answer to the first research question and achieve the second research objective of evaluating the current planned actions of the Dubai Metro security system, and its effectiveness in preventing and managing terrorist attacks and resulting emergencies. This would be achieved by critically examining the planning arrangements and how emergent situations are taken into considerations in the existing security systems.

This would highlight how the present security system (planned action) is regularly reviewed concerning current emergent activities in the environment and the impact of this regular review of actions on the effectiveness of the system. This planned action construct is regularly reviewed through a planning process influenced by emergent activities and deferred actions. The interrelationships between this set of planned action constructs will be examined to identify the impact of planning and emergent activities on the planned system and the resultant deferred action to produce the desired objectives of safety and security of passengers and staff.

The Police training and preparedness construct represents the emergence constructs of the theory which enables the evaluation of the process of evolving, of adapting and transforming

spontaneously and intuitively to current changing circumstances and finding new ways of managing new situations. It evaluates the training of the security unit concerning planning for possible emergencies on the Dubai Metro line. An examination of the police training and preparedness in the Dubai Metro security system would highlight the capacity of security agents to respond to the new emergent situation and changing circumstances. The role of the transport police, the forms of training, and the capacity to adapt to changing circumstances through the training provided would be examined. This would enable the provision of answers to research question two and achieve the third research objective in identifying possible emergent situations and the preparedness of the security units in managing such emergent situations.

The third construct is the improved safety and security based on deferred action construct which examines how the planned action and emergence situations are linked to providing the capability of security agents to respond to the emergence in specific organization situations. It helps to contextualize planned actions in emergent situations which make it easy to identify how deferred action blends action and emergence. This would help provide answers to the third research question and achieve the fourth research objective which is to identify and formulate possible deferred actions or analytical model (MetPass) for an improved security system in the Dubai Metro capable of accommodating emergent situations.

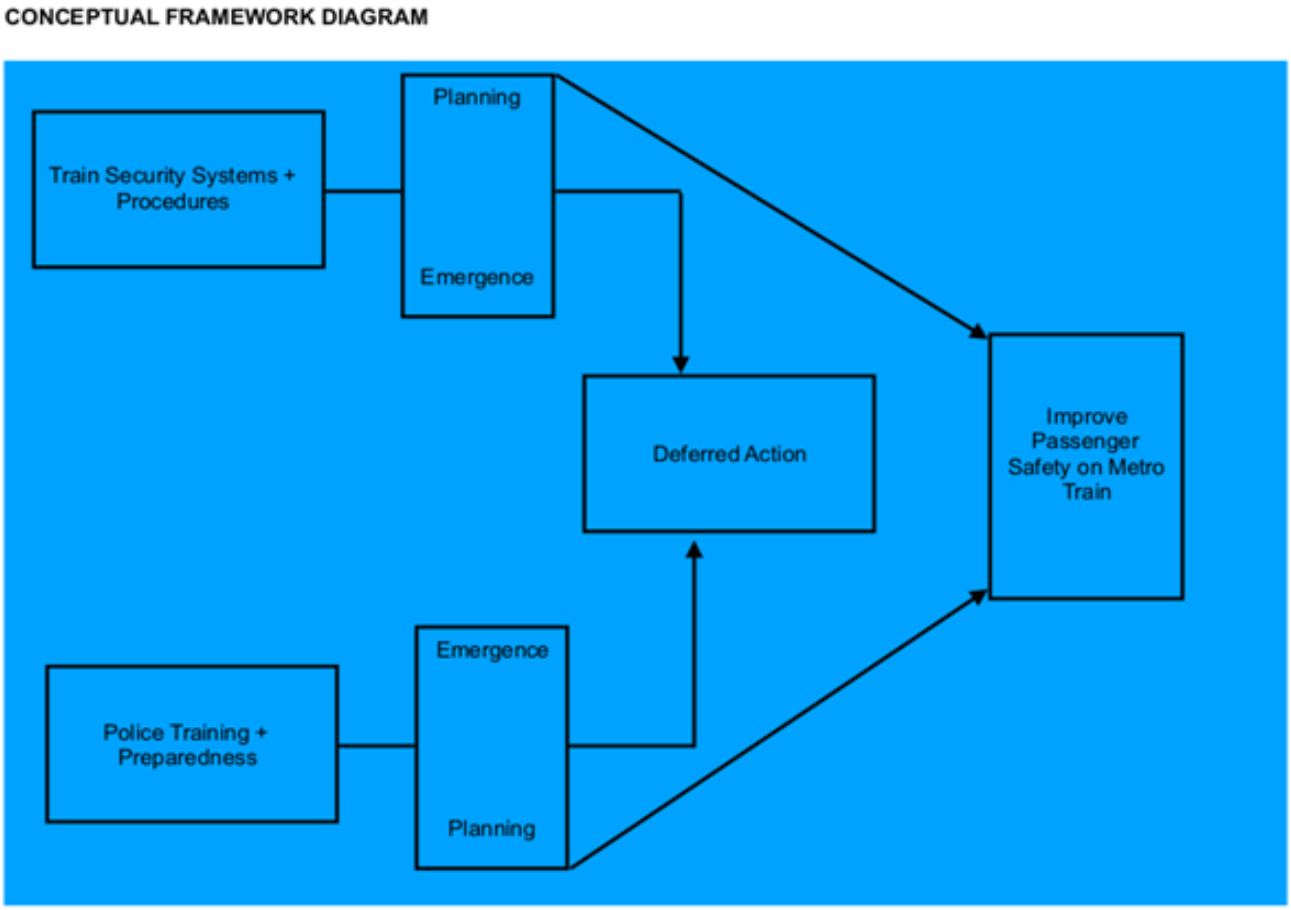


Figure 3- Pictorial Illustrations / Version of the Conceptual Framework

3.14 System Analysis Design Input/output

The system design input/output is a security management program that allows inclusivity allowing actors to employ different security management technologies. The security management systems are classified as employees or passengers tailored to support security management of the Metro Trains. The liquidity of the security management system interacted between passengers and employees make it a powerful security management platform. Potentially, the system analysis design input/output is accessible to all employees of the organization. The researcher cites group discussions, workshops, employee professional training, and informal conversations between employees, knowledge portals and emails,

cybersecurity, Artificial intelligence, body scanners, traffic control technology as exemplars to explore the security of Dubai Metro Trains.

For example, the use of artificial intelligence, traffic control systems, and body scanners for recording and sharing insecure information can be used by employees for critical self-reflection to show how to thwart any terrorist attempt. This information is generated, shared and reused for organizational transformative growth. Including emails, work conversations, the digital exchange of messages demonstrate quick and reactive communication between organization employees, passengers to enhance security management.

The researcher using the three dimensions of deferred theory adopts the rationality dimension to describe planned training that views planning as a predetermined action. The effectiveness of employees training and planning for emergency process and outcome can therefore be assessed at the different levels of emergency planning and training. There are different levels of planning: strategic, tactical and operational plans made by management and employees. The organizational actors apply different specified plans in emergent situations by applying deferred action to solve problems in reality. The MetPass model acknowledges the existence of managers, employees and passengers training in real-time, this is a strategic action that caters for operation plans in time. The MetPass model does not separate planned action and emergence but explains in existence the necessary and required patterns between managers, employees and passengers' actions in response to an emergency.

The model, therefore, explains how to achieve a secure Metro train using the three projections earlier described used Patel theory of deferred action (planned action, emergence and deferred action categorizations) (Patel, 2006) to resolve issues of terrorism. At a time when managing technology and information systems is becoming sophisticated, polls inform us that the public confidence in the ability of private and public companies to perform

effectively is reducing, the confidence of the public in professionals who offer services and manage organizations is also decreasing steadily ('The Journal of Applied Behavioral Science announces', 2006). The MetPass model instantiates emergent action of passengers during a terrorist attack requiring immediate action from employees and managers. Such emergent action includes specific behavioural changes during a terrorist attack. During a terrorist attack, the passengers are instilled with fear and stress understanding these behavioural responses can affect the efficacy to control an emergency in saving lives (Shipman and Majumdar, 2018). Understanding all these require an actuality-based strategy for managing the Dubai Metro Trains security management system. From its inception, it clearly shows the police patrols and emergency planning procedures that would be regularly provided for the Dubai Police. The framework placed great emphasis on this due to the frequent nature of terrorist attacks on the railway network in many parts of the world these days. And as could be seen in the Figure, this operation and its benefits are directed to the Dubai railway network.

As argued by Jacyna, Wasiak, Lewczuk and Kłodawski (2014), that because of the ever-changing technology, the train transport system has also subjected to constant changes as it is essential that all personnel working in the Dubai Railway Network, particularly the Dubai Police, to carry out frequent police patrols on the Dubai railway network.

Henderson (2006) also complemented that when she observed that Dubai demonstrated an ability to forestall terrorist attacks through vigilant and frequent police and security patrols and established itself as a relatively popular destination with a high tourism growth rate.

Adopting the Patelian 3-dimension construct of the deferred action theory, the researcher argues that, the standards of evaluating the MetPass model, should lie within the decision relating to emergency planning, fear of terrorists, human behaviour, technology for detecting

terrorism, and intended system of the change elements as applied in the MetPass modules, indicating their symmetricalness between planned, emergent and deferred analysis. This is because the MetPass model aims to achieve transformative growth with the inclusion of the human factor when designing the security management system supported by modern technology. After all, the security management system draws on socio-technical principles.

3.15 Planning Implementation and Evaluation Tools

Planning implementation and evaluation tools assume that security management could be planned and evaluated consciously. Planning consciously guides the organization to the future, driven by calculated goals and minimum level of contribution as suggested by (Ekamper, 1997). Actions taken by the management and security management processes in the planning and implementation and evaluation tools are essential but not adequate to support a secure Dubai Metro Trains. Management actions are mainly due to managers are entrusted with organization activities and are charged with a greater responsibility of ensuring the Dubai Metro Trains is safe and secure. In emergent cases, planning fails because the future is indeterminate. Bottom-up ideas from the junior staff to the senior staff during planning for security management are sufficient for enhancing the Dubai Metro Trains security management system, such knowledge informs senior employees to modify plans to reflect emergence.

Strategically planning security management activities are meant to ensure that there enough strategies to thwart a terrorist attack. Security management planning and evaluation tools are commonly designed with the expert view and delivered to train stations with inadequate collaborative means for the passengers and employees review. Employees and passengers' feedback is, therefore, restrained. Planned security management objectives, specified security management tools and evaluation components adjust to the thinking of the designer, but

inconsistent with the realities of the actual events on the ground (Pentland and Feldman, 2008). Designers inhibit creative thinking due to their discreteness and formality.

Evaluation based on the planning implementation and evaluation tools module of security management lack a unified solution of all security management system of Dubai Metro Trains for the junior employees and passengers. In reality, the security management system favours the interests of the senior managers. Following (Argyris, 1977) thinking this is a single-loop security management system where security framework, goals, values and strategies are taken for granted. Any defect in the security management is hidden.

3.16 Reality Security Management Tools Requirements

An emergent situation is represented by the reality security management tools, attempting to place security management actions in context. Communication between employees and passengers creates new knowledge to modify the existing security management system, such as the integration of human factor in designing security management systems (Ghanim, 2019). Top management meetings for planned specified security systems redesign use feedback and responses from other growing economies neglecting the fact that terrorism is a self-interested activity (Monga *et al.*, 2015). The managers use feedback from various training employees undergo, security system strategists and departmental meetings which suggest modification of the security management system. The ideas are commonly random and are developed from the dissenting views of the junior staff and passengers. Daily security threats emerge every day from the work practices which influence the design of the security management systems.

Dissimilar, limited actor's feedback is characterized by the planning implementation and evaluation tools module; on the other hand, the reality security management tools module adopts a human-centred role to allow employees participation in designing the security

management system. This allows for a feed-forward and feedback relationship between users of the security management system and the designers (Goldsmith, 2003). The outcomes of such a participatory process are irregular but centred on the daily activities of the people creating room for innovation. The reality security management tools module represents a program for reflective thinking of the existing system and activities. This is a self-organizing security management system, insisting employees identify security gaps, training and development needs in fulfilling missing capacities.

The reality security management tools contribute to the preparation of integrating human factor in technology while designing security management system for managing security during emergent situations. The module stimulates users' stipulations to modify and improve the existing Dubai Metro train security management system. This allows the deployment of tailor-made security management tools flexible for managing insecurity when there is a need for emergent transformation. Actors' in the module adopt a double-loop contribution, where the subordinates' contributions are considered for transforming the organization.

Typical security management processes engage to regulate insecurity are informal conversations and activities generated through the day to day activities, emails are seen as emergent communication tools among employees to assist employees to communicate security management processes to increase creativity and information flow (Akkirman and Harris, 2005; Karanges *et al.*, 2014). The intended improvements of the Dubai security management system, the second-order change, acquired through the double-loop reality security management tools module are emergent factors of evaluation. Second-order change is seen as a discontinuous shift from first-order change (Bartunek and Moch, 1987; Ertmer, 1999; Meynell, 2005). As argued by (Bartunek and Moch 1987) the second-order change moves past correcting gaps to embrace replacing old operation processes, however, second-order change does not attempt on improving the system continuously. Second-order changes

are treated as permanent shifts, organizations and individuals embracing such changes are unable to resume their previous behaviours (Anderson, 2007). This is categorized as risky affairs, incertitude and equivocalness behaviours of the complexity theory. Uninterrupted development is achievable when actions that endanger sustainability are modified as deferred action (Patel, 2007). The above discussion on the Dubai Metro Network passenger safety and emergency training dovetails into the planned training for the Dubai Metro train staff as captured in the conceptual framework in Figure 3 above. This, when carried out frequently and efficiently, enables all staff to know what to do during an emergency such as terrorist attacks on the train, and adequately contain it.

3.17 Deferred Action Security Management Tools and Interactive Lens

The fourth module offers a practical explanation for evaluating the technology effectiveness and efficiency of Dubai Metro trains security management. The deferred action security management module merges actual and organized processes evaluation to intend practical interaction between defined evaluation and inquiry from the study findings.

To meet transformative change with the theory of deferred action, we can say the deferred action security management interactive lens module has the features of a double loop and deferred systems that deliberate planned actions as a rational dimension but provide for unpredictability (Patel, 2006). Transforming tools such as CLUB-U locomotive device are well-cut technologies that support strategists' hunches (Elzen, Enserink and Smit, 1996). These technologies are considered as models of deferred systems changeless with second-order change in the module. This repeats the take that socially designed artefacts are an example of a deferred model of which the true nature manifests after its design through the input of the users (Elzen, Enserink and Smit, 1996). This is equivalent to stating that second-order change is realizable with the deferred action security management interactive lens

module a representation of the adhered security management with human-technology enhanced systems.

The analysis elements of the deferred action security management tools and interactive lens are suggestive. The evaluation framework, supports the evaluation of the security system, supporting the MetPass via constant interactions between the employees, passengers and management. The MetPass model, hence, develops through planning, and emergent security management training and systems within the deferred action security management tools and interactive lens module. Specific training targeted at terrorist attacks.

According to research conducted by Meyer, (2012), it is imperative to develop strategies to tackle terrorism in train transportation. One of those strategies that needed to be adopted is averting the planned terrorist attacks. According to this strategy, the railway authorities must prevent and stop any terrorist attacks which have been planned by terrorists.

Meyer, (2012) complemented this theory when he suggested all the intelligence institutions, security and law enforcement agencies, police, the public and all stakeholders in the railway operations network be trained in total readiness for such an emergency. Thus, as aforesaid in the Chapter, Terrorist attack awareness training is crucial for the safe operations of the Dubai Metro Railway network. All the four main crucial points discussed above in the model for evaluating and improving the Dubai Metro Train Security Management, when effectively, frequently and adequately carried out for the Dubai railway network, would engender an 'enhanced security' as captured in the conceptual framework designed for the research in Figure 3 above.

3.18 Deferred Model for Metro Train Security Management

Public transports are means of obtaining reduced energy consumption, air quality improvement, and economic development. Around the globe, the most common means for public transport is the busses due to low capital, reduced operating cost, and flexibility. Besides buses, the metro trains have offered support to the public and the government through their comfort, reliability, capacity and positive image (Greenberg et al., 2011). It has been observed that Metro train services are based on the periodic or cyclic or regular interval of train schedules. The planning of such schedules is a crucial task for effective railroad planning. However, disruption in these schedules due to fabricated incidents usually hinders the entire process and schedule. Therefore, different methods and models are followed by countries and governments to make metro systems more effective and reliable (Robbins Dickinson and Calver, 2007).

Moreover, as underground transportation systems consumed a significant amount of energy at the regional scale, (Casals *et al.* 2014) proposed that accurate information on energy consumption is required for non-traction practice is vital for both energy planning and productive continuation of Metro systems.

A different method for improving the metro train operations and functions can be implied for instance, as stated by Chang *et al*., (2000) the mathematical programming methods have been used for the optimization in the processes of the planning of trains. Chang *et al*., (2000) also, indicate that the majority of the optimization problems arise during the training phase of planning and scheduling when it is handled through a single objective approach. The single planning objective is observed to be constructed from the perspective of the user based on the time, service, and distance of the operator such as the revenue, capacity, and cost. However, it has been evident that train-schedule planning problems are inherently multi-faceted.

Similarly, as per Abdalla, (2002), multiple interests that are highlighted by the stakeholders and social concerns are also responsible for the issues occurring in metro trains. For this purpose, multi-objective programming techniques are developed to offer decision-makers the explicit knowledge of the relative objective values that are related to the single-objective approaches implicitly.

3.19 Chapter Summary

The conceptual framework chapter of the current study identifies that in most regions of the world, including Dubai, insecurity is affecting the infrastructure system badly because of being a soft target for terrorist activities and influencing a large population of tourists and citizens through detrimental effects. However, this kind of activity that is affecting the transportation security system needs some vibrant strategies, in which integration of deferred model can be inescapable since it involves a rational decision-making process along with other effective approaches or actions, such as prevention and protection, planned police training, passenger emergency training and preparedness. In general, the conceptual framework of the study deals with the critical concerns associated with terrorism. It is argued that critical concerns of terrorism vis-a-vis infrastructure security need further developments in the infrastructure of a region using sufficient and effective actions by applying the best models such as a deferred model for improving the security management. On the contrary to this argument, the in-depth analysis of the conceptual foundations of the research illustrates that within the Dubai region, in the past different models had been selected to find the direction of infrastructural development of rail systems.

These selected strategies assisted the responsible authorities to start from the most accessible as well as a primary point to reach the highest level of security of the train system and progress. Although these dominant strategies and actions tied to infrastructural development,

still the peak of the train security measures in Dubai has not been found, which further requires the proper investigation, evaluation, and importance of incorporating a deferred action model similar to other developed and developing nations, including the EU member states and the U.S. The review of the literature of the study was also used to develop conceptual models and theories, including the deferred action theory for the current research. This fundamentally guided the assessment of the partial model in the present or the past and its need soon for active infrastructural development in the rail transportation system. It was critical to use the deferred action theory to evaluate the effectiveness of novel actions since it helps in generating accurate information.

Moreover, this action approach leads the research towards addressing strengths and weaknesses, which later on become a root to overcome the flaws in the existing security management system. Therefore, its selection was made to answer the research questions that developed in Chapter one, in both general context and specific to the Dubai Metro Train security measures against terrorism. Furthermore, the qualitative methodology has been deployed in the research that has assisted in the collection of the data. Qualitative research has been characterized by aims relating to the methods that develop words instead of numbers, as data for analysis.

In a nutshell, this Chapter has looked at Dubai Metro Trains insecurity and employed the MetPass analytical tool to critically evaluate the security management systems of the Metro. Gaps in the security system have been identified and a conceptual framework to improve the security management system has been proposed. The approaches such as railway system design, use of technology, proper equipment are inadequate to support emergent security requirements. The researcher invokes the theory of deferred action in developing the MetPass model for evaluating and improving the security management system of Dubai Metro Trains for passenger security. The MetPass model is an evidence-based framework for critically

evaluating and improving the security management system supported by continuous employee training, and applicable to Dubai Metro Trains. The MetPass model is a reality-based security evaluation framework; the MetPass is an ‘actual’ vital epistemology that tests established social systems in reality and offers redesigning or improvement.

The next chapter, Chapter 4 discusses the Methodology and research design employed by the researcher.

4.0 Research Design and Methodology

4.1 Introduction

It is important in identifying the research problem before determining the structure of the research. As presented in previous chapters, this research develops a model (MetPass) for evaluating and improving the Dubai Metro train security measures using the theory of deferred action. The study develops a deferred action model to improve passenger safety.

The last chapter has illustrated the connection of deferred action theory in developing the MetPass model, indicating how it could improve the security problems and gaps in Dubai Metro Trains. Employing appropriate research design and methodology could empirically justify this theoretical claim. This chapter presents the issues about the choice of the method, its design and the process of data-collection techniques of the study. By emphasizing the integration of human resources factor in technology to improve the security of the Metro Trains (police training and preparedness, train security systems and procedures and emergence planning (the four modules of the MetPass model) the study uses the case of the Dubai metro system, thus, it is designed as a qualitative case study.

The phenomenon under examination, therefore, requires data from (i) Dubai Metro trains security management processes including the technology employed to promote transformative change purpose such as improving passenger security; (ii) Planning and police training preparedness for emergencies; (iii) Implementation of the human resource factor in technology to enhance security; (iv) How to evaluate Dubai Metro trains security management system including design of the infrastructure and how they are managed and address issues associated with insecurity that can hinder service delivery. Regarding the data collection, the study will collect data on the perceptions of the junior and senior staff of RTA and Dubai Police Force on the security of train system in Dubai by employing a combination

of in-depth interviews, focus group discussions and documentary analysis on policies and strategies. This Chapter has expressed the applicability of the deferred action theory in developing a security management system, examining how it would give a discourse to the security management systems gaps in Metro trains. To validate this theoretical applicability empirically, the interpretivist researcher employed a case study approach to collect relevant data from RTA and DPD employees. From the research questions and objectives, the investigative phenomenon requires data on:

1. The effectiveness of the current Metro trains security system including employee training, information technology employed and employee preparedness

2. Strategies employed for tightening up security management systems of Dubai Metro trains with such factors as planning and implementation

3. Data on how to evaluate the current Dubai Metro Trains security systems and give solutions to issues connected to the organization technology-supported security systems for improved security

4. Developing a security management system effectively from the conceptual model developed earlier using the theory of deferred action.

This chapter will explain why the researcher used the case study methodology for their research investigation. Research questions were answered using the case study research methodology. The primary question is 'how to critically analyze and evaluate the security management system for Dubai Metro trains.' With the improved technology, terrorists have upgraded in their game which poses a great threat to train security systems in an emergent organization. The researcher will explain why they chose a case study research approach as opposed to other alternative research methodologies for guiding the research. The case study

research is used to adjust to the changing nature of terrorists' actions and behaviours which are a threat to the management of the Metro trains security system. The appropriateness of the case study methodology approach for the understanding of the security management system is examined. This enhanced the researcher to propose a possible solution to the security problems encountered by Dubai Metro Trains. The ethnographic data empowered the researcher to record accurately the qualitative data. The case study data is used in Chapter 5 for the data analysis process to answer the research questions and to contribute to the practicability of the theory of deferred action. The case study methodology gives the timelines for collecting data. The ethical requirements during the data collection process are represented together with the practical and theoretical advantages acquired from using the case study approach.

Later in this Chapter, the researcher will discuss what made him select a qualitative data approach, the researcher will discuss how they avoided bias in research, and the various data collection techniques and data analysis to justify their methodological choice.

From the perspectives of conducting social research, there develops a few meta-theoretical questions that are connected to epistemology and ontology. Briefly, ontology describes the things that are found in the social world and assumptions about their elements and forms in social reality. Epistemology is conceived to be real for instance beliefs, values that develop from the material world but do not mould it. Research methods are corroborated by philosophical assumptions.

4.2 Epistemology and Ontology

The researcher's perspective of deferred systems is that the models are real-life. The researcher ontology is that real-life is emergent, however, it can be designed by human beings to achieve their pre-set goals and objectives. Social actions (organizations) are viewed as

emergent by the researcher. Nonetheless, institutions can be rationally planned to achieve certain goals and objectives (rationally designed). The epistemology of the researcher is that through case study research they can obtain the ontology of their knowledge. The viewpoint that institutions and their use of IS which eventually leads to them being emergent, gives the researcher the interpretivist epistemology, using the approach of qualitative research. A study by (Moses and Knutsen, 2012) argues that the ontological and epistemological views determine the methodology selected by the researcher. They articulate that the beliefs of the researcher both ontological and epistemological influence the construction and action of social research. This is demonstrated by (Holden and Lynch, 2014) in choosing the appropriate methodology to align the ontological and epistemological views. The area of philosophical science is given understanding by ontology and epistemology (Machamer, 2008). Methodologies on what social research is required to investigate are informed by ontology (Sarantakos, 2005). The author views ontology as a theological term that is anxious with the essence of things.

The focus of ontological assumptions are around the nature of the human being around the world and whether people view social realities or expression of the world as external, autonomous, objectively real, or as designed socially and experienced subjectively (Kalyvas, 2003; Power, 2010; Scotland, 2012; Latsis, 2015). Nonetheless, the theory of knowledge is what is referred to as epistemology (Latsis, 2015). Epistemology is composed of knowledge; from the source; who owns the knowledge; what type of knowledge is easy to understand and illustrate (Bryman and Bell, 2011; Bryman & Bell, 2015). As Bryman & Bell, (2015) postulates the epistemological view is concerned with the question of what is accepted knowledge in a field. The nature of knowledge is illuminated by the methodologies employed or what is viewed as facts and where knowledge is to be solicited (Carter and Little, 2007, 2015). Methodology research strategy interprets ontology and epistemology concepts into

suggestions of how to conduct the research (Tennis, 2008; Patel, 2015). The researcher consents with the two authors (Tennis, 2008; Patel, 2015) opinion. The researcher's ontological and epistemological concept is the model of deferred reality. The deferred model is influenced by the emergence and is affiliated with the case study approach used. The case study research approach employed qualitative data as opposed to either quantitative data or a mixed approach of both qualitative and quantitative approaches. Using purely qualitative data is in line with the researcher interpretive views on the ontology and epistemology views of the emergent character of organizations.

4.3 Suitability of either Qualitative or Quantitative Approaches

A dissection exists between qualitative and quantitative research approaches (Myers, 1997; Klein and Myers, 1999; Baskerville and Myers, 2004). Nevertheless, some fascinating illustrations that help inform the researchers stand are analyzed below. The natural science area as argued by (Baskerville and Myers, 2004) employs quantitative research to study a natural phenomenon. They affirm that lab experiments, surveys, econometric formal methods, and numerical mathematical modelling methods are encompassed in quantitative research. However, they contend that a qualitative research approach is the most applicable in studying social and cultural phenomena. They advance their argument by stating that qualitative research approaches assist the researchers in answering research questions in live settings. They extend their arguments, that action research, case study, and ethnography are bracketed in the qualitative research approach. The methods of data collection that goes hand in hand with these methods are documented analysis, focus groups, interviews, texts, questionnaires, observations (Gill *et al.*, 2008; Alshenqeeti, 2014).

Qualitative research, however, should not be viewed as either a supporting or a disagreeing approach to quantitative research (Djamba and Neuman, 2002). The authors' further state that

the justification of selecting either or combining the two approaches should be in line with the study aims and objectives. The "word qualitative is not a synonym for interpretive," as expressed by (M. D. Myers, 2009). Literally, "qualitative research can be positivist while quantitative can be interpretive;" this was the perspective of (Kaplan and Duchon, 1988). Researchers position themselves exclusively as either, qualitative or quantitative researchers, researchers stick to one research approach (Hammarberg, Kirkman and De Lacey, 2016). On one hand, researchers employ surveys, questionnaires in a quantitative approach, while on the other hand interviews and observations are the commonly applied instruments in qualitative approach data collection. The epistemological traditions; positivists, interpretivism use qualitative research in organisational research studies (M. D. Myers, 2009). These classifications based on social science are interpretive instead of comprehensive in explaining the reasoning behind selecting the research methodology.

This being said, combining the two methods (mixed methods; quantitative and qualitative approach) increases the results and findings effectiveness, which through the triangulation approach are easily validated (Creswell, 2002; J. Creswell, 2009; Harwell, 2011). As defined by (Olsen, 2004) triangulation in social science is a process used to indicate that two or more research approaches are employed in research with the intentions of validating the results. Triangulation, therefore, helps in getting to reliable and valid recommendations and conclusions. Researchers should apply mixed methods in their research as argued by (Johnson and Onwuegbuzie, 2004), they further state that combining the two approaches will give dependable and richer research findings and results.

The researcher, however, found it illogical to use the mixed approach from various paradigms. The researchers' perspective is that research approaches are enclosed to specific paradigms— is a collection of opinions that explain how a subject is understood they provide which methods researchers should use for a specific discipline, they impact what should be

studied, how research should be conducted and how the data results are interpreted (Morgan, 2014). Paradigms shape how we search for answers to research questions.

All research either qualitative or quantitative approach should have certain primary assumptions (J. W. Creswell, 2009). These chief assumptions are what entails valid research that dictates the effective approach for data collection and data analysis. Positivist and interpretivism paradigms should be taken into account when conducting a research study (Myers, 1997; Myers and Avison, 2002).

4.4 Research Paradigms Interpretivist Viewpoint

In this study, the researcher used an interpretive qualitative case study methodology to address the research questions in line with the investigator's views on epistemology and ontology. The action research approach is handled by the views of interpretivism. The following subsection will dissect the features of positivist and interpretivism as examined by (Myers and Avison, 2002).

4.4.1 Positivist Research

Saunders, Lewis, and Thornhill, (2007) explain the positivist epistemological position, as the reality of the phenomena which is represented by objects that can be measured rather than social phenomena that are concerned with human feelings and attitudes and have no external reality which can be seen, measured and modified like real objects. In contrast, it can be argued from the interpretivist epistemological points of view that, human feelings can be and are mostly measured. Further, (Myers and Avison, 2002) maintain that the positivists accept that, “reality is objectively given and can be described by measurable properties, which are independent of the observer (researcher) and his or her instrument”. The two articulate that, "*positivist studies generally attempt to test a theory, to increase the predictive understanding of the phenomena.”*

The researcher's positivists perspectives infer that there exists a real-world condition, that is autonomous of our knowledge of it and we can obtain entry to that world by observing, registering, and reasoning our experience of that world cautiously. This will help researchers identify patterns that exist naturally but are usually concealed by life difficulties (Moses and Knutsen, 2012). There is incoherence between the investigator's ontological viewpoint and the positivist epistemology. Our research problem is encompassed in getting an insight into social action. To explore the situation, the investigator cannot be impartial of the observer as the positivist view states. The investigator is supposed to be investigating the process of interpretation, accepting the motivations and scrutiny of the participants. The researcher cannot, therefore, be separated from the subjects being examined. This is a principal viewpoint of the interpretivist paradigm.

4.4.2 Interpretivist Research

Xinping, (2002) specified that interpretivists researchers commonly start with the presumption that researchers understand reality designed socially through the meaning given to them by people. They argue that simple basic laws, features of positivism are inadequate to comprehend the entire difficulty of social occurrence.

A neutral observation of the social world is difficult; this is because the world has importance to people and is designed by human beings behaviour and actions (Walsham, 1995). Interpretivist maintains that awareness is developed and theory is built by growing ideas generated from the observed and explicated social actions (Walsham, 1995). Unforeseen findings beyond contemporary scientific understanding are prompted during the research process; the research should make sense of such findings. Interpretivism tries to comprehend personal realities and to present interpretations that have meaning to the research participants (Walsham, 2006). The researcher's activities in the study are more obvious in action research. In the case study research the investigator takes part in the research process together with the

participants to deal with real-life problems in a particular surrounding and strives to provide and apply practicable remedies to the problem (Coghlan and Casey, 2001; Coghlan and Brannick, 2014; Coghlan D, 2014). The concept of value-free research is declined by interpretivism (Walsham, 2006). Axiology is a philosophy branch that is concerned with research nature and value. Researchers provide the world with valuable interpretations of the social world. The interpretations of the social world by the researcher are constructed socially and deliberate on the motives, attitudes, and opinions of the researcher.

Human interests are the key drivers of what and how we investigate the world, for instance, what do we want to know, what questions do we seek answers for and how we lay our understanding that is, how we convey our answers to the world (Symonds and Ellis, 1945). Studies further added that case study research is utilized in researching social occurrences. This depicts the researcher's common construction of his understanding through basic ideas to do with the social world (Alford *et al.*, 1995; Noor, 2008; Taylor, 2013a).

As maintained by Walsham, (1995; 2006) interpretivism has the below beliefs:

1. People observe the social world by seeing what interpreting what definitions people give to the social world. These definitions/meanings are clarified from the viewpoint of the researcher

2. By looking at the inclusiveness, that is the only way to understand the social phenomenon

When researching social phenomenon the researcher should make sense of how people view the social world, this demands the researcher to be part of the research process (Walsham, 2006). Unlike natural occurrence; the social phenomenon is indicated by a high difficulty and is frequently distinctive as they are as a result of many incidences which are constructed by

many different people. A great significance of the study generalization of findings is not connected to the definition of interpretivism (Walsham, 2006). He adds that the business world is dynamic continuously changing and what may seem relevant 4 years ago maybe irrelevant now. With these levels of dynamism generalization even in short periods may be uncertain (Walsham, 2006). Interpretive research was conducted by (Walsham, 2006) in building a framework to create a learning management system for tertiary institutions. This study indicates the suitability of employing interpretive framework methodology in developing the security management system for Dubai Metro trains.

Other remarkable interpretive research regarding the security management systems include (Baskerville and Myers, 2004) in their information systems action research, which analyzes two studies in the US and Denmark. Their research reveals that the identity of information system development is continuously dynamic to meet emergent organization requirements, which are in terms of design. .M. D. Myers, (2009) maintains that just as there exist different philosophical views that typify qualitative research, so there are many different approaches to qualitative research. He further asserts that research methods are inquiry strategies that progress from the principal philosophical beliefs to the research design and collection of data. Data collection is influenced by the research method. Specific skills are required when using certain research methods (M. D. Myers, 2009). These features will be further discussed in the following section.

4.5 Justification for Case Study Research over Action Research as a Qualitative Research Approach

Researchers have the freedom to administer either action research or case study qualitative approach when attending to IS research questions (Truex, Baskerville and Klein, 1999; Truex, Baskerville and Travis, 2000; Baskerville and Myers, 2004; Baskerville, Pries-Heje and Ramesh, 2007; Lee and Baskerville, 2012). In this section, the researcher discusses

which method is suitable between case study and action research in addressing this study research questions. Both approaches, however, use the interpretive approach (Walsham, 2006) in examining an occurrence. The researcher, therefore, looks at the important features within both approaches. To add to this, the study research problem within Dubai Metro trains of sole importance, and also the process of clarification, through which the research conceptions are developed and tested is required.

The researcher views the case study as a forthcoming research technique with features to balance the limited time for fieldwork with quality data collection in which our study was evident to be short-lived.

Table 2- Action Research in Context

	Positivism	**Action Research**
Scope	Free of context	Created on the basis of context
Method	Lead to cause-effect relationships	Understandings cannot be verified quantitatively
Role of the researcher	Disconnected from the research	Active participant
Goal	Set by the researcher and a few selected participants	The entire group sets the goals
Outcome	Generalization and laws	Understandings dependent of context

The five criteria in Table 2 depict the difference between action research and positivism. These five criteria assist the researcher to use in justifying his application of case study research through an interpretive view (Avison and Wood-Harper, 1991). The main objective of our research is to critically analyze the MetPass model for evaluating and improving the Dubai Metro Train security management system. The researcher actively negotiates with the entire participants and clients when developing his model. More details of how the researcher carried out the study are provided in the research design of this Chapter.

The strengths and weaknesses of employing a case study approach to the study are described in Table 3 as according to Yin, (2009). The case study approach proves to be inadequate in answering the research question. Weaknesses of document analysis are identified by this approach.

Table 3- Weaknesses and Strengths of the Case Study Approach to Data Collection

Data Collection Method	Strength	Weaknesses
Interviews	• The selected group focuses on the research topic • The perceived casual influence is provided by interviews	• Poorly formatted questions lead to bias • Participants response bias • Reflexivity - the researcher answer questions in a way to please the researcher
Documentation	• The researcher can review them repeatedly • Documents are exact with the exact	• Access may be blocked purposefully • The author can be biased

	reference and names • They have a long life span	in reporting • Retrievability can be low
Researcher Observation	• Events are covered as they happen • Enhanced understanding of interpersonal behavior and intentions • Covers surrounding of events	• Costly and time-consuming • Investigators may manipulate results leading to biasness • Reflexivity with different results being processed

Yin, (2014) described the strengths and weaknesses of different data collection approaches using a case study approach to qualitative research. In the following section, we will look at the Case Study Methodology.

4.6 Case Study Research Methodology

Lopez and Aguado (2015) posit that it is appropriate for the researcher to adopt the appropriate research methodology when developing security management systems that have a first-hand understanding. As Baskerville, Pries-Heje and Ramesh, (2007) state choosing the appropriate research methodology is vital while developing practically applicable knowledge. The reason behind this is that once the knowledge is assimilated into the research it helps to approach the theory, get responses, modify the theory to meet the research requirements and test feasible solutions iteratively. New understandings can be obtained by using this case study approach, which will further the understanding of the research problem in its surrounding and create solutions that can be applied practically (Gillham, 2014).

The researcher employs the deferred action theory to develop the MetPass model; he relates the framework in the reality of a world situation. So the researcher considers the case study approach for his research since it contributes to the conceptual and theoretical framework of the MetPass model.

4.6.1 Introducing Case Study Research Method

Case studies are applicable in many organizations with varying orientations in epistemology and methodology (Walters, Millward, and Lewis, 2006). To research how terrorist behaviour keeps on changing and develop a security management systems in an organization that is continuously changing, the researcher needs to employ a case study research approach and can make major strides in providing a remedy to this problem (Alford *et al.*, 1995; Taylor, 2013a; Gillham, 2014).

The views of (McCutcheon and Meredith, 1993) on case study research are that case study research seeks to improve real-world conditions and the acquiring of knowledge. These views call for a research process that is based on the previous epistemology revelation. The researcher has stated that he will adopt an interpretive epistemological approach before initiating a case study research approach as (McCutcheon and Meredith, 1993) recommends. The case study approach is categorized under qualitative research (M. D. Myers, 2009). As (Gillham, 2014) states case study research approach combines data collection techniques that are tailored to fit the objective of the research and the setting of the organization. They recommended three vital types of data that the researcher collected and composed about evaluating and developing a security management system for Dubai Metro Trains. The three data collection methods are documentation, focus groups, and in-depth interviews. The data collection methods will be scrutinized in the section for data collection strategies.

The researcher in this study employs the theory of deferred action to evaluate the existing Dubai Metro Trains security management system and recommend improvement. The

researcher was able to improve the theory of deferred action through case study research to develop an applicable model (MetPass) that manages Metro train's security systems in the emergent Dubai City. The researcher tried this model in practice. Through this process, the investigator was competent to implement the deferred action theory into practice and develop theoretical insight into the effects of organization emergence on security systems.

4.6.2 Action Research Method

This approach permits the researcher to avoid the prejudice of a purely theoretical approach about the study of developing a security management system (Arsuaga *et al.*, 2018).

A good definition of action research is provided by (Coghlan, 2014) who defines action research as aims to provide both practical solutions of human beings in a problematic context and to the purpose of social science by using collaboration within a connected ethical framework. A paradigm shift was noted by (Oates, 2005) towards the interpretive action research approach. The shift was classified as a social science 'linguistic turn.' This was brought about by the changes in the world of interpretivism. Oates, (2005) further adds that people are studied in their social settings by interpretive studies to comprehend what meanings are assigned by people. Interprevitivists aims are described by (Chowdhury, 2014) as systematic findings of how humans make an understanding of their discovered world and how those understandings change with time and are different from one person or groups of people to the next. Many researchers as early as (Ln and Allport, 1945) have employed action research in social work. They defined action research as an emergent theory query that applies behavioural science knowledge that is combined with existing organization knowledge and applied to solve the problems in the organization.

Further development of the action research methodology was conducted by (Noffke, 1994) in an action research analysis article for the current generation. She argued that researchers should frequently use the action research methodology in their investigations, and suggests

that it is inappropriate for researchers to read about methodologies and write case studies they should build their methodologies.

4.6.3 Data Collection Techniques for Case Study Research

In this section, the researcher will look into data collection techniques for Case Study methodology. Marrelli, (2007) recommends combining data collection techniques in case study research. The researcher used in-depth interviews, focus groups discussions, and document analysis as a means of gathering data. Coghlan and Brannick, (2014) give a preview of the Case Study cycle: The cycle is made up of four primary steps namely diagnosing, planning action, taking action and evaluating action. Coghlan and Brannick, (2014) suggest that the Case Study cycle gives information on the researcher's findings instead of simply creating statistics. The above data collection techniques will be employed to answer the research questions and the objectives of the research. The research objective is to evaluate and develop a security management system for Dubai Metro Trains.

The data techniques were employed on two different participants the Dubai Police Department (DPD) and Rail Transport Authority (RTA) employees. Coghlan and Brannick, (2014) Case Study pattern have two phases. The first phase is diagnosing, planning, and evaluating data in connection to the research project. The second phase iteratively reflects on the first phase. This is achieved through relentless inquiring into the named four steps to improve on successive steps. Coghlan and Casey, (2001) consider the second phase of the Case Study as the "core of the thesis." They describe these phases as self-reflection phases; they allow the researcher to express their experiences, through careful thinking, interpretation and affixed action. The researcher can reflect on what has been discovered through the data collection process and then reflect on results.

The first data collection technique was RTA and DPD document analysis. The documents have information in connection with the existing security management model, technology

applied, employee handbook just to mention a few. These documents were analyzed by the researcher to gain insight on how to implement changes in the current security management model. An example of one such document is illustrated in Appendix 2. These documents are significant in gaining insight into the challenges the security system designer faces. They provide understandings into, for instance, the quality of security camera specifications required. The documents also provide insights on which security management system aspects design are more vital in comparison with others.

In-depth interviews were important to gather understanding from employees involved in the security management process. In-depth interviews as described by (Bryman & Bell, 2015) are a list of questions on a given topic to be covered, usually called an interview manual, but the interviewee has open ways into how they reply. Questions may or may not follow the stipulated order as on the interview manual. The interviewer may ask questions that are not on the list to gain better insights. In transcribing similar words as used by the interviewee and interviewer are written down. The researcher employed in-depth interviews to gain an understanding of points that were not covered by document analysis and to explore new points that interviewees may raise.

Time constraints limited the use of in-depth interviews in conducting this Case Study; interviewees were allocated 30-40 minutes.

4.7 Research Design

The research design is meant to enable the case study researcher to answer the research questions clearly as possible by providing the researcher with a research design (Jang, 1980). The research design gives the researcher the guidelines to plan the research and maintain focus on the research question, controlling external factors and capture qualitative data (Jang, 1980). The problems the researcher's faces are established within the data collected. The

researcher analyzed data to reveal patterns within the data and also establish connections through categorization. Generating a connection between data furthers understanding (Suter, 2006, 2012; Ridder *et al.*, 2014).

The researcher seeks meaning and then develops a connection of data through the analysis process. The researcher further creates associations from the categorization of the data analysis. This was to achieve the objectives of the research that is to evaluate the Dubai Metro trains security systems using the theory of deferred action. As opposed to the inductive approach the researcher employed the deductive approach to conduction the investigation. There exists two approaches to data analysis; namely inductive and deductive approaches (Soiferman, 2010). He further portrays the inductive approach as one that gains insight into human behaviour, an insight into the research context, qualitative data and adjustable ways to allow changes in the research process. The inductive approach is meant to create an understanding of complex data by creating summary or themes from the source data (Fereday and Muir-Cochrane, 2006).

The deductive approach is elaborated by (Azungah, 2018) as a technique of reaffirming a theory that starts with solid empirical evidence and works about more ideas or notion and theoretical connections. The problem being evaluated requires a deductive approach to reaffirming the theory of deferred action. The four stages are followed by the case study researcher. The four phases are ordered as follows:

Phase 1: The Literature review

Phase 2: Evaluating the security management systems through case study research

Phase 3: Developing security management systems

Phase 4: Testing the security management system

The following section will discuss the above phases in the order of their presentation.

4.7.1 Phase 1: Literature Review

The task of the literature review is to provide adequate information and views on the study area of the case study (Shir Pei Poh-Lim, 2014). The researcher carried out a literature review on the components of train security management systems within Dubai Metro Trains, the researcher further looked into the idea of the emergence of terrorist behaviour, and this is studied and defined. The literature review enhanced the active researcher on components of the train system and how trains operate, this is vital for evaluating the existing security management model and developing a new one. Additionally, (Shir Pei Poh-Lim, 2014) identifies the benefits of conducting a literature review which is outlined below:

4.7.1.1 Encompass Coherence and Emphasis on the Research problem

The literature review simplifies insight into the research area and helps the researcher to create a concept on the research problem (Labaree, 2007). Further, the researcher can see the interconnection between the ideas of previous researchers and the research problem. This enhances coherence and cognizance. From the literature, the researcher identifies that developing a train security system is challenging as organizations and terrorist behaviour keep on evolving.

4.7.1.2 Controlling Methodology Problems Using Literature Review

Mistrust is a common factor that affects case study research (Cassell and Lee, 2011). To suppress this challenge (Cassell and Lee, 2011) recommend that the researcher spend most of their team with the participants and organization employees to build trust. The researcher is an employee of the Dubai Police Department so there is trust between him, the managers and colleagues, however, the researcher spent a few weeks building trust with the employees of the roads and transport authority (RTA). This involved the researcher together with train operators evaluating the gaps in the existing train security management system. Further,

(Cassell and Lee, 2011) recommend that understanding the challenges will help the researcher apply a more relevant methodology.

4.7.1.3 Widen the Skills and Knowledge in the Research Field

Understanding the research field is very critical to the researchers (Winchester and Salji, 2016). They state that the literature review widens the researcher views on the research topic. To further their argument, they state that the literature review enables the researcher to categorize the results and findings of their research in the right context of the extant body of knowledge.

The researcher gained insight from a vast source of knowledge namely: peer-reviewed journals both electronic and hard copy, conference papers, books, reports, and online literature. Additionally, the literature review is extracted from various research disciplines as IS, human-terrorist interaction, people behaviour, security system development, IT artefacts, organizational studies, organization portals and websites, and organization culture. The researcher applied the knowledge acquired to understand the phenomenon of terrorism and security management systems using a deferred model and appropriate theories to understand terrorism to better the development of an efficient security management model.

4.7.2 Phase 2: Evaluating the Security Management System using Case Study

The evaluation of the existing Metro Train security management systems enhances understanding problems of emergence in the development of security systems in a dynamic environment with changing the behaviour of terror threats. These problems are changing employees training needs and change of terrorists' behaviour. This stage equips the researcher with the problems faced and in the long run, upgrades the development of the security management systems using the problems identified.

4.7.3 Developing Security Management Framework Systems Using a Case Study Approach

This phase is the core of the research where the research constructs the security management system, MetPass model. The results of the previous stage (phase 2) are applied in this phase. The findings of phase 2 enabled the researcher to overcome problems identified in phase 2 such as; employee training needs, proper equipment, planning and passenger and employee preparedness. The researcher produced themes, guidelines (patterns) and associations that assisted the researcher in the security management system development. The last phase is concerned with testing the security management system.

4.7.4 Testing the Security Management System

This phase incorporates testing the security management system developed in phase 3. The development of patterns and connections was crucial to the development of security management systems in an emergent organization. Explanations of the different components of the security management system are explained by the researcher in this phase.

The study purpose is highlighted in Table 4

Table 4- Study Purpose

Approach	Reason
In Practice	The ethnographic researcher gains experience and knowledge
Data collection	Collect data analysis on the weaknesses of the security management system
Data analysis	Identify issues in developing security management systems in emergent organizations
Evaluation of	Evaluate the findings of the research to identify lessons learned and

data	proffer recommendations

A study was first conducted to evaluate the security management system of Metro Trains, this study enhanced understanding the patterns and connections that are produced from the data analysis. This gave the researcher an opportunity to analyze data while still in the field.

The case study researcher conducted the evaluation and analysis and dispensed the findings for designing the security management system. The findings of the field data analysis are displayed in Table 5

Table 1 - Applying Data Analysis Findings

Approach	Reason
Application	Apply data analysis results in improving the security management system
Refinement	Reapply the findings to the current security management system
Research proposition	Deduce conclusions and recommendations from the critical analysis of the MetPass model

Additional information was acquired from interviewee outside the research questions which generated knowledge and understanding of security management systems.

4.8 Research Design and Accomplishment of Issues

The type of questions as laid in Chapter 1 affects the research design selected. The roles of research design are to enhance the researcher gather as much evidence to answer the research question as unambiguously as can be (Creswell, 2003; Friedman, 2003; Sobh and Perry, 2006; Leedy and Ormrod, 2010; Toledo-Pereyra, 2012). The principal purpose of the research design is to allow the researcher to evaluate and develop a security management system for Dubai Metro Trains. Themes and patterns are drawn from the data analysis which gives accuracy to the study. The researcher through the data collection process gained skills to accommodate the fast-changing security structures of Dubai Metro Trains. The researcher, however, had no control of the data collection surrounding and could not change it (Avison *et al.*, 1999). To subdue this challenge, the researcher was allocated more time for data collection as the researcher and subjects (participants) required more time to build trust.

4.8.1 Arranging Case Study Data in Context

The case study research data is dependent on information; it represents the various views of the participants regarding security management systems. A case study emphasizes the researcher's ability to identify gaps in the current security management system and develop a better model. Conducting focus groups discussions and in-depth interviews, therefore, is simply not considered as data collection but rather as a learning process between the researcher and the participant involved. This learning process provides solutions to the problems identified by generating themes and patterns. These themes and patterns are used to develop an effective security management system. The case study research aims in producing new knowledge by finding solutions or improvements to real-world problems within a conceptual framework (Review and Hultgren, 1990; Currivan and Gilbert, 1994; Huxham and Vangen, 2003; Checkland, 2010; Bridget Somekh, 2014).

4.8.2 Case Study Qualitative Analysis Observation

Qualitative analysis observation is a continuous process throughout the research life span (Schwandt, 1996; Sally Thorne, 2000; Williamson, Given and Scifleet, 2017). The observation may shift from personal experience to knowledge. There may be a shift from the initial research problem during the research lifespan. Instead, the researchers' observation may be more focused and concentrated depending on their understanding of the problem.

Coding data is recommended by (Stuckey, 2015) to shift focus from the way of focus and view data in an easier to understand manner. Coding generates meaning if the researcher employs it to search and test ideas that are generated from the data. The researcher should begin with a simple concept or question and examine it from there (Jackson, 2014). Literature review and codes should assist the researcher in developing themes and patterns from the data analysis. The trick to data analysis is asking questions from the data collection, and thinking it through to answer in different ways. The researcher is recommended to study other articles using the same approach even if the research topic and problems are entirely different. This enables the researcher to gather ideas on different ways to approach the problem.

The researcher should look into studies that have employed the deferred action theory to gain insight into how the researchers appropriately used the theory to gain understanding and conduct their investigation. Guidelines for data analysis are provided by (Richards, 2009). He goes further to give the achievements of a comprehensive data analysis:

1. The analysis should give something other than what the researcher has reported

2. The analysis should interpret the data

3. The analysis results should be usable, that is, the researcher should be able to evaluate and develop a management security system from the data results

The researcher opines that the three perspectives are perfect examples of a successful case study research data analysis. The last perspective is crucial to the predetermined purpose of this study. After all these are achieved the research is brought to a conclusion with recommendations, and requirements for future research. The researcher employed coding data with NVIVO software in the data analysis process

To conclude on this section (Schwandt, 1996) proposes three components of a successful qualitative analysis:

1. A successful qualitative case study research data analysis should meet the objectives of the research and answer the research questions

2. A satisfactory analysis should give results and not just descriptions

3. It should offer an explanation or a new theory

The researcher concurs with the above that a successful case study should answer the study research questions.

4.8.3 Case Study Research Direction

The excitement and worries of a case study qualitative research is that it is hard to understand where it will start and where it will end (Crozier, Denzin and Lincoln, 1994). The direction of the research is experienced during the data analysis process. This enhanced understanding of the research questions posed in Chapter 1. Schwandt, (1996) maintains that the results of qualitative research can have all or any of the following three features emergent theory, theory testing, and application of results.

4.9 Data Collection Instruments

The case study researcher applied a mixed-method to data collection document analysis, in-depth interviews and focus group discussions to achieve reliable results to the research. The

data collection process is directed by the research objectives, the supporting deferred action theory, and the recommended evidence-based **MetPass** conceptual framework.

The conceptual framework is designed to help provide answers to the research questions and the achievement of the research objectives based on the defined constructs of the theory of deferred action. The first construct of the conceptual framework is on the planned actions of the existing Dubai Metro security system which requires the examination of the existing system and its effectiveness in coping with emergent situations. This requires the collection of data on the security systems, procedures, facilities and organizational structure. The second construct on the training of police and security personnel is to examine forms of training and responsiveness to changing circumstances and emergent situations. This requires the collection of data on security training and preparedness. The third construct examines how the planned actions of the existing security system can be linked to and merged with new emergent system requirement. This requires the collection of data on how the existing system can be modified and improved to accommodate changes.

Collection of data is one of the most critical stages in the qualitative study; it requires careful planning and selection of the techniques and participants. The researcher extra carefully conducted this with the help of the supervisor to enhance the accurateness of the study.

4.9.1 Triangulation of Data

Triangulation describes using multiple sources of data or the use of multiple methods of analysing data aimed at enhancing the credibility of the research (Patton, 1999). The design is to align the divergent data perspectives to gain a good and comprehensive understanding of the research phenomenon. The method has the potential to provide multiple lines of sight and multiple contexts to enrich the understanding of a research question. It is also particularly associated with qualitative research methods which involve the examination of data collected from a set of interviews, focus groups, and other sources.

Four types of triangulation are usually applied in most research namely method triangulation, investigator triangulation, theory triangulation, and data source triangulation (Patton, 1999). However, triangulation is usually very useful in mixed methods studies that combine both qualitative and quantitative studies. This research adopts a data source triangulation with the use of semi-structured interview, focus group sessions and document analysis (Salkind, 2010). This is critical in establishing corroborating evidence with its potential to provide multiple lines of sight and multiple contexts to enrich the understanding of a research question (Salkind, 2010).

4.9.2 Sampling and Selection of Participants

The theory used in the qualitative research, analytical judgments, participants sample size and reliability of data collection technique determines the sampling technique to be used (Strauss and Corbin, 1990; Margarete Sandelowski, 1995; Marshall, 1996, 2011; Coyne, 1997; Noy, 2008; Qu and Dumay, 2011; Robinson, 2014; Maxwell and Reybold, 2015). The reasoning behind this is that the qualitative research approach focal point is more on human instincts, experiences, to explore an experience/occurrence/phenomenon and explain social action theories such as our guiding theory of deferred action in the application.

For instance, Skotnes, (2015) used stratified sampling in selecting the target population for their work to address the challenges of safety and security management of network companies; they selected employees from the electric power supply and ICT companies. Their study employed the theory of institutional organisation. They concluded that managers and employees understanding of ICT risk factors can influence the participants' risk perception.

A four-step approach was provided by Robinson, (2014) which the researcher applies in sampling. The Researcher starts the sampling process by defining the inclusion and exclusion criteria to select potential participants for interviews. Then, the sample size is decided by the

epistemological and practical emphasis of the research. As the third step, the researcher decides upon a sampling strategy among the various types. Choosing the most convenient sampling strategy is followed by sample sourcing where researchers apply strategies to recruit interviewees such as advertising and incentivizing. This last step also includes strategies to avoid bias and getting the informed consent of the participants. Almost all qualitative research studies follow these four sampling process for the sake of coherence, transparency, impact, and trustworthiness of the research (Robinson, 2014).

As mentioned earlier in Chapter 1, the research will use three data collection techniques. Each one of these data collection methods has its specific way of identifying a target population, community, or study area. This is also because researchers cannot collect data from all of the target populations simultaneously. Thus, there is a need to identify a sample population that represents the population of the study.

Sampling procedures are more established and straightforward in qualitative research as the goal of given qualitative research is to provide in-depth understanding (Palinkas *et al.*, 2015). By identifying a random sample, the study ensures the representativeness of the sample. Then again, by aiming to provide an in-depth understanding of the issue in question, qualitative studies (as predominantly adopted by this research) prefers to choose sampling methods to identify a specific group, event or process (CIRS 2018). For finding the most appropriate sampling group, qualitative researchers employ criterion-based sampling techniques namely purposeful sampling, quota sampling, and snowballing sampling.

Purposeful Sampling: Purposeful sampling is the most popular sampling method. In purposeful sampling, participants are selected according to a preselected criterion. The selection criterion is usually based on the research question(s) of the study. Purposeful sampling is used to identify and select samples for information-rich cases (Patton, 1999).

This technique involves selecting individuals who are knowledgeable about the phenomenon in question. Besides knowledge and experience, the researcher should underline the importance of availability and willingness of the participants in this sampling technique (Creswell, 2003; J. W. Creswell, 2009).

Quota Sampling: In this particular sampling method, before the sampling participant quotas are determined. Usually, if a researcher is aiming to reach a certain number of participants who meet certain criteria such as age, gender, HIV status, among others, quota sampling is used. Thus, quota sampling is one of the non-probability sampling types as it involves the selection of a certain section of the population. As opposed to probability sampling methods in which each subject has a non-zero likelihood of selection, in non-probability sampling methods such as quota sampling subjective methods are used for sample selection (Lavrakas 2008).

Snowball Sampling: Snowball sampling is the common name for chain referral sampling. In snowball sampling method helps researchers find and recruit more participants via a reference of existing participants. It works like a chain referral. When asked by the researcher, Participant A (initial subject) refers to some other potential participants to the researcher during the interview. They act as gatekeepers for researchers. Patton, (1999) states that snowball sampling is applied when the sample population for the study is very small.

Against the presented background information about sampling methods in qualitative research, the researcher chose to use purposive expert sampling and snowball sampling for the following reasons. As the goal of the study is to collect data from Dubai Railway Authority and Dubai Police about the security of the metro rail system in Dubai, the natural population of the study is limited with the higher and mid-level officers from these two organizations. The theme of the study -the security of the metro rail system in Dubai- also

restricts the population. Only experts (officers) who work for the security of the Dubai metro system comprised the population. Under these conditions, the most convenient method of sampling that appeared was purposive expert sampling. Purposive sampling was complemented by snowball sampling to reassure some of the mid-level staff to participate in the research. As they felt uncomfortable in talking about the performance of Dubai police and Dubai railway authority in securing the metro system, a reference from senior-level staff helped the researcher to reach such unwilling staff to participate in interviews.

As far as the sample size is concerned, following the selection of the sampling method, the researcher must think about the site of the sample. The researcher must decide that the number of participants whom the data will be collected. In general, the sample size depends on the researchers' questions, the purpose of the study, application of the findings and the credibility of the research (Patton, 2002; Michael Quinn Patton, 2014; Michael Quinn. Patton, 2014; Patton and Schwandt, 2014). Particularly in purposive sampling, participants/interviewees are selected according to their personal experience or knowledge. It is expected that participants will generate rich, detailed, focused information on the subject which helps the researcher to produce a thorough understanding of the phenomenon (Curtis *et al.*, 2000).

To minimize the risk of producing superficial data the researcher should give particular attention to determine the sample size. A "clearly defined research topic and a small number of well-selected homogeneous interviewees (with adequate exposure to or experience of the phenomenon) can produce highly relevant information for analysis" (Cleary, Horsfall and Hayter, 2014). In some cases, a very large sample may result in superficial data. Based on these considerations on the sample size, the researcher decided to keep the sample size for interviews with 30, 10 senior and 20 mid/junior level staff. As the study also involves focus

groups and document analysis, the numbers of interviewees are found adequate to produce meaningful data.

The sample size of 30 interviews is, therefore, an adequate size based on the type and nature of the study. Arrangements were made to schedule interview meetings in advance which make provision for changes and accommodate any new demands depending on circumstances. This arrangement manages the challenges of late responses and absentee participants who can be replaced anytime. It also creates an atmosphere for effective data collection.

As far as the sampling in focus groups is concerned, in many cases focus groups studies employ a theoretical sampling model. In the theoretical sampling model participants are selected, “to reflect a range of the total study population or to test particular hypotheses” (Kitzinger, 1995). Focus groups are usually formed through a purposive selection method from a limited number of populations. Sampling bias occurs if we claim to interpret data from a limited sample as representing the whole population. If the source of the population is limited, the researcher is forced to acknowledge those limitations and plan his/her study accordingly, or to find other sources to reduce these biases. In selecting participants for focus group discussions most of the researchers recommend maintaining homogeneity of the group to underline shared experiences. However, it is important to note that particularly in studies on working environments hierarchy within the group may affect the quality of data. As a sampling strategy Kitzinger, (1995) suggest forming groups naturally. For example, a group that works together may make up a focus group. Or they may draw for the research from different departments. Using a pre-existing group means that as they are already friends and colleagues, can relate to or challenge each other's comments. Such a familiar context may help the researcher to make interactions as natural as possible (Kitzinger, 1995).

In qualitative research, sampling is driven by theory or natural factors when selecting the number of participants and the suitability of the data collection method (M. Sandelowski, 1995; Marshall, 1996; Coyne, 1997; Suri, 2011). This is due to the focus of human intuitions in qualitative studies to explore phenomena and interpret social action theories like the theory of deferred action in practice. Purposeful sampling is widely employed in qualitative research for the recognition of rich information cases to a phenomenon of interest for effectively using limited resources (Patton, 2002). There exist various purposeful sampling approaches, but criterion sampling is widely used in implementation research. This necessitates identifying and selecting participants or groups of participants that have knowledge or expertise of the phenomenon under investigation (Cresswell & Plano Clark, 2011). Bernard, (2002) postulate that in addition to experience and knowledge the individuals should be willing to participate, and able to communicate their experience and feelings in an articulate, communicative and reflective style. In contrast, probabilistic sampling is employed to ensure the generalizability of the research findings by reducing the likelihood for bias in identifying, selecting and control for the possible effect of known and unknown confusion. Based on the merits of purposive sampling, the researcher selected a sample of 30 participants, 10 senior and 20 junior staff was selected that is in a ratio of 1:2. This was based on the judgment that junior staffs are on the ground and are more aware of the security system since they are the operators. From the literature review, it is evident that the junior employees are the users of security management systems. With the research aiming to propose an evidence-based model to evaluate the Dubai Metro trains security management system and continuously improve the safety of passengers, 66.6% of participants were allocated to junior staff as they were considered to have ground knowledge for obtaining emergent ideas for informing managers and strategists planned actions.

The preferred higher sample of junior employees was, consequently, meant to allow more junior staff to proffer propositions for improving the Dubai Metro Trains security management system in their line of duty. Generally, the researcher preferred junior and senior staff who used the Dubai Metro trains security management system. The group was widened to include the strategists of designing the security management system. The researcher excluded employees, system users who could not provide consent for participation, in addition to trainee employees on placement.

Based on the information given about the sampling strategies, four focus groups are conducted: one focus group discussion for senior staff and one focus group discussion for junior staff in Dubai RTA and one focus group discussion for senior staff and one focus group discussion for junior staff in Dubai Police. As the source of the sample was limited to the staff who must provide/maintain the security of the Dubai metro system, the researcher was forced to follow a purposeful sampling method targeting these group of staff from Dubai Police and Dubai RTA purposively. Each focus group discussion is made up of 4 participants. It is believed that this is to allow issues to come out freely without junior staff feeling intimidated by their seniors. Focus group discussions are conducted either in English or Arabic languages since some participants prefer to speak English but others may feel comfortable in Arabic. Each focus group is recorded along with note-taking to enable the researcher to transcribe the text fully.

4.9.3 Time Period and Preparation for Fieldwork

In Jan 2018, the researcher gained ethical approval from the rail transport authority. The researcher spent three weeks building trust. The case study was conducted on senior employees and junior employees in the first week. The researcher conducted in-depth interviews with both senior and junior staff. Throughout the process, the researcher gathered the relevant data for his research from Jan 2018 to Jan October 2018. After collecting all the

documents, the researcher commenced data analysis where he categorized the relevant information from May-July 2018. The submission of the research thesis is planned for March 2019. Further analysis of qualitative data is conducted by the researcher to examine the data followed by a 6 months write-up.

The researcher started the research by writing a summary of the research proposal to the Research and Development to the office of Dubai Metro trains and Cardiff University see Appendix 3. The research sample was approved by Cardiff University Research and ethics department and the researcher was given an approval letter see Appendix 4.

Table 2 - Time Period

Time Period	Ethical Approval	Building Trust	In-depth Interviews	Focus Groups	Document Analysis	Data Analysis	Thesis Write-up	Thesis Submission	Revision
2018									
Jan									
Feb									
Marc									
April									
May									
June									
Jul									

Aug									
Sept									
Oct									
Nov									
Dec									
2019									
Jan									
Feb									
Marc									

During the field data collection since January 2018, the researcher has been building his research skills. This will enhance the quality of data caption both in practice and theory. The skills gained enhanced the researcher to identify the weaknesses in the methodology chosen. The weaknesses identified will be further discussed in this chapter. Before visiting the field, the key senior staffs for RTA were identified using the mentioned sampling technique. Brief emails and phone calls were made to inform them of the research discussion and schedule meetings with them.

An internal advisor at RTA assisted me with the selection criteria of the high ranked employees. The informer availed their contacts and provided the head of departments' contacts for easy access to relevant internal and external documents. The senior employees were selected based on experience this was quite helpful in extracting information from them.

The researcher spent approximately one week preparing the journey from London to Dubai his residence city. The researcher had requested certain equipment that would enhance the data collection process they include; a room, intranet access, and a projector where the researcher would conduct the initial interviews and focus groups discussion. The researcher on his part was equipped with a Laptop, notebooks, Sony ICD PX333 Digital Voice Recorder, a pen, and interview guide questions.

Copies of the in-depth interviews were supplied before the interview; this was aimed to build a strong understanding and relationship between the researcher and the respondents. The privacy room gave the respondents the freedom to express their innate understanding and perception of the Dubai Metro Train security management system. The purpose of the Sony ICD PX333 Digital Voice Recorder was to capture every detail from the participants for further analysis.

Intranet access allowed the ethnographic researcher to access internal documents and other relevant information related to the study. The senior staff was so interested in my study and a sign of appreciation they availed all the requested input equipment or facilitators. The researcher spent approximately three weeks in the field this was a part of building trust with employees and the feasibility of the researcher's budget. Averagely the researcher spent approximately 150 hours in the field.

4.9.4 Document Analysis

In general, document analysis is a form of secondary data collection. The data is easy to collect as it can be obtained from the intranet, newspapers, employee report, minutes, journals etc. This data is like a form of literature review. The main benefits that the researcher accrued from secondary data analysis were the ease of access, (having intranet access), this saved time and resources, however, the researcher had no control over the quality of data.

This lack of control leads to insufficiency in informing the phenomenon (Karen Cacciattolo, 2015).

Document analysis gives the researcher antecedent information before visiting the field for data collection (Bowen, 2009). To get an understanding of the RTA and DPD operations the researcher had to look into the annual reports, website content, publication, policies, and procedures handbook. The case study researcher gathered both internal and external documents relevant to his study research questions and objectives and adopted a content analysis approach. J. W. Creswell, (2009) contends that content analysis is important in identifying patterns in text. There is no clear distinction between content and thematic analysis so the researcher was in line with the analysis approach (Vaismoradi, Turunen and Bondas, 2013). Analysis of the documents gave the researcher first-hand information regarding Dubai Metro Trains and greater insight into the study context. Historical data assisted the researcher in answering research questions on how efficient the security systems of Metro Trains are. The researcher examined public domain documents such as annual reports, RAND reports, intranet contents, UN reports on Metro trains, the Metro Trains policies and procedures and the security management manual before commencing to the field for data collection. Examination of the documents gave the researcher background knowledge of Metro Trains and a wider understanding of the research problem. This led to rectifying the research questions and the in-depth research questions, helping to enkindle attentive thinking linking to, for example, concerns of passenger security, fear of terrorist attacks, which were applicable in the design of the evidence-based security management system.

Relevant internal documents such as work reports provided the researcher with large data for analysis. The documents provided the qualifications of each employee, their pay scale and their expected activities. Artefacts analysis gave an understanding of the proper operations of the security system. The artefacts did not highlight how they would accommodate security

breach uncertainties. This was crucial in developing the MetPass model. Large data for analysis was found in 2012 and 2013 work reports, the researcher chose these as they had information on past actions, achieved results and planned future actions regarding the security of the Dubai Metro Trains.

Evaluation of the 2012 and 2013 work reports was meant to look for evidence of the deferred action, planned action dimension, organizations strategically plan their activities to achieve specified results (Ugboro, Obeng and Spann, 2011; Bryson, 2015). Unfortunately, the work reports did not indicate how planned activities would cater for uncertainties that may influence the accomplishment of set goals.

Items chosen from the 2012 and 2013 work reports are analyzed in Table 7 indicates how security management was enhanced and the professional training of the employees is summarized in the table. Applicable elements from the evaluation of the documents used for the development of the evidence-based MetPass model are summarized with other documents.

Sample Work Report for 2012/2013 For selected Departments						
Objectives	**Priority Area**	**Activities**	**Output**	**Results**	**Performance Indicators**	**Date**
ITech To strengthen the security management	Passenger and Employees welfare	Use AI to control and coordinate trains	14 employees benefited from the session	Improved safety and service delivery	The number of staff attending the session	Jan-March

systems						
Dubai Metro Serco group To provide specialized automated services for passengers	Passenger welfare	Driverless trains	100 employees benefited	Customer satisfaction	% reduction in accidents	Feb-May
Dubai Metro e-learning To support training of new and existing employees	Support employee training	Train employees in relation to handling terrorist risks	200 employees trained	Improved safety management	Increase demand for train transport	1st Quarter

Table 3 - Sample Work Report for 2012/2013 For selected Departments

The evaluation of the work report helped in identifying relevant questions to ask in identifying emergent issues that the documents did not disclose. This includes improving the security management systems, low train security issues, concerns for passenger security, and

addressing fear of terrorist attacks. Ways of addressing the above issues were necessary for developing the MetPass model.

Newsletters, minutes, financial reports, budgetary allocation were equally important, however, such documents are not sufficient to address a phenomenon under the circumstance, they serve their purpose better when used with other documents (Bowen, 2009).

4.9.5 Focus Group Discussions

Gradually, it has become one of the most common qualitative research method technique to collect data. Focus groups had started to be used in communication studies to analyze the effects of films and television programmes on the audience. Then, it became popular in the health sciences to assess the health behaviour of people to design healthcare systems accordingly. More recently, focus groups are being used in many social sciences and business-related research both as a sole data collection technique or a complementary technique. As stated by Morgan (1997) focus group cannot substitute other qualitative data collection methods such as individual interviews and participant observation. Rather, focus groups help the researcher to access data that cannot be retrieved through interviews and observation.

Typically, focus groups are formed with a small number of participants. Focus groups are usually consisted of around 6 to 12 participants to discuss the subject in question. If group dynamics work well, and the researcher manages the group well the research will produce a result that serves the objectives of the study. Focus group discussions have also sampling advantages compare with other data collection techniques. First of all, the focus group context embraces participants who cannot read and write. Furthermore, it encourages individuals who do not prefer to be interviewed on their own and also encourages people who feel that they have nothing to say on the subject (Kitzinger, 1995).

In a focus group format, a moderator (in academic research contexts, it is generally the researcher's himself/herself) facilitate the discussion where participants have introduced topics for discussion. Moderator acts as a guide and encourages the active participation of each one of the focus group participants in a natural discussion (Halkier, 2010). Throughout the focus group, discussions interactions among participants by agreeing and disagreeing on certain issues make the process stronger. Moderator/Researcher listens and records the discussion to get insights into how the group thinks about the issue in question as well as their opinions and ideas. Focus group discussions also show the researcher the inconsistencies and variation of opinions and experiences within the group (Halkier, 2010).

Focus group discussions are usually employed to explore the range of opinions/views on a certain topic. In that sense, it is very useful in collecting a wide variety of insights and experiences. Focus groups discussions are also very instrumental in bridging research and policy by providing an opportunity to hear people from the field. It also helps to collect data on different opinions of individuals who involve in the change process in a given organization. It is also a good method to employ before designing questionnaires and/or start interviews (ODI 2009). It is important to note that, in a focus group context, the moderator/researcher do not ask each participant his or her opinion. Instead, focus groups use group interactions to listen to the contributions of members and collect the required data. In this regard, participants are encouraged to talk to each other instead of talking to the researcher. To manage the group discussion effectively, the moderator/researcher should have a list of open-ended questions that inquire about issues related to the research question and objectives, in their wording, generating their queries while pursuing the research objectives (Kitzinger, 1995).

The method’s reliance on interpersonal communication is important to reveal (sub) cultural values or group norms. By analyzing humour, consensus, and dissent and by observing group

dynamics the researcher may identify shared and common knowledge within the group. In this regard, focus group discussions are useful for studying workplace practices (Kitzinger, 1995). However, there is always a risk of group dynamics and group norms that may silence individual voices of dissent.

Planning of focus group discussions requires the researcher to think about several considerations such as the nature of data and its impact on the study. In this context, the researcher needs to decide who will participate in the focus groups. Then, he/she has to determine the structure of the groups, including the level of moderator involvement. There are also other things such as the size of focus groups and the numbers of groups are decided by the researcher(Morgan, 1997; Krueger, Richard A., 2009).

The following guidelines should be considered when planning focus groups research:

1. use homogeneous strangers as participants,
2. rely on a relatively structured interview with high moderator involvement,
3. should have 6 to 10 participants per group, and
4. should have a total of three to five groups per project (Morgan, 1997).

This researcher aims at conducting four (4) focus groups discussions; two from the Dubai Police and two from Dubai Road Transport Authority. To conduct these focus groups discussions, clearance has been sought and obtained from both the Dubai Police and the Dubai Road Transport Authority.

From the one-on-one in-depth interviews responses, the researcher developed the focus group questions to include new emerging ideas that originate from planning for emergency and terrorism as per mutualist elements required to input information into the security

management processes at the Dubai Metro trains. The theoretical justification for planning the research questions did not diverge from employing the theory of deferred action to address the two data collection instruments.

Through focus groups discussions the researcher received varying suggestions from actor groups on how to improve security management. The researcher observed advantages in focus groups as a method that contributed to gathering assorted ideas for developing the evidence-based MetPass model.

The primary themes of the questions were a carbon copy of the specific research problem outlined in chapter 1 and 2. The researcher asked questions about: How Dubai Metro Trains has planned its security management systems for passengers and employees' security; the employees involved in the planning and evaluation of the security management systems and their defined roles. The researcher asked questions colligating with emergence and incertitude with planning for an emergency to find out the unpredictable behaviour of terrorists, and any other unanticipated events that might affect evaluation and improvement of the Dubai Metro Trains security management system. Queries on how to improve the efficiency and effectiveness of the current security management system were asked. The researcher asked questions about the organization could empower employees to be actively involved in making security design decisions for continuous system usability.

4.9.6 The In-depth Interviews

Qualitative Interviews:

Most scholars are of the view that qualitative research allows the researchers to get a deeper understanding of the issue being studied (King, 2004; Knox and Burkard, 2009; Peters and Halcomb, 2015). Furthermore, qualitative data helps to strengthen the collected data by taking into account the actual scenarios which result in reaching a thorough and validated

conclusion (Lancaster, 2005). The interviews were prepared as in-depth interviews to allow some comparable data to be collected, but also to allow the individual interviewee some freedom to expand on points he/she might like to expand. The interview data is mainly qualitative and, although subjective, gives room for triangulating the other data collected through focus group discussions and documentary analysis. Thus, in-depth question lists were developed to gather qualitative data from the respondents. Sets of 10 open-ended questions addressing various issues relating to the security of metro train systems in Dubai were prepared.

The researcher's aims to develop an evidence-based model for evaluating and improving the Dubai Metro train security measures using the theory of deferred action demanded the use of in-depth interviews to gain meaningful data. The semi-structured in-depth interviews compelled the interviewees to interact with the interviewer, with flexibility from the set questions. The emotions were expressed in their non-verbal communications which brought elucidation of human behaviour in emergent situations when dealing with terrorists.

This study investigates the perceptions of higher and lower rank staff from the Dubai Police Force and Dubai RTA regarding the security of metro train systems through an analysis of their answers to the prepared sets of questions. The researcher had two sets of in-depth interview questions one for junior staff and the other for senior staff. This enhanced the researcher to capture various views of managers and subordinates on the Dubai Metro Train security management system. From the in-depth interview responses, the researcher developed the evidence-based MetPass model.

Interviews constitute one of the main sources of data for this explanatory case study. . Thus, open-ended interviewing is needed. In this context, 30 in-depth interviews, 15 with RTA staff and the other with Dubai Police staff, will be conducted. From Dubai Police Force 5 senior

(Captain and higher ranks) and 10 junior levels (between the ranks of policeman and major) staff will be interviewed. From the RTA 5 senior-level staff among managers and supervisors and 10 junior level staff from officers, engineers and specialists will be interviewed. The study encouraged the participants to reveal information to describe their perceptions of the security of the system. The interviewees are chosen regardless of their generation. Participants are chosen from different levels of hierarchy and departments.

Each interview will last approximately 40-60 minutes and will be recorded and points were written down. The researcher conducted a one-on-one interview to maintain the privacy of the respondents. The in-depth interviews on average took 35 hours.

Cognizant of the fact that the issues to be discussed were sensitive given the professional nature of the context that involves hierarchical relations within selected government offices, the interviews were planned to be conducted in a very considerate way. First, the questions for higher ranking and lower-ranking staff were distinguished. Secondly, for interviews meeting rooms will be reserved in advance to keep interviewees away from peer pressure. For reserving rooms and interview schedule official approvals will be taken. Lastly, interviews will be conducted in Arabic in case the interviewee thinks that he is more comfortable with Arabic. Each interview will be recorded along with note-taking to enable the researcher to transcribe the text fully.

The researcher had gained some understanding from document analysis; however, a deep understanding of human interactions was enhanced by the researcher immersing himself in the research context. We complemented the interview participants with mugs and lunch vouchers for the vast information they availed. As busy as Dubai metro trains are being considered as the most attractive city, the participants still committed to avail for the interviews. The mugs and the vouchers were just a little sign of appreciation. It was very

difficult interviewing the senior staff due to their busy schedules but all in all we were able to conduct a successful in-depth interview.

The interview questions were harmonious with the security management systems outlined in the conceptual framework. Some adjustments were made to place the Dubai Metro Trains as a security management system. The interview questions were designed to exhibit interrelations between the gap in the existing security management system, the aims of the research and MetPass – the conceptual framework. The themes identified in the research were guided by the objectives examined in the review of the literature.

4.10 Data Analysis

Case studies are qualified with incessant writing and habitual data evaluation as the fieldwork takes place (Study and Building, 1995; Taylor, 2013a; Yin, 2013; Tight, Symonds and Symonds, 2016). There was continuous data analysis of documents, in-depth interviews and focus group discussions that gave discriminative cues that provided emergent issues necessary for the ensuant data gathering process. The case study data were grouped into four models of the deferred model of reality for further analysis and discussion in Chapter 6.

However, choosing a particular method of analysis to crystalize the text-based meaning of the empirical data for the readers and the participants is very essential. The researcher chose to use the NVivo 12 software to develop themes that relate to the four modules of the deferred model.

4.10.1 Nvivo12 Data Analysis Software

The dependability of qualitative research relies on the honesty of data collection and analysis, the strength of data analysis procedures and the verification of extensiveness throughout the procedure.

In this research, the researcher employed software that would assist them in managing the tasks comprehensively. The Nvivo12 facilitates the researcher to exhibit honesty, the strength of data management and efficiency of the findings which will build trustworthiness to the participants and data users since the researcher can back up findings with results.

Nvivo12 gives the researcher large data storage with easy retrieval, the data stored varies from in-depth interviews, focus groups, employee documents, among others. The powerful tool enables the researcher to classify and categorize the data within a short span. The researcher visualizes the ideas which enhance brainstorming to explore relationships between research items.

The software applies a coding system to generate relationships between project items. The software is effective and gives the researcher the freedom to:

1. Test preliminary relationships within the data
2. Discover and examine new relationships in the data
3. Chart relationships and ideas
4. Keep at par with data analysis and save the research analysis findings

The researcher used the features of Nvivo12 to transcribe audio data collected through the data gathering process and create memos. The transcribed data was from in-depth interviews audio, focus groups discussions recorded. Memos are separate from real data; this safeguards the integrity of the data from pollution by the researcher's views. In this manner, reliability is built in the data management process, as long as the researcher is using the software's potential with integrity. Gathering the data was time-consuming the same as transcribing. The researcher approximately spent three months transcribing the data.

Modern technology of digital audio recorders, which have enabled playback, enhanced smooth transcribing of the data. Audios were played more than once to enhance understanding and developing themes and subthemes. Thematic classification of in-depth interviews assists the researcher in identifying issues identified in the data set (Aronson, 1995).

The in-built Nvivo12 features make it sophisticated qualitative research software, however, the researcher is mandated to safeguard the reliability of the research results and align them with the research approach, epistemology and ontology when handling the research. Nvivo12 software enhances the strength in the practice of data analysis. The robustness is evident through the researcher's data management process to establish reliability. Nvivo12 creates transparency in data analysis which creates room for closer inspection. This will call for the researcher's careful thinking through the methodological process along with the data analysis process. This aims to certify that the answers to the research questions are from the connections emerging from the data.

Nvivo12 is software that manages data from the researcher enhancing greater in-depth analysis simplifying the search for themes in large quantities of text to empower the researcher to make accurate judgments from the transcript, therefore, Nvivo12 is not a research data analysis tool. Nvivo12 gives the researcher considerably less time to efficiently manage the data; however, it takes time to learn how to use the software efficiently. Proper interaction with the tool leads to reliable results (Hoover and Koerber, 2011).

4.10.2 Data Analysis Strategies by the Researcher

The first step is the classification of data into nodes using Nvivo12 software from the three sources in-depth interviews, focus groups, and document analysis. The themes identified were combined to enable the researcher to categorize them into the main constructs of the conceptual framework. The data collection and thematic analysis were in line with the

research methodology which facilitated data analysis. NVivo12 software facilitated in-depth analysis of ethnographic material.

Data was coded with the ideas of the constructs, the in-depth interview transcripts of the clients in the same group, for example, senior staff for both RTA and DPD, were first verified against the confirmation of each other to classify the data. The classification was thorough to identify uniformity and distinction in participant responses, and contrasted with the evidence from other junior staff interviewee participants. In-depth interviews and focus groups were supplemented with document analysis. Document analysis findings were categorized under the MetPass Modules framework to enhance sub-classification into the four MetPass modules. The critical researcher chose to reveal the study findings with each particular theme being matched with the study objectives, the method of data collection, and specific MetPass modules. This was meant to present the researcher findings in an orderly manner.

The cycles of the research form the essence of explaining the patterns and themes from the data. First, the in-depth interview is coded as II and each phase in this II is labelled from II1 to II 3 in that order. Second, the same procedure is employed to focus groups which are coded as FG, and last, the analysis of the documents is labelled as DA. Each cycle in the two is labelled from FG1 to FG4 and DA1 to DA4 respectively. The symbols (II, FG, and DA) assist the researcher with easy comparison of participants' input to gain a deeper insight into the cycles. The data analysis is conducted in a logical sequence to reveal the relationships between patterns and themes generated from the three data collection processes. The researcher identifies patterns data from II and FG to answer the research questions. The research questions how effective the current Dubai Metro train security measures are, and what strategies to use to enhance the security of Dubai Metro Trains.

4.10.3 Outcome of Data Classification of the MetPass Model

Categorization in data analysis refines the data in ways that enhance interpretation and making sense from the collected data by the researcher.

1. Bulk data is divided into units
2. Units are organized into categories (individual categories)
3. Coding of each category (each category is given a special name)
4. Features of each category are identified (representation of each category)

The MetPass model analyses how police training, police planning and emergency procedures, and passenger training, as well as police preparedness, contributes to the efficient security management of Dubai Metro Trains.

The relationship between how police could improve the security of Dubai Metro trains using deferred systems was identified during the data gathering process. This enabled the researcher to create thematic codes from the ethnographic material and categorize the nodes into the MetPass Modules.

4.10.4 Data Analysis and Interpretation Strategies

The researcher wrote notes, establishing cues on emerging issues significant to be addressed in the consequent data collection. Data were categorized based on the modules of the conceptual framework.

Selecting a specific method for analyzing the empirical data to illuminate the meaning of the field data for the thesis readers is not an easy task. The difficultness is choosing a stringent method that converges with a PhD award demand, and concurrently, elaborate to make sense to the RTA and DPD junior and senior employees who cared to see the impact of the research on the Dubai Metro Trains security management systems. The universal rule of selecting a

data analysis method is that the method should connect with the research aims, objectives, theoretical premises, and research questions (Biggerstaff and Thompson, 2008). As the researcher aimed to develop a model for evaluating and improving the Dubai Metro train security measures using the theory of deferred action one single approach of field data analysis was not sufficient; the researcher adopted supportive data analysis such as thematic data analysis and content data analysis (Gilbert, 2008). The researcher refers to the combination as interpretive thematic analysis. The researcher combination of thematic and content analysis method is what (Frost *et al.*, 2014) refer to as pluralism; this involves using more than one strategy to explore a research phenomenon. The diversity of approaches is; different theoretical traditions, data analysis techniques, epistemologies, among others. Different data analyses help the researcher to capture meaning from the in-depth interviews, documents analysis and focus groups transcripts.

Of course, understanding the process of qualitative data analysis is unquestionably an important aspect of not only conducting qualitative research but as well reading, comprehending and interpreting it (Thorne, 2000). For the readers of qualitative research, the language used in the analysis can be confusing, making it difficult to understand what the research did in a certain phase and how the findings evolved. For the case of the Dubai Metro Trains thematic interpretive analysis was augmented with a narrative approach to explore the comments of the participants to understand how their stories were developed and positioned (Hickson, 2016).

The researcher commenced the focus group discussions and in-depth interviews with open-ended questions this, gave the respondents freedom to express their attitudes and feelings towards Dubai Metro Train security- more information was gathered. The MetPass model gave the researcher the freedom to design his research and data collection techniques established on the deferred model of reality. This would, in turn, enhance the association

between participants and the findings of the analysis. The data is interpreted to illustrate patterns that reflect the modules of the MetPass model.

To identify patterns, the researcher conducted a thematic analysis. Using thematic analysis alone does not equate to thorough qualitative research. Thematic analysis is an approach that reports themes/patterns within the ethnographic data. The researcher settled on this method as it can be employed to answer a variety of research questions (Fereday and Muir-Cochrane, 2006). The thematic analysis involves generating codes from the data and grouping the codes into themes that coherent with the four modules of the MetPass model. The themes capture important concepts relevant to the research questions (Castleberry and Nolen, 2018). The researcher develops associations between the themes identified and the modules of the MetPass model in regards to evaluating the security system of Dubai Metro trains. This increased the understanding of the researcher using the interpretive approach to evaluate and critically analyze the security management system using the MetPass security model. For instance, in the data analysis Chapter 6 the researcher analyzed and compared the employee training needs with compared them with efficient execution of their roles and responsibilities. There was a direct association between the 4MetPass model modules and effective security management. This enhanced a better understanding of the MetPass model within an emergent organization.

4.11 Challenges and Limitations of Using Case Study Research

The views by (Suter, 2012) is that case study research methodology is reliant on the surrounding, however, his conclusion that research findings can be applied in different contexts are controversial. For instance, other security management systems developers may not have the same trust as the research had with Rail Transport Authority. This, in turn,

would make it harder for the researchers to develop and implement their system in Dubai Metro Trains.

The researcher believes that case study research can be applied to produce further knowledge within various contexts of research. For example (Avison and Wood-Harper, 1991) employed a case study to develop information systems in practice through immediate experience. Yin, (2002) views the researcher's direct participation in case study research as crucial in identifying various challenges that would occur in practice. This is in line with the researcher's ontology that to gain insight into the research problem, the researcher has to participate directly. Case study research is devised to change the environment, researchers have little or minimal control to change the environment (Yin, 2002). Having little control over the organizations' environment inhibits the researchers' capacity to successfully execute change. The researcher, therefore, spent considerable time building trust with the Dubai Metro Trains Managers to overcome this challenge. This enhanced the researcher to change the perspectives of employees in the organization.

Other challenges the case study researcher faced are:

Being an employee of the Dubai Police brings both advantages and disadvantages in conducting the research. Being an employee makes it easy to collect all of the necessary managerial approvals and consent forms see Appendix 5 on the consent forms and participation sheets. It also helps to find contacts for interviews and focus groups. At the same time, colleagues and senior officers might have issues in sharing their work-related ideas with a colleague for research purposes.

Surveying colleagues at Dubai Police and Dubai Metro staff can be problematic in that colleagues might not feel free to fully express the truth when approaching them directly. They may feel the risk of losing their jobs if their names are revealed. Another issue that

might be of the problem is the structure and type of questions that will be used during the survey and interviews. There is a likelihood that some participants may feel that the questions are sensitive and inappropriate and might not be keen to answer them truthfully. Lastly, the time duration of the study may affect participants' personal or professional commitments.

4.12 Identifying and Avoiding Research Bias in Research Design, Data Collection and Data Analysis

Transparency and accuracy are crucial when conducting research. Researchers have the responsibility of adhering to basic principles of research; researchers are concerned with the quality of the work they submit for publication, this is achieved by enhancing transparency and honesty in their work. Deflection from the trueness in research design, data collection, data analysis, and publication is referred to as a bias (Sackett, 1979; Grimes and Schulz, 2002; Long, Strauss and Corbin, 2006; Pannucci and Wilkins, 2010; Šimundić, 2013; Ioannidis, 2018). Bias can occur deliberately or accidentally. Bias leads to false conclusions and misleading interpretation. Research that does not follow the simple principles of transparency and accuracy is misleading. To conduct biased research, therefore, is immoral and unethical. Every researcher has the responsibility of identifying potential sources of bias and attempt to downplay all necessary actions to minimize the deflection from the truth.

Authors and researchers commonly understand bias as any tempt that brings a distortion in the findings of the research (Paul Galdas, 2017) – bias is a term pulled from quantitative research. The term as most (though not all) acknowledges the concept as antagonistic with the philosophical justification of qualitative research (Thorne, 2009). In lieu, qualitative researchers ordinarily agree that deliberating on ideas like validity and trustworthiness are more apposite to the reflective, subjective existence of qualitative study. Vast strategies for preserving these ideas during this research have been formulated and extensively discussed. This section will identify bias in the research and how the researcher handled it.

4.12.1 Bias in Research Design

Researchers are tasked with identifying research designs that are of quality, the selected research design should be communicated with the readers. The two tasks are equally difficult. The researcher has communicated the research framework; starting with the theoretical and conceptual framework and advancing to the deferred model employed throughout the research. The researcher has also clearly described the study area under scrutiny.

4.12.2 Bias in Data Collection

The researcher employed in-depth interviews and focus group discussion to collect raw data. Interviews and focus group discussions are meant to collect raw data through oral communication from the participants. Attentive listening and probing questions are crucial in this process. The researcher avoided bias by adopting unstructured in-depth interview. The research questions were designed to obtain specific and systematic data on the study subject. Face-to-face interviews allowed the researcher to observe facial expressions and non-verbal patterns that were crucial for the study. The team and I overlooked the personal qualities of individuals to avoid bias in the reliability and validity of the data. The data collection and analysis process was allocated 45% of the entire research time to avoid biases.

According to the study's objectives, the researcher drew a random sample of participants from both junior and senior personnel. They were sampled based on years' experience and operational department. Anonymity was guaranteed and the interviewer maintained a neutral stance. The researcher and the participants attended professional training on conducting interviews to minimize the problem of research bias. Overall, the researcher avoided bias through the entire data collection process by thorough preparation of the interview questions and proper selection of the interviewers, the researcher also allocated more time to data collection and analysis.

4.12.3 Bias in Data Analysis

The analysis and findings took into consideration variance that is attributable to the measurement method rather than to the construct of interest. Potential sources of method biases were considered by acknowledging the cognitive processes through which method biases influence responses to measures. Necessary procedural and statistical techniques were also considered to control possible method biases (Podsakoff et al 2003).

It is entirely difficult for the person conducting the data analysis to separate themselves from the data (Pannucci and Wilkins, 2010). For objectivity and avoidance with data analysis, the researcher employed the following strategies. The researcher used software (NVivo 12) and was assisted by a colleague to avoid inconsistency in data analysis. We coded the data separately using the software and deep scrutiny. We noted consistency in our interpretation and thereby the themes were formulated. The results were reviewed by independent people who acknowledged consistency in the interpretations. Alternative findings were reviewed by peers who concluded my findings and conclusion are well-grounded with the research objectives.

This research led me to the interrogation — practically how much of the researcher own measures and feelings require to be pointed in the qualitative research design, data collection, data analysis and interpretation for it to represent bias? The answer is the query is unsound. Researchers conducting qualitative research are an inherent part of the process and the outcome, separating the researcher from this is incompletely impossible and unwanted. The worry should instead be whether the investigator was reflexive and open that is severely reflective about self-preconceived ideas, dynamic relationships and analytical direction (Thorne, 2009) regarding the research design, data collection and data analysis.

4.13 Ethical Considerations and Challenges

Obtaining approval to conduct a case study in Dubai Metro trains was a rigorous activity, this required perseverance of the researcher. The researcher first contacted the Research and Development supervisor in Dubai Metro Trains via email and phone to inquire about the feasibility of conducting a case study on evaluating the security management systems. The phone call was followed up with a brief research proposal see Appendix 3. The supervisor gave a positive response as the issue of security with the dynamism of terror threats is a great threat to security management.

The ethical clearance at Dubai Metro Trains was without major setbacks. The researcher views that research ethics validates the relationship between the respondents and the researcher. This connection between the researcher and the respondents enhances understanding of Metro Trains policies and procedures, cultural norms and values that would lead to detailed findings.

The researcher completed the Dubai Metro Trains ethical list form after discussing it with the manager. By adhering to the research ethics requirements the researcher was able to conduct the study honestly and responsibly (Yip, Han, and Sng, 2016). The research ethics statement is attached in Appendix 6.

The study has already obtained official ethics approval from the university. The Cardiff University approval was not rigorous, as this research study will not pose any health, legal, economic or psychological risks to the participant and their details will not be made public. It is anticipated that this research study will produce information that might be relevant to strengthening the Dubai Metro Train Security System.

Quick approval of the study by Dubai Metro Trains was, firstly, the study will ensure equitable distribution of findings by sharing the results of this study with the RTA, Dubai

Police, government departments and other countries to inform future security measures that might help prevent terrorist attacks on train systems. Secondly, data gathered during the collection process will be identified with markers to maintain the confidentiality of respondents. The responses collected with be securely stored in the password-protected Database. When conducting the research, the researcher was trained on the importance of confidentiality. Consent forms were circulated to the respondents, the forms had information related to anonymity and confidentiality. To enhance privacy data collected from the respondents' is not available to the third party. Information on participants is coded and the names of the respondents are removed; they are identified with codes such as RTA01 or DPD01 on the focus groups discussion and in-depth interviews transcripts.

4.14 Exogenous Variable (Deferred Model)

Although it has been evident that powerful economic and political forces play a definitive role at both national and international level decision making. The overall viewpoint regarding the development of the metro train in Dubai depends on the degree of peace and security at the regional and international level. For instance, Henderson (2006) argue that the same is applicable for tourism as well whereby travellers are discouraged due to the instability of politics and the fears of global terrorism. Although Dubai has not been faced with severe terror threats, the city is still not immune to the probability of unexpected events since it is the commercial centre of the UAE.

The demand within Dubai in terms of development is still influenced by the probabilities of political instability and terrorism. Another reason for this issue is the proximity of Dubai to the conflict zones of the Middle East namely Yemen and Iraq. A deferred model, therefore, is required for improving the conditions of Dubai Metro Trains. Based on the conceptual frameworks that have been highlighted using different theories and techniques, the deferred

name model implies that the study had been focusing on developing a method that could be applied in the future. Deferred is a term usually used for elements that tend to improve within the systems. Within the case of Dubai, the deferred model designed through this study would be suitable for later use with limited to no vulnerabilities that could affect the running system of Dubai's Metro Train.

4.15 Endogenous variable (Dubai Metro Train Improvements)

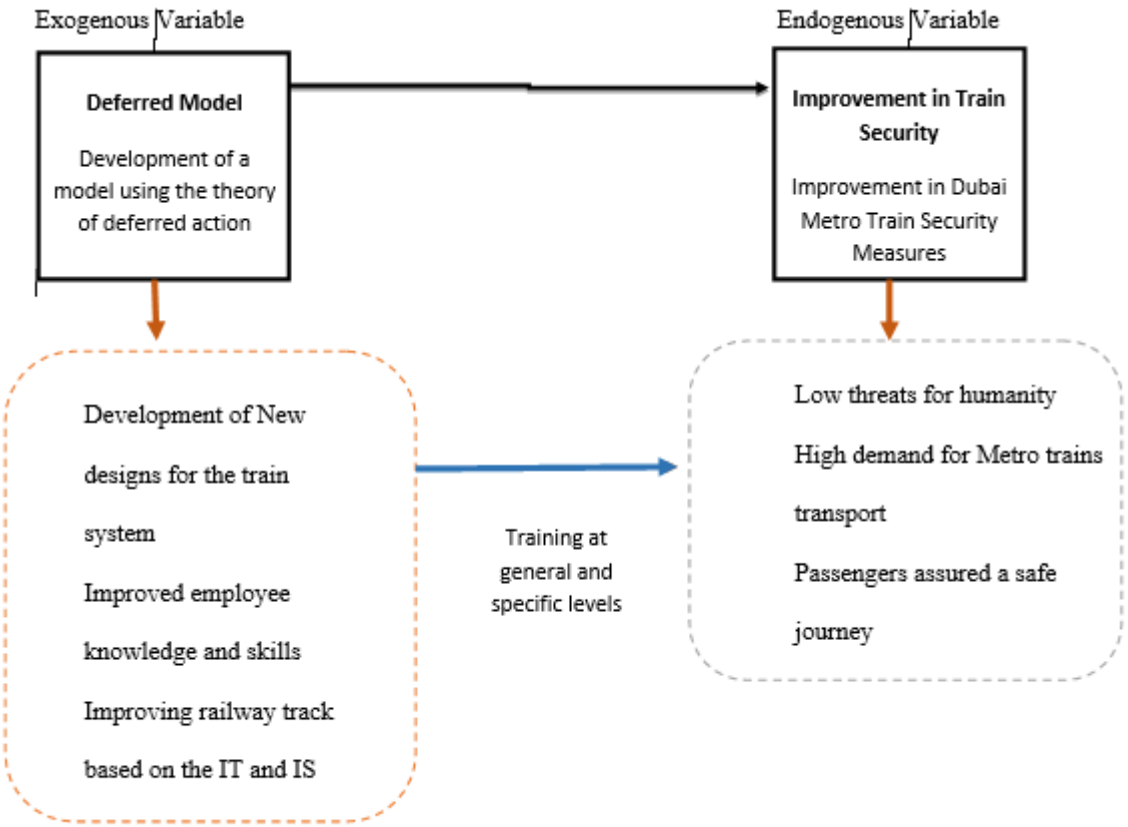
Regarding the Dubai Metro, it has been evident that the intention of the Dubai Metro was viewed with the ambition to alleviate the traditional traffic jams' burden and elevate the probabilities of cross-city connections (Acuto, 2014). However, after the introduction, the developments and improvements have been observed to be stagnated. It has been observed that the response of the public regarding the Dubai metro train system was positive (Acuto, 2014). However, the difference between the safety felt within a car, and the metro is different. As per the study conducted by Hiscock *et al.,* (2002), it has been observed that people are attached to cars due to their association of autonomy, prestige, and protection. According to the research, in contrast to public transport, which in the present research's case is the metro train safety, people generally have the perception of more ontological security in cars compared to public transport, which could hinder the idea of travelling in public transport. This indicates the need to improve the Dubai Metro Train Safety to create the perception and generate the association of safety with them.

4.16 Essentials (Training and Policies)

Similar to the other police forces, Dubai Police Force is responsible for the safety, protection, and security of people and their properties. However, it fails in specific categories within the development segments. It has been observed by Ngah *et al.,* (2016) that within the governmental sector, organizations' knowledge management are executed on a

comprehensive level. However, management, maintenance, and retaining appear as a challenge. Ngah *et al*., (2016) also show a significant positive relationship between knowledge management and organizational performance, which has the probability of influencing performance. On the other hand, the research conducted by Seba *et al*., (2012) indicated that despite the different programs that are developed for Dubai Police Force's training, four potential barriers still influence their performance of knowledge sharing and understanding and influence their decision making. These factors entail leadership, trust, organizational structure, and time allocation. This could influence the improvement of the Dubai metro train safety.

Figure 4 - Illustration of the Process Analysis



4.17 Dubai Police and the Improvement of the Dubai Metro Train Safety

Documents, reports and statistics show that the police team may be overwhelmed due to their level of capacity and operational infrastructure. The increasing number of road accidents and other social crimes has raised alarm on the need to increase the capacity of the police through training and the provision of appropriate gadgets and other infrastructures (Abdulla, 2002).

The role of knowledge management in ensuring an adequate and effective security system in any country has been emphasized in different studies. Records show the need for an efficient knowledge management system as the principal source in the Dubai Metro security system / Transport police in the integration of both internal and external knowledge in the organizations (Ngah, Tai and Bontis, 2016).

This indicates the need for the human resource department to work on the provision of the required learning environment and process. This is necessary since the knowledge management concept includes the learning process of an individual and the organization as well. This is observed at the global safety level as well that the police force within the global transport aspect is responsible for the protection of the people's life, law and order-preserving and prevention of the crime after it has been detected.

However, concerning the development of the police force, the management must be proactive for both implicit and explicit knowledge, which has not been observed in the Dubai region. In this research, Dubai police and the improvement of the Dubai metro train safety has been analyzed through the evaluation of the existing actions that have been undertaken by the authorities of Dubai. The research also focuses on future strategies that can be adopted by the authorities of Dubai to develop a robust and secured train network. This issue has been considered in this study by evaluating existing actions undertaken within the region and future strategies that can be adopted with efficacy.

4.18 Conclusion

The chapter highlighted the need to adopt the use of qualitative interpretative case study in the research investigation. Focus group discussions and semi-structured interview techniques are the chosen data collection instruments. The qualitative textual data collected would also be analysed using the thematic analytical method. In the beginning, this chapter assumed that different methodologies and philosophical traditions make hard it the select an appropriate approach for the research. For instance, positivism relies on scientific evidence like experiments and statistics to factually reveal how society works. This is inadequate to develop a security management system based on participants' perception in an emergent organization (Metro Trains). Interpretivism is based on a qualitative data collection of human experience. The researcher adopted this approach to social research as it enables him to understand terrorists' behaviour through human experience and interactions, the researcher believes the individual shapes the society, seeing the real-life problem through the eyes of the participant will enhance deeper understanding. All these factors of interpretivism are critical in designing security systems in an emergent world. The researcher evaluated the suitability of a qualitative research method to provide answers to the research questions. The researcher settled on case study research as the most suitable one to answer the study research questions.

To add to this, the researcher's ontological and epistemological views of interpretivism are in line with the case study research methodology. The researcher did not only chose the case study research approach due to its appropriateness or alignment with his views, but he considered the case study as suitable in researching organizations that are repeatedly emergent to fit in the changing world. The case study researcher used in-depth interviews, focus groups and document analysis as the appropriate data collection techniques. Weaknesses were identified in the existing security management system from document

analysis. Gaps are identified with employee training and preparedness - skills gap. Some employees' roles are unrelated to the maintaining of security. The in-depth interviews and focus groups senior and subordinate staff contributions are important in designing an evidence-based framework for evaluating the security management systems for Dubai Metro Trains.

Regarding the data collection, the study will collect data on the perceptions of the junior and senior staff of Dubai RTA and Dubai Police Force on the security of train system in Dubai by employing a combination of in-depth interviews, focus group discussions and documentary analysis on policies and strategies. It is believed that by employing these three different techniques to collect data triangulation was maintained.

The ethnographic data is classified with the four modules of the **MetPass** model which were instructed by deferred action theory. Adopting an analysis method was not easy, the researcher, however, chose the thematic combined with content data analysis method. The challenge originated from meeting the research requirements and disseminating the findings to the interested parties. The combined thematic and content analysis enables the employees and managers to understand how the proposed analytical MetPass model could enhance and improve the security management of Dubai Metro trains.

In the upcoming chapter, Chapter 5, we will look at data interpretation and discussion.

5.0 Data Interpretation and discussion

5.1 Introduction

The data analysis chapter begins with the question, “What comprises a satisfactory data analysis?” The case study researcher views satisfactory data analysis from a qualitative perspective. Recently, qualitative research is increasingly becoming more valued and recognized, it is of vital importance that it is orchestrated in a methodical and detailed manner to provide useful and worthwhile results. For the results to be recognized as valid and reliable, researchers that engage qualitative approach must exhibit that data analysis is guided by a detailed, uniform and substantial manner. The methods of analysis should be disclosed to the reader to determine whether the process applied is reliable. Even though there are numerous ways of how to carry out qualitative research, there exist a few sophisticated tools used by researchers for rigorous data analysis, for example, ATLAS, HyperRESEARCH, Doodose, NVivo, among others.

In this chapter, the data collected from in-depth interviews, focus groups discussions and document analysis are presented, analyzed, described, and clarified in an orderly manner as the next progression in our research process. The researcher strived to ensure that all data during analysis was considered. The data collection process was being steered by the intentions of the study, and the core factor was the theory of deferred action, and the suggested evidence-based conceptual framework. Data collection is one of the pivotal ingredients for qualitative research; the researcher was able to conduct this accurately. The primary purpose of qualitative data analysis was to identify themes reflecting the management of Metro trains security systems, as well as, assess the effectiveness of the current Dubai Metro train security measures identify the challenges that Dubai Metro trains face in security management and develop a conceptual framework guided by the theory of deferred action.

The analysis process also aims to present the data in an interpretable manner to identify the course concerning our research aims(Davis and Meyer, 2009).

The qualitative study addressed the following four major research questions that rotated around the main thematic models of the conceptual framework:

The primary research question is; How can the Dubai Metro trains design an effective security management system that supports emergence in organizations?

The following sub-questions facilitated the researcher in addressing the primary research question.

1. What is the relevant literature on train transport security management; train systems and their components; security issues: threats and vulnerability of train systems, terrorism and its causes as attributable to different theories, and the strategies for security?
2. How effective are the current Dubai Metro train security measures?
3. What are the strategies for tightening up the Dubai Metro train security measures?
4. How can Dubai Metro Trains design an effective security management system to enable continuous safe service delivery?

The empirical data is examined with thematic interpretive analysis. The themes correspond with the four modules of the conceptual framework used in section 3.3. As explained in Section 3.10, the combined application of the analysis tools create sense to the empirical data required in developing the MetPass model, the deferred model of reality, in the context of Dubai Metro trains.

Firstly, we will present data from in-depth interviews, followed by focus groups and finally analyze data from document analysis. Ten open-ended questions were employed for the in-depth interviews. The study focused on senior level and junior level employees. From the police department, we interviewed employees from the high level and the junior level. From the RTA department, there was the top-level (management and supervisors and the junior level employees). Four focus groups were used to collect data whereby in RTA there were two focus groups one for the senior staff and one for the junior staff same as Dubai Police Department. The focus group members and interviewees were selected by snowball sampling method to enhance the quality of data and results (TenHouten, 2017).

We will be able to answer the four research questions and further develop the conceptual framework from the analysis of the data; the design of the model is being guided by the theory of deferred action. The analysis of the data we collect is interpretive and narrative since the approach method is qualitative. The results from the analysis of the data are presented to improve and to reflect on three aspects: security management of the Dubai train transport system, the effectiveness of the Dubai security system and components of the deferred model action to address the challenges of the security system. The researcher adopted a thematic and content analysis whereby the focus was on the main elements that influence safety and security management at Metro Train. The analysis is established on document analysis, focus groups discussions, and interviewees' verbal comments and their views.

5.2 What Comprises a Suitable Data Analysis

The standards of suitable data analysis were set out by (Richard, 2009). They are:

1. The analysis should meet the goals of the research by answering the research questions

2. The method should offer detailed analysis and not just a description

3. The method should offer not less than a new theory or explanation

The case study researcher concurs with the standards set out by Richard (2009) that is, the data analysis should meet the research goals by answering the research questions. The strength of data analysis is key to meeting the goals of the researcher. The researcher also concurs with the second and last point. The second point states that the researcher should avoid adopting a purely descriptive approach, for instance, if our research was exclusively descriptive it would have failed to address the aim of the research which is to evaluate and improve the Dubai Metro Trains security management system. The researcher agrees with the third point which is the analysis recommends an explanation to factors affecting the Dubai security management system viz employee training, passenger training, employee preparedness. Later Richard (2009) identified another three standards. The author expressed that the three additional standards should be achieved for satisfactory qualitative data analysis. They are:

1. The analysis should account for the data

2. The analysis should provide more than what the researcher has reported

3. The outcome of the analysis should be applicable i.e. the researcher should be able to apply the outcomes

The researcher perceives the additional standards as acceptable indicators of case study research. Point three of ‘applicability of outcome’ is critical for the planned purpose of this research.

5.3 Data Analysis and Explanation Approach

Qualitative research is designated with continuous writing and analysis of data as the data collection at the field progresses. During our data collection, there was constant data analysis with an evaluative interpretation of the in-depth interviews, focus groups, and document analysis, this gave us signals imperative to our data gathering process. Data analysis during the research process allowed the researcher to review the research questions, as well, as allowing the researcher to test the research methods, (the researcher refined where it was needed) (Fereday and Muir-Cochrane, 2006; Silverman, 2010).

The researcher used verbatim transcription, for the majority of in-depth interviews and focus group audios, notes were also made during the interview and focus groups process that guided the researcher in developing potential themes. Therefore, the data was analyzed deeply using the traditional method of pen and paper, as well as, in-depth analysis using a software package (NVivo). It was not an easy task choosing the discrete method of analyzing data that could help us get the textual meaning of the field data to our readers. The problem is choosing a diligent method that meets the requirements of a PhD award and at the same time, the data analyzed should be comprehensible to DPD, RTA, and Dubai Metro train managers and staff.

A widespread law by (McQuitty, 2018) is that the method of analysis the researcher selects should be in correlation with aims and objectives, research questions, and the theory guiding the research. The researcher aimed to design a conceptual framework describing safety and security management at Dubai Metro Trains using deferred action theory. We will derive the deferred action theory through the inductive process by systematically analyzing the data collected. The use of coding paradigms qualifies the deferred action theory as an adequate method for building the conceptual framework (design and action). The method facilitates the

creation of an evidence-based conceptual framework and changes relating to organizations structure and position as well as social interactions (Jabareen, 2009).

The researcher considers different analysis approaches to make the data comprehensible to the readers. The methodology of analysis used by the researcher is widely accepted by most qualitative researchers. We can simplify methodology as the organized measures undertaken to lead us to meet the desired goals. As (Crotty, 1998) and cited by (Abutabenjeh and Jaradat, 2018), the context of the methodology is defined as "the plan of action, design or process lying behind specific methods and connecting the choice of methods employed to attain the desired outcomes. Figure we describe the methodology of our qualitative data analysis."

The researcher used diverse analytical methods to make sense of the data to the reader. First, the researcher employed the computer-aided tool NVivo. NVivo software is practically used to analyze unstructured data such as audios, interviews, focus groups, journal articles, document analysis among others. Secondly, the inductive analysis approach according to Attride-Stirling, (2001) emphasizes examining patterns or themes within the data provided and create a connection. The inductive analysis will allow findings of the research to emerge from the frequent patterns or themes ingrained in raw data. Figure 5 briefly describes the inductive process method whereby, data collected is analyzed by open coding, followed by axial coding, then selective coding which further drives us to saturation. Inductive analysis was combined with NVivo 12 data analysis to develop themes for the in-depth interviews, focus groups and documents analysis

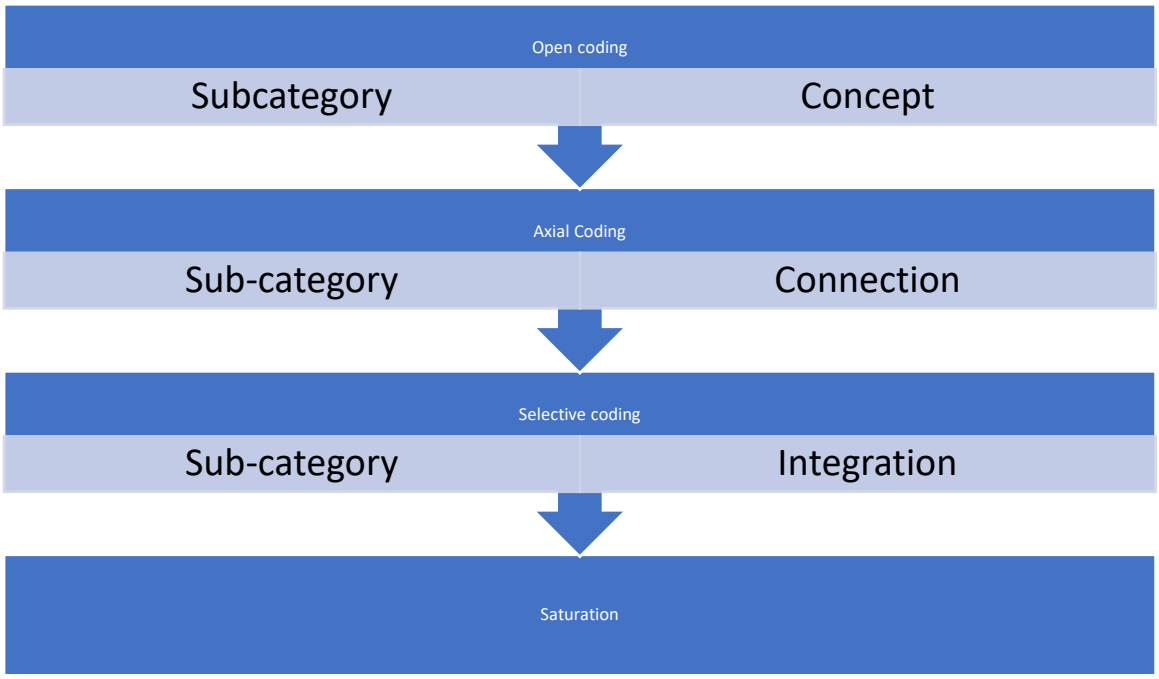


Figure 5 - Illustrative view of the inductive analysis technique

Thirdly, thematic analysis; in our thematic analysis, a three phases approach is suggested by (Amsteus, 2014), the stages are; the collection of the data, data analysis, comparison of results. A five steps process was recommended by (Attride-Stirling, 2001 and Amsteus, 2014) in the thematic process method: beginning research, choosing data, data collection, analyzing data, and concluding the research. The approaches by the two researchers are more or less the same. The themes in the research will guide us towards the aims and objectives of the research which will enhance the creation of the conceptual framework. Stages of data analysis:

Stage 1

Conduct data analysis on the concept of safety and security of Dubai Metro Trains by using the inductive analysis method approach.

Objectives

To investigate the incident

To identify and create characteristics of the incident

To develop the conceptual framework that describes the incident

Stage 2

Conduct data analysis on the concept of safety and security of Dubai Metro Trains by Using NVivo software

Objectives of stage 2

To assess the conceptual framework

To analyze the data on the proposed safety and security framework

Results and discussions

The deferred model action conceptual framework

A conceptual framework will be developed by summarizing the data from the detailed themes and patterns.

5.4 Thematic Analysis

Braun and Clarke (2007) describe thematic analysis as the process of identifying themes/patterns in qualitative data. Historically thematic analysis is the most common form of qualitative data analysis. This method involves identifying recurrent patterns (themes) in the data whereby the researcher is immersed in the data to identify common patterns or ideas. The main advantage of thematic analysis is that it is a flexible method other than methodology which contrary to other research methodologies it is not held up to a specific epistemological or theoretical perspective (Braun and Clarke, 2006; Clarke and Braun, 2017).

The themes identified in our research will be used to address the research questions and objectives. According to Braun and Clarke, (2006; 2017), a common pitfall to thematic analysis is using the interview questions as our themes.

In their study Clarke and Braun, (2017) emphasize various ways to use thematic analysis with a broad range of research interests and theoretical aspects:

- Thematic analysis works with a broad range of research questions for instance research questions dealing with people's experiences, construction of a particular design in a given context

- Thematic analysis can be used in the analysis of different types of data both primary and secondary sources such as; interviews, focus group discussions, articles, annual reports, among others

- Thematic analysis works well with both large and small data-sets

- The thematic analysis applies to produce analyses driven by either data or theory.

In the thematic analysis, the researcher adopted a six-phase approach suggested by (Braun and Clarke, 2006; Clarke and Braun, 2017) in their article on "Using thematic analysis in psychology". The phases are not systematic and you may move forward and backwards between them if, for example, dealing with complex data.

1. Phase 1 Familiarize yourself with the data

2. Phase 2 Generate opening codes

3. Phase 3 Search for existing themes

4. Phase 4 Review themes

5. Phase 5 Defining themes

6. Phase 6 Write-up

Phase 1 Familiarize yourself with the data

Our first step to qualitative data analysis was reading, and re-reading the in-depth interviews and focus groups transcripts. The interview transcripts are found in Appendix 7. The researcher is familiar with the entire data corpus (interviews, focus groups, and documentary analysis). The researcher at this stage made notes on early impressions.

The following are some rough notes made by the researcher during the in-depth interviews process:

Integrated system implemented in Metro Trains shows high efficiency in the issues of train traffic management and security

At the UIC level, this technology is recognized and recommended as the main one. The technology of multi-level systems is adopted

There are no analogue systems and there is the adoption of modern technology

For Dubai railway transport, the issues of import substitution are in many respects of key importance

Observe the most important principle - all traffic control and traffic safety systems must be following Dubai IT infrastructure

Technology improves the safety and security of the Metro train transport system. This is according to participants

Employee training improves their efficiency and effectiveness in maintaining safety and security at Dubai Metro Trains

Phase 2: Generation of Primary Codes

In this stage, the researcher organizes data in a meaningful and systematic way. Through coding, data is reduced to small sizes with meaning. There are different methods of coding which are determined by the research questions and the researcher perspective. Our main concern in generating codes was to address the research questions- this was preferably a theoretical thematic analysis. With this in mind, we coded each section of data that was relevant or interesting to our research questions. We, however, did not code every section of transcript text. We applied open coding; this translates that we did not have any earlier sets of codes. The researcher instead developed the codes during the process of coding. The generation of codes was enhanced by the use of NVivo 12 software.

5.4.1 NVivo 12 Data coding

Using the deferred action theory, we will develop a conceptual framework to enhance security management at Dubai Metro Trains. The findings of the first stage describe the components of Metro Trains terrorism —motivation, target spots, action method and tools of attack. To analyze the data for stage 2 we will use the latest version of NVivo (NVivo 12) for Mac. We will use the software to analyze data from in-depth interview questions and focus groups. NVivo which is qualitative research software will assist us to manage and make sense of data that is unstructured (Geisler, 2018). We will transport directly transcripts from the word document to NVivo. The data is then visualized in image form in NVivo. NVivo 12 software will help us develop themes and visualize meaningful findings and conclusions.

By using the software, we will put the sentences in a node that can be identified.

The sentences are labelled by assigning codes to represent each unit. A theme or pattern is represented by the node in each category of the data. We identified recurring themes for this analysis which are: motivation, security awareness, automation of services, employees training requirements, emergency response and preparedness, communication and awareness (both internal and external communication), document control and records, established health, safety and working environment requirements, identification of hazards and risk assessment, reporting of incident and investigation, compliance with obligations, and lastly roles and responsibilities. The themes above were identified by repeatedly reading raw data from the transcripts. At the end of the research, no new themes emerged. NVIvo 12 software assisted the researcher in evaluating the conceptual framework through visualization.

NVivo is commonly known for its ability to help discover more from qualitative and mixed methods data. It is useful in uncovering richer insights and produce clearly articulated, defensible findings backed by rigorous evidence. NVivo provides users with the ability to organize and analyse non-numerical or unstructured data, to classify, sort and arrange information; examine relationships in the data; and combine analysis with linking, shaping, searching and modelling.

NVivo offers a far greater range of options for storing, coding, locating and presenting data than other alternatives such as Microsoft Word. However, some studies may not need all of that sophistication and functionality with a small data set, text-only data or are conducting a semantic level thematic analysis or something similar, Word may do the trick just fine. You may just find that you need to reassess your comments or colour coding intermittently and would probably want to use a different document, program or pen and paper when it comes to searching for themes in your data.

5.4.1.1 In-depth Interviews Data Analysis

Using NVivo exploratory tool the case study researcher analyzed the in-depth interviews, document analysis, and focus groups transcripts and we were able to come up with the most frequent word in in-depth interviews and focus groups, this gave us the starting point for developing the primary themes concerning the research problem (research questions).

The QSR NVivo 12 software assisted the researcher in tracking the whole research. For instance, the research imported each interview transcript to NVivo for coding. The codes were generated inductively from the transcripts by using the wider concepts of the framework. The codes kept on changing numerous times throughout the research process. The changing codes were identified and documented. This creates an understanding of how the researcher came up with the themes and concepts.

The researcher also used visualizations to explore the data further which assisted us in identifying the key codes. The codes were guided by the conceptual framework model we acquired from the theory of deferred action. The themes were combined with comprehensive elements to enable reduced subthemes. The codes are outlined below in the codebook. To develop the codebooks in both in-depth interviews and focus groups, we inductively analyzed the data from the 14 interviews and 2 focus groups. The findings are discussed in relations to a feasible code pattern based on the frequency of occurrence and the suggested samples for thematic analysis.

Figure 6- Word cloud for the common words in in-depth interviews to develop key themes

The font sizes represent how frequent the terms appear in our data.

Table 4 - Primary codes in Interviews Data Analysis

Interview data analysis Nodes

Name	Description	Files	References
Awareness		8	22
Communication		11	44
Coordination		6	7

Name	Description	Files	References
Effectiveness and efficiency		14	32
Equipment		9	25
Planning		12	39
Policies		10	25
Research		14	65
Technology		13	42
Cyber security		5	10
Technological		7	17
Automation		5	19
Training		14	76
Knowledge		13	70
Training needs requirements		10	30

5.4.1.2 Focus Groups Discussion Data Analysis

Figure 7- Word cloud to the primary themes

Table 5 - Focus Groups Data Analysis Nodes of the most common words Nodes

Name	Description	Files	References
Communication		2	25
Equipment		2	62
Infrastructure		2	18
Safety and security		2	141
Technology		2	70
Training		2	33

In addition to the above main themes, three specific themes were discussed in each focus groups and in-depth interviews:

1. What are the main gaps in the existing Security management systems?
2. What do you think are the major security management approaches to be adopted in integrating the Metro train system?
3. What are the modern technologies that help in establishing a strong security system?

These three topics will be covered in this chapter, and every theme with twenty or more mentions will be equally addressed in this chapter to understand their importance in enhancing the security of Metro trains.

5.4.1.3 Document Analysis

To give voice and meaning to our research topic the researcher investigated both internal and external documents. The main challenge to an external researcher is that the documents and website are in Arabic. The researcher through document analysis can complement understanding by investigating a socio-cultural occurrence (Bowen, 2009). The researcher reviewed documents both printed and electronic that are computer-based and the documents that are transmitted electronically. The researcher looked into 10 documents that deal with training, policies and procedures among other documents; the contents of the documents are sufficient for the conceptual framework. Documents analysis assisted the researcher in the sampling process of the interviewees by providing preparatory knowledge. Document analysis is appropriate for providing information on the organization former incidences without changing the results outcomes.

The researcher assembled documents both electronic and printed from Metro Trains that applied to the objectives of our study. The documents enabled the researcher to identify the existing safety and security management measures, and how training and proper planning

could improve on the processes. Documents such as terrorism reports on UAE, website contents of both RTA and DPD, annual reports, RTA and DPD policies, background papers, agendas, press releases, were studied by the researcher before sampling which employees to interview. This analysis enabled the researcher to better understand the study research problems. A better understanding of the research problem guided well-structured interview questions.

Based on our study we analyzed the relevant internal documents such as human resource forms and documents, meetings minutes, employees' qualification documents, RTA and DPD database adequately provided the researcher with enough data for analysis. By selecting these documents, we were able to identify RTA and DPD plans for Dubai Metro Trains. Achieved results and past challenges were evident in these documents. The documents provided priorities of DPD and RTA in enhancing an effective security system for Dubai Metro Trains.

Analysis of plans reports was in an attempt to find the organized action for deferred theory action, the highly ranked actions would give us the leverage to developing the conceptual framework.

Table 6- A sample of documents selected and data analyzed at DPD, RTA and Dubai Metro Trains

Documents Selected	**Data Analyzed**
Annual reports (Employee training manual)	The success of metro trains security List of projects

Minutes of meetings	Motions and decisions that occur during meetings
Policies and procedures	Major decisions regarding training and security in the future. Technology adopted The current security systems

Analysis of DPD, RTA and Dubai Metro Trains annual reports and the minutes of meetings were important, even though the documents are inadequate to give facts on an occurrence under investigation. For triangulation, they serve a better purpose when analysed with data collected by other methods.

Figure 8- Word cloud for the most frequent word to develop codes

The nodes for document analysis (annual reports, policies and procedures, and website content analysis)

Table 7- Documents Analysis of both RTA and DPD

Name	Description	Sources	References
Communication		2	87
Efficiency and effectiveness		2	25
Equipment		2	79
Information safety and security		2	112
Preparation		2	31
Technology		1	9
Training		2	46

When we finished the coding process we compared the codes, scrutinized them and modified them. In Appendix 8 a detailed extract of codes is attached.

Phase 3: Searching for themes

Our earlier definition of theme shows that it is a pattern captured within the dataset that is significant or relevant to the research questions. As our dataset was large we observed

minimal overlapping of themes. We weighed the codes and most of them fit into a theme. For instance, we had several codes that related to the participants' perceptions towards the effectiveness of the current Metro Trains security management systems. We collated the codes into a theme called, “Evaluating the efficiency and effectiveness of the Dubai Metro Train safety and security system management”.

During this phase, we organized the codes into broader themes that were detailed in the research questions. Our themes were chiefly descriptive that is they described the sequence in our data applicable to our research questions. Themes identified in the coding of in-depth interviews, focus groups, and document analyses are presented along codes associated with them in Table 6.4. Most codes are linked to more than one theme and are highlighted in the table and Appendix 7.

Phase 4: Reviewing the themes

All the themes identified in phase 3 are modified and reviewed to ensure that they make sense with our research questions. All data around each theme is gathered. Themes within subthemes are identified in this stage. Emergent themes which will later be discussed in our study are identified at this point. Themes should be unique from each other.

Phase 5: Defining themes

This is the last stage of our themes refinement; the sole purpose is to identify the importance of each theme. What the theme is talking about. The relationship between themes is also identified.

Participants of the in-depth interviews and focus group analysis are consistent with what constitutes a safety management system. The participants also give suggestions about how current systems could be improved.

The next step to data analysis after the thematic analysis was to analyze the passages during interviews, focus groups and documents analysis associated with the key themes identified in the data set.

Phase 6: Writing-up

The end-point of our analysis is presenting the themes broadly. The themes are categorized into modules of our conceptual model, each theme is covering the evaluation of Dubai Metro trains security management systems including the supporting infrastructure and technology, and this will explain the application of Patel's theory of deferred action in practice.

5.5 Presentation of Themes

In analyzing the data collected from our three approaches; in-depth interviews, focus groups and document analysis we will expand on each theme and how it affects the safety and security of Dubai Metro Trains.

The case study researcher interpreted the empirical data to address the five research objectives. The first three research objectives were: (i) To conduct a systematic review of the relevant literature addressing train transport systems, theories on terrorism, components of trains security systems to identify gaps in existing trains security management systems; (ii) To analyze the effectiveness of the current Dubai Metro Train security measures; (iii) To integrate human resources factor in technology to improve the security systems in metro train transportation.

The analysis of the combined set of data identified codes that have been grouped into themes that show the characteristics of the theoretical dimensions and constructs of the theory of deferred action. Table 12 below shows the codes, themes and related theoretical dimensions and constructs. These themes are described and interpreted in the following section.

Theory of Deferred Action Dimension and Constructs	**Themes**	**Themes problem statement**	**Codes**	**Evidence Source**
Planned / Real system	Organizational infrastructure / readiness	Members of RTA, DPD, and passengers training requirements	Training Awareness	In-depth interviews Document analysis Focus groups
Planned / Real system	Maintenance of security system	How Dubai Metro Trains has successfully maintained the security of their employees and passengers	Infrastructure Equipment Technology	In-depth interviews Document analysis Focus groups
Planned / Real system	Organizational communication network	Communication between various departments.	Communication Coordination Technology Research	In-depth interviews Document analysis Focus groups
Emergence	Security requirements	Determining the requirements of the safety and security management systems of the Dubai Metro Trains	Training technology equipment Involvement	In-depth interviews Document analysis Focus groups

Emergence	Adaptability of the security system	Evaluating the efficiency and effectiveness of the Dubai Metro Trains safety and security system management	Effectiveness and efficiency Equipment Infrastructure	In-depth interviews Document analysis Focus groups
Emergence	Security risks			
Deferred system	Security strategies	Strategies employed to manage the security systems and improve existing ones	Management Planning Policies infrastructure	In-depth interviews Document analysis Focus groups
Deferred action	Application of Technology for Security Management			

Table 8- Problem Statement of themes, codes attached to them and the evidence source

5.5.1 Theoretical Dimension/Construct: Planned Action / Real System Model

The identified themes related to the planned action dimension and the real system of the metro train passenger security system include Organizational infrastructure / organizational structure; Security requirements; Maintenance of security system; Organizational communication network; and Security Personnel training. These themes show the concern of the participants for the existing structures of the organization that enhance the security systems of the metro train system. Each of the themes reflects an aspect of the organizational behaviour that shows organizational practices structured as planned action for the

achievement of organizational goals. The activities reflected in each theme are structured and organized to ensure the security of passengers, staff and assets of the metro rail.

5.5.1.1 Theme: Organizational infrastructure / organizational structure

The theme highlights organisational infrastructures put together to ensure the smooth running and safe operations of the Dubai Metro Rail. The data set identified the focus of the management of the Dubai Metro on infrastructural development aimed at providing a platform for a safe and secured rail system. The analysis shows that all the infrastructures put together in the metro rail system are designed to carry out specific functions based on some planned actions that ensure the safe and secured operations of the train system.

Participants and records note that the Metro line company has focused on infrastructural developments with lots of investments to put in place a set of infrastructure that is fit for purpose and planned activities. The metro line has extra elements like advanced technology, automatic signals, and auto-ticketing and terrorist analyst devices.

These unique set of infrastructures have a different set of functions, operational systems and procedures which are carefully planned, coordinated, controlled and managed for effective provision of safe, fast, secured and convenient service. However, the planning and management of these infrastructures and systems depend on the type of services required of emerging demands and situations.

Participants note the importance of ensuring that the infrastructures are engineered and designed to meet emergency needs and current demands. This requires monitoring of the environment and market demands. The important role of each part in the overall running and smooth operation of the rail system and how this can be exploited to meet current needs is also of paramount concern.

A notable infrastructure of the Dubai Metro Line is the centralized system which allows for the easy integration of the entire tracks of trains aimed at effective control, monitoring, maintenance and security of the tracks and trains. The automatic control system and the centralized system infrastructural set becomes very important to set as part of the planned action for the rail system.

Another set of organizational development and organizational structure is the establishment of the security unit and the recruitment of security personnel. The government has set up a dedicated Police team in managing security issues in Dubai Metro with the recruitment of professionally trained security staff for daily patrol of stations and trains, 24/365 access control, management of security risks, and enforcement of railway bye-laws. Furthermore, State-of-the-art safety equipment will be used such as CCTV in stations, trains, depots, track-side and sub-stations, Emergency Call Points (ECP) on station platforms & trains, intrusion alarm systems and smart card operated access control system.

The director of TSA, Colonel Mohammad Ahmad Al Bastaki, confirmed that the transport security personnel have been authorised, mandated and equipped with the latest gadgets to ensure a zero crime rate per million commuters. The task requires meticulous planning and the building of a comprehensive database on security and safety statistics in the global transport sector. The director also notes that the security unit has dealt with about 1.6 million criminal cases within the metro line environment.

5.5.1.2 Theme: Security requirements

A study by Sharma, Dhyani and Gangopadhyay, (2013) points out that railways are designed in such a way to minimize pollutions concerning environmental conditions. The impacts of the nature of environmental conditions could be either negative or positive. The Dubai Metro train system is designed in such a way to withstand air, water, fire and earth. Metro rail transport system design is in such a way to avoid conflict with other means of transport.

One interviewee points out how Metro trains are designed to ensure the safety of their passengers:

The main purpose of the architectural design of the stations is to ensure safety and security for the public. The interior designed in a way that ensures clarity and simplicity, while minimizing distances. To move to the lowest level possible, the ground station entrances are integrated with the other modes of transport. It provides a link with the pedestrian movement and maintains contact with the environment surrounding the station. One of the largest projects also implemented by the Dubai authority at a cost of approximately AED 15 billion. It has also taken care of the requirements of the special technical segment. It includes ten main services such as elevators, escalators, automatic payment systems, and train gates. In addition to the allocation of wheelchairs with safety belts, allowing Disable passengers to travel safely in all vehicles. (Focus groups RTA 1)

To suit the public, the top ground stations are designed to suit public needs regarding visual contact with the external environment as the passengers travel to the station. The architectural design enables public safety and security. The interiors are designed with clarity and simplicity to minimize travel distance by passengers to enhance their security. In the particular technical segment, there are first services such as elevators, automatic payment systems, and train gates. In addition to the allocation of wheelchairs with safety belts, allowing passengers with disabilities safely travel in all trains. Other unique interior features for the disabled are HD audio-visual devices for the deaf and people with visual impairments. Ground marking facilitates the movement of people with visual disabilities to move. The ground movements assist them to move to the train gates. The safety of people with disabilities is enhanced through such devices.

From the data analysis, we reveal that the restructuring of the traditional system will improve the safety management system. The state regulations will be integrated with the Dubai railway systems. Changing the legal system environment will change the management of the system. Measures are put in place to eliminate human factor errors and improve the effectiveness of the system. The senior staff and experts are confident that there will be an improvement in the management of the train transport system. (DPD and RTA interviewee 2,3, 5,6) As one participant points out:

"Well, to design a safety management system, the department of traffic safety and ecology should perform some of the significant functions. The establishment of safety indicators for passenger and cargo transportation and technological processes also increase the safety of passengers. Anyways, I would add that it is crucial to integrate technical programs with compliance with regulatory principles. Consistently, to increase safety, complete guidance needs to be given to all the employees that reduce the possibilities of technical failures. Here, I would tell you that it must ensure the normative values of the safety performance indicators of their functioning, as well as the functional characteristics of specialists" (Dubai Police Department Interviewee 3).

The design and architecture of interior designs there is the adoption of ergonomics of people in their place of work. The interior should be in such a way that in case of an impact there would be no or minimal casualties (Byran and Gilad, 2012). The current interior design does not require any adjustments.

5.5.1.3 Theme: Organizational communication network

The analysis shows that a key component of the rail infrastructure critical to its smooth operations and safety is the network of communication systems. The entire rail transportation system relies on a real-time communication system and signal controls for the transmission of all operational data and information on routes and train schedules. Furthermore, information

as an asset and the value of assets to any organizations are significant and need to be highly secured. Data can be kept in different forms such as digital form, in the form of training employees (knowledge or material form) (Hina and Dominic, 2018). The information can be conveyed through electronic means or verbal communication. Irrespective of how data is transferred it requires protection (Coffelt, Baker and Corey, 2016). The information involves honesty, availability and confidentiality for effective communication.

One participant points out for the safety of information a domestic communication system is in place to ensure the safety of train and traffic. The local communication system offers a complex of technological processes for telecommunications and communication between departments. An interviewee from RTA states how communication occurs between the employees and passengers in case of an emergency (RTA 7)

It depends. A general or system-wide issue would use the public address system, and officers on the ground would provide face to face communications to guide people to safety in the case of an emergency (RTA 7).

The security of the information is thereby enhanced. Proper communication between departments creates a link between the safety and security of passengers and employees.

One interviewee pointed out that:

The department of safety conducts workshops that show how the Metro train service provider has a quick response team in cases of a disease outbreak or terrorist attacks. The response teams are well equipped whereby the follow-up teams give additional tools based on the evaluation of the situation. The situation is usually evaluated by the National Emergency Services, and they determine the location, nature, and how to access the event.

With this collaboration controlling a terrorist attack or any risk is with minimum effort. (Railway Transport Authority, RTA 7)

From the focus groups and interview participants' responses, Metro train has been striving to improve the security and safety of their passengers and staffs. The integration between the Dubai Rail Transport Authority and Dubai Police Force has a significant impact on the safety and security of Dubai Metro trains. The employees from the two organizations are offered the best training and equipment tools. Their level of education is a significant contributor to achieve the performance of their duties and responsibilities best.

To enhance the safety and security awareness of employees, it is advisable to learn from developed countries. The level of education and training gaps are identified as the primary cause of accidents at the place of work (Nie *et al.*, 2018). Training and education equip employees with the necessary skills to handle and identify risky situations at their place of work. Training at a Metro train will provide employees with the essential knowledge and practical skills that will enable them to handle terrorist risks. Occupational health and safety is part of vocational education training (Nie *et al.*, 2018). For instance, security officers should have advanced skills that can enable them to handle unpredictable safety threats in their departments. See Appendix 9 for the text query on communication as an emergent theme.

5.5.1.4 Theme: Maintenance of security system

The establishment of a security system has been identified in the data set as very essential for the safe, smooth and secured operation of the Dubai metro line. It was noted that crime rates and the potential for terrorism are usually higher in crowded areas such as crowded trains and stations. The situations may easily create higher chances of security breaches which necessitates the boosting of security arrangements and a system.

The TSA according to the director relies on the maintenance of a comprehensive database on security and safety statistics in the global transport sector. The database is updated regularly to inform the security unit of the security requirement and need for the current situation. This enables the TSA to develop tailor-made security systems for the Dubai Metro Line.

The security unit has also embarked on state-of-the-art security inspections systems at metro and tram stations to enhance the safety and security of the rail system. The unit has also created new departments and sections to boost security efforts. The bomb squad, K9 and rapid intervention force were all created to maintain an efficient security system.

Participants also note that the security unit successfully set up action plans to ensure the effective provision of security in the rail system. The TSA has also been noted to participate regularly in international transport conferences to keep abreast with the latest technology and challenges.

5.5.2 Theoretical Dimension/Construct: Emergent System / Model

The identified themes related to the emergent dimension of the metro train passenger security system include Planning for emergency procedures and Police planning; Integrating State Operations Regulations with Dubai Metro Trains; and Changing Role of the Human Factor in the Security Management system

5.5.2.1 Theme: Planning for emergency procedures and Police planning

Participants and the documents analysed show that the planning for emergencies in the rail system and its periodic evaluation is important in establishing different scenarios of possible criminal and terrorist attacks. The different scenarios help in the formulation of adequate and appropriate security systems for Dubai Metro.

Police planning should account for the changing safety and security needs of the system in future. The current system is facing challenges in ensuring there is optimum security as it did

not plan for future changes in technology, training needs, among other factors. The current design adopted traditional knowledge of dealing with terror attacks; the system did not look at how advanced terrorist are.

The interviewee from RTA confirms that planning is inevitable and is a necessary dimension in our deferred model to achieve the set objectives. In addition, under the new system, two separate organizational units have been established. One of which is the planning of transport and communications, the development of technical standards and the protection of trains, while the other organizational unit will supervise the safety of the trains and their operations (focus groups RTA 3). Planning becomes the key dimension of our deferred system. Planning was the emergent factor that was forgotten in the previous system. After linking up the themes the researcher was able to come up with a model that would enhance and improve the security management systems of Dubai Metro trains (see Appendix 5).

5.5.2.2 Theme: Integrating State Operations Regulations with Dubai Metro Trains

Through the integration of Government operations and regulations, flexibility will be observed in how security is managed at Metro trains. There will be a fast response to security threats, and improved efficiency and effectiveness. One interviewee from the Dubai Police department identifies the benefits of integrating Metro trains to government regulations:

Yeah! The problem of improving the safety management system for the transport of passengers and goods remains the most burning issue at the present stage of the development of rail transport. In addition to the restructuring of the traditional system, it is necessary to focus on integrating the state regulations of operations in the Dubai Railway system. The functions of economic management of its activities, its relevance is determined, firstly, by a significant change in the legal environment for the functioning of the management system. Secondly, there is a need to increase the effectiveness of measures that reduce the negative impact of the "human factor" on the safety of transport. Given these and some other

circumstances, many experts are confident in the inevitability of improving the current transport safety system (DPD 01).

The integration will see reduced costs in employee training on how to deal with terrorists, a safe operating environment, modern technology and equipment in combating terrorism. Since terrorism is a global challenge integrating the operations of Dubai Metro Trains with those of the government is the best option with the changing world security.

5.5.2.3 Theme: Changing Role of the Human Factor in Security Management system

The increasing role of passengers and staff in the design of a security system was highlighted in the analysis of the data set. Passengers are the key beneficiaries of the security system and as well as the key targets in the event of any criminal or terrorist attacks. Participants note that the education of the passengers and their level of awareness of security concern in the rail system increase their level of participation in the design of the security system.

Participants' responses and feedback are very important in the design of a reliable security system as it provides the required information on current events and situations. The methods of designing the security management model were insufficient without the feedback from the participants. The senior and junior staff called for a change in the management of security systems. Through empirical data critical analysis, we suggested the need for a deferred model for evaluating and re-designing the systems used by Metro trains to manage safety and security.

The systematic design of communicating to passengers during an emergency was insufficient and ineffective (RTA interviewees 2, and 4). Existing communication is based on onboard call boxes, and communication is between OCC and the affected passenger. There is a problem here, where operators misuse the communication systems for their convenience. The

communication system is technology-powered and not people-powered, most people do not have expertise in how the system works (RTA 02).

The senior staff interviewees acknowledged a shortfall of expertise in operating the systems – calling for a change in the improved security management system (RTA 06). The improved system should consider the human element as a new approach to achieving secure Metro Trains in achieving innovation in complex security systems that are smarter, collaborative and more inclusive of the employees and other stakeholders (DPD, 05).

The explore of actuality-based approaches for designing and improving the Dubai Metro Trains security systems was accepted as an effective way of finding out whether the rails were achieving enough security or not. This was a prognosis for considering the MetPass deferred model in DTM security systems, participants received the suggestions well that action to change the security management systems should involve all stakeholders to address modern terrorist's threats (Interviewee DPD, 03, 04, 06 and RTA, 01, 03, 05).

The study findings have so far stimulated how technology, policies and procedures and the human factor is used in enhancing security management. The findings suggest a shift from the traditional security management systems to more people-centred security management systems that is user-friendly.

5.5.3 Theoretical Dimension/Construct: Deferred Action/System - Security Management Tools and Interactive Lens

The analysis identified themes that reflect on activities that blend planned action and emergence as a response to emergent systems. The themes also show how the organizational infrastructures and planned actions in terms of an automatic control system, centralized control systems and the security personnel with the security gadgets may be adapted and used to respond to emerging situations. The themes include the periodic evaluation of the safety

and security management system; changing security strategies and tactics; and application of technological innovations.

5.5.3.1 Theme: Periodic evaluation of the safety and security management system

Participants note the focus of the management of the Dubai Metro line to periodically evaluate the safety and security management system with a view of identifying its fit for purpose in the current dispensation. The existing system is weighed against the current risk trend and its ability to efficiently manage such potential risks. The impact of both external and internal factors on the effective functioning of the existing security system is examined periodically to ascertain its readiness for use at all times. These factors such as increasing crowd, increasing platforms, stations, and staff have necessitated the need for an improved security system (Catalano *et al.*, 2019).

From the interpretation of in-depth interviews, focus groups - responses, views and comments we examine the efficiency and effectiveness of Dubai Metro Train in managing their security system and expanding their railway capacity for more users. Efficiency and effectiveness is a critical factor in safety and security management systems.

The researcher was able to build insight and how participants feel about the existing system:

GMA:

So, do you think that the methods used by the RTA are effective?

RTA07: Yes, they are very effective, but that doesn't mean that we can just relax. Ensuring that they remain effective requires continuous improvement, including readiness for things that are not likely to happen. (RTA 07)

We found that the key strategies employed by Metro Train are; the adoption of technology-supported security learning planning to assist in achieving enhanced security against

terrorists' threats. The employees involved with Metro train security are of a high capacity to deal with any emergencies. The equipment includes police dogs, patrol cars and the deployment of modern surveillance cameras at all stations to secure the metro train stations. (DPD and RTA interviewee, 1, 3, 4, 5).

One participant of Dubai Police Department (DPD 03) points out that:

According to me, Dubai ensured effective managing of the terrorist attacks. Therefore, integrated safety requirement consists of the mandatory application of probabilistic safety indicators for the operation of technical facilities and personnel. As well as the establishment of their regulatory values, under which the regulatory values of safety indicators for passenger and cargo transportation as a whole would be ensured. This requirement also follows from the provision of paragraph 1 of Article 6 of the Federal Law of the Saudi Federation "On Rail Transport in the Saudi Federation". In principle, it is impossible to determine the compliance of technical means with the established requirements for the safety of transportation of passengers and goods. I understand it would be a little complicated for you to understand these laws at this stage.

There has been a special budget set aside for the security department to provide training to security employees and provide them with the necessary equipment. Special offices are provided for every security officers at different stations. Proper coordination and cooperation within the Dubai police department and criminal investigation departments enable containing an occurrence of a crime from the ground. The Director of Civil Defense provides the required training to employees and equipment needed for the Metro Train security personnel, ensures the latest technology and equipment are provided. The adoption of technology and modern equipment will strengthen security systems. The efficient design of the safety management framework increases the Metro train safety indicators. The organizations'

hierarchical levels have enabled organizations to develop technical means and technologies for making equipment for stations.

In the implementation of an integrated system, Metro Train has shown efficiency when it comes to the management and security of traffic. The integrated system technology is highly recommended with multi-level systems (Nie *et al.*, 2018). The absence of analogue systems has shown vast improvements in Metro trains operations. The traffic control and traffic safety systems are in line with Dubai IT infrastructure. The trains will run on schedules creating accident-free train traffic. The integrated automation of the metro systems could allow advances regarding operational efficiency and safety management of operations.

In ensuring the safety of passengers from terrorist attacks one interviewee points out that there is the adoption of integrated security. The integrated safety system requires that the system has the mandatory application of probabilistic safety indicators for the operation of technical facilities and personnel. There are Federal laws in place that regulate the safety values of passengers and the transportation of cargo. When evaluating the success of efficiency in the Metro train transport system, the ability to maintain results is the most important factors. The adoption of new technology and automation of processes plus evaluation of the critical success themes has indicated a positive impact on the transport system (Oglesby *et al.*, 2014). Continuous training of employees has improved how they attend to their duties enhancing their effectiveness and efficiency.

According to Cao *et al.*, (2013); Yu, Patterson and de Ruyter, (2013), proper employee motivation, training, communication, a healthy and safe workplace among others improve performance and productivity. We can deduce that the efficiency and effectiveness of Metro train employees' competence are achieved through providing training centres, health facilities for continuous medical checkups for employees working in hazardous environments and

providing automated equipment for delivering safety and security measures. The experience of employees also contributes to the efficiency and effectiveness of their performance (Harris and Fleming, 2017). From the findings up to now, we can provoke re-designing the way safety and security is managed at Metro Trains. The findings suggest a move from the existing security system to a more advanced one.

5.5.3.2 Theme: Changing security strategies and tactics

The analysis shows that the management of the Dubai Metro lines has focused on employing different security strategies and tactics based on the identification of security hazards and risks. Participants note the importance of the safety management approach adopted by the management and adjusted periodically from active to proactive in addressing current security needs.

An effective safety management system as per the interview and focus group comments and views we were able to identify potential safety hazards, provide methods for assessing the risk and provide a criterion for addressing the safety risk indicators (DPD and RTA interviewee 4, 5, 7)

According to one interviewee, they point out that; Dubai plans and implements courses on safety and security. Establishing safety and security specialized centres has been the mandate of the UAE. The training at the centres enables identifying and assessing challenges at either the national or regional level or using state resources to serve the problems. Security is also a role of the Ministry of internal security, and they adopt the latest technologies to maintain security and safety together with improving the efficiency of the police. To counter terrorism, there is the application of the 'Eye of the Falcon System' whose launching was by the government of Abu Dhabi; the system extends up to The International Airport of Abu Dhabi.

Over the years the Metro train system has advanced technologically. A coloured traffic system enables the safety of the Metro train system and subways; this allows the efficient running of the train systems. For improved speed and performance, the automatic locomotive signalling devices of the continuous ALSN is used. There has been an upgrade to multi-valued ALS-ALS-EN alongside high-transmission of communication information. Data is transmitted via radios at a speed of 160 and 460 MHz. Security of information is enhanced where there is only two-way communication between stations. The ALCH systems used in the mid-1993 have been improved by more complex microprocessors for example CLUB, CUT, TC CBM, among others. The Microprocessor train system enhances the safety and security of train traffics in modern days. Automatic and semi-automatic systems intensify the safe passage of routes at stations. Safety and security tasks are enhanced through the use of electromagnetic compatibility and protection issues, the availability of a digital radio channel, the use of surface-mounted technology, and the use of the latest digital signal processing processors. (Focus group RTA)

A recently commissioned system allows recognizing the number of wagons for access border crossings, access roads, and harbours. Software adopted a flexible protocol program that interacts with the previous systems. The modern mobile and remote management system connect with a large number of customers and users. The monitoring, documenting, and recording of operations in the rail system can be carried out using technological processes. However, proper investment is required for the adoption of modern technology. This will improve performance efficiency and effectiveness by adopting new devices and control systems. Consolidating the systems will ensure that the Dubai Metro system is monitored, evaluated, and assessed simultaneously.

One interviewee pointed out that the improvement of systems interval regulations and continuous monitoring of the technical conditions for the facilities in addition to the adoption

of specific automated technologies were significant in improving the existing security management systems. The automation of processes will enhance the security systems. A centralized domestic system for managing and maintaining the safety of Metro train traffic offers the whole complex technological processes. Creation of awareness whereby basic training is provided to the relevant employees for smooth implementation of the safety and security awareness programs (Garg and Lal, 2015).

Understanding of security and safety risks is frequently briefly referred to in the interview and focus group themes. Security awareness is commonly understood as the average knowledge level of employees concerning hazards and informing channels. To create this awareness the commitment of the management and providing necessary training are fundamental elements in the creation of this awareness. Reminding the employees continually is essential as the risk factors evolve continually. Regularly informing the employees builds confidence thereby developing a risk management system culture. Systems security awareness is continuously mentioned throughout the data collection processes that as the interview and focus groups.

One participant points out what training entails in enhancing the security of Metro trains

"*You asked the right question, at the right time. I do not know whether you know or not that recently, a statement issued by the Department of Public Relations and Information in the police in light of the dissemination of traffic awareness. It includes the complete education of countering the accidents integrated among different classes of school students and their active and moral participation in the work of the traffic police in organizing traffic to schools. Let me think more, well yeah the training also included for the easing of traffic accidents and facilitating the entry and exit of students to and from their schools. Implementing the project of the police patrols and the formation of traffic safety teams placed*

in a different institute that offer the education and degrees for security management in the police. I guess, I also read once that a statement added by Dubai authorities that several basic school students in the town of Dubai were trained by the Traffic Awareness Officer and the Road Safety Patrol Officer in the Traffic Department of Dubai District". (Dubai Police Department DPD 1)

These texts substantiate that training is being offered to improve service delivery.

From the interviews, there is support for constant training and awareness program for the Metro Train employees. The awareness programs emphasize the significance of security, some of the interviewees suggest that the physical premises and stations should change, access to the stations and the well equipping of the employees will be a catalyst in improving security and safety of both the staff and passengers.

From the participants' responses, the Dubai Rail Transport Authority and Dubai Police Force can come up with the following strategies to tackle security risks from terrorists or accidents. Some of the approaches include:

1. The interconnection of all processes, information transfer channels, and systems with minimum human interaction and increased automation

2. The transition of the Dubai Police Department training where vocational training is offered and proper selection of personnel to work at Dubai Metro Trains

3. Adoption of a better security management system that will provide sufficient security (which is our main purpose of this project)

4. Automation of processes and control systems of operations for controlling traffic systems

5. Proper training of employees at RTA to deliver efficient services to their clients as well as to detect risky events

Management of security control systems should be at the check-in whereby passengers are streaming to the railway or airport stations; this is according to Kierzkowski, (2017). The check-ins and control systems need to be thoroughly analyzed to minimize any risks of terrorist attacks. The check-in control systems should have a specified amount of time whereby each passenger spends at the checkpoints. Historical data is used in determining the connection between the passengers exiting the check-in control systems and those passengers who are entering the check-in control systems. Adoption of such a system will reduce the dangers of a terrorist attack and increase the productivity and safety of passengers and employees. The data was explored critically with the narrative themes to correspond with the set standard parts of the conceptual framework. Making sense of data was achievable by questioning the logic behind Dubai Metro Trains security management systems. After analyzing the data we came up with the required emergent themes for re-designing the system. From the critical analysis of the ethnographic data, we find out the feelings and resentments of the participants regarding the existing safety and security management system.

5.5.3.3 Theme: Application of Technology for Security Management

Employment of the CLUB-U locomotive device improves the security and safety of the traffic system by relaying information received from ALSN to the driver. As CLUB-U has a longer service life, it is equipped with approximately 1500 trains. The CLUB-U locomotive device is an efficient tool that enables forced braking during emergency and pre-emergency conditions. The forced braking can also be triggered by the officer on duty at the stations irrespective of the driver's actions. Employees are trained on how to operate the CLUB-U device.

Young graduates are recruited to create a long reserve of future employees, their work is supervised per individual, and five traits are observed; their business qualities, their attitude to work, leadership skills, decision making, and problem-solving skills. Continuous training and commitment to excellence make an organization sustain high levels of performance and productivity while maintaining the safety of the employees. Institutions operating in the hazardous or risky environment should continuously train their employees and provide a conducive working environment to boost the morale of their staff. To enhance safety and security in a highly dangerous environment proper management and systems should be put in place. One participant points out that junior officers training could help avert terrorist attacks:

"*Well, the younger generation is very good with technology and more and more of this area is being driven by technology. Facial recognition, dataset connectivity's, rapid regression analysis, all of these things are contributing to the ability to identify when an individual presents a threat or is on the run from authorities. I doubt the DP would be involved in something urgent at the Metro because of the design and the operations, but I could see other scenarios in the future where persons identified by other police forces are recognized and identified on Dubai Metro trains, and that information is passed on to the relevant authorities. Because of the level of safety of the trains, this is more the kinds of areas that I could see becoming part of the everyday work of DP."*

Technology is further enhanced in the management of the increasing traffic which has led to high maintenance costs as a result of infrastructure degradation. Generally, degradation affects the infrastructure, safety, comfort, speed and reliability of the overall train's performance. As pointed out by one participant (RTA 03) there is a need for effective track management:

You know, we are the first in the world in the future decided to abandon the track sensors, replacing them with satellite coordinate systems. In the development of algorithms for safety devices, additional requirements for the human-machine interface were taken into account. For an integrated system, an intelligent display is developed, with which the operator receives a large amount of operational information. Therefore, I say that it is possible to focus the driver's attention on the management of the train. The integration of the system suggests installing two modes of operation. Here, I would also explain that first, traffic signalling for the movement of freight trains of fixed weight and length, and also signal less indicating for the accelerated movement of suburban trains. Flexible technology allows transporting 300 passengers per day.

A workforce that is motivated is a committed workforce that has the skills necessary to achieve their roles and responsibilities for safely performing their duties and responsibilities. After assessing the safety and security risks, the results will be employed in creating safety management system programs in line with the safety targets and objectives of the organization. The safety risk evaluation results will assist in specifying the most efficient design of a security management system. Using the evaluation risk outcomes, it is easy to identify the resources and employees required for the safety management training skills needs will also be evident after the evaluation.

In summation of the theme elements, in each focus group and interviews the following specific elements were discussed;

1. The modern technologies the Metro train is employing to help in establishing a strong safety and security system

2. The successful management of Dubai Metro Train security systems

3. Requirements of Dubai Metro Trains to adapt and improve the safety of their systems, as well as, developing and improving existing systems

From the interpretation of the data, the participants accept that employees and passenger training is a critical factor for improving the safety and security of Dubai Metro Trains. This data supports the generalization that training will improve safety and security management at Dubai Metro Trains.

5.6 Discussions of Findings

5.6.1 Relating the Themes with Research Questions and Objectives

The three main themes identified in the analysis of the different data sources used in the study (Interviews; Focused groups, and Documents) provide answers to the research questions and enhanced the achievement of the research objectives. The findings of these themes show the validation of the data from the different sources as there are no conflicts indicated. It further signifies the importance o data triangulation in qualitative research. These findings in the themes and their relationships to the research questions and objectives are discussed below.

5.6.2 Theme- Planned Action / Real System Model

This theme examines the planned action of the existing Dubai Metro Line Security system with a view of highlighting the components and structures and how these have impacted the system's effectiveness in the management of safety and security in the Metro line. This theme thus provides answers to the first research question "What are the current planned actions of the Dubai Metro security system and their effectiveness in preventing and managing terrorist attacks?" The theme also helps in the achievement of the research objective "To evaluate the current planned actions of the Dubai Metro security system, and its effectiveness in preventing and managing terrorist attacks and resulting emergencies"

The evaluation of the existing system of Dubai Metro System in the data analysis shows that the system is anchored on an organisational structure that is evolving to meet current and future requirements. The system also relies on sets of specially designed infrastructures for a different set of functions, operational systems and procedures which are carefully planned, coordinated, controlled and managed for effective provision of safe, fast, secured and convenient service. Furthermore, the analysis shows that the infrastructures are engineered and designed to meet emergency needs and current demands. This shows the preparedness of the existing system (Planned Actions) to cope with present and future security situations.

The evaluation of the existing system also shows the robustness of the security arrangements in the existing system designed to ensure the safety and security of passengers, staff and infrastructure. The architectural design of the stations and the restructuring of the traditional security management system coupled with the introduction of state regulations to integrate Dubai railway systems have played important roles in ensuring security with minimal casualties (Byran and Gilad, 2012).

Another feature of the existing system that plays a big role in the existing system's effectiveness in ensuring safety and security is the real-time communication system and signal controls for transmission of all operational data and information on routes and train schedules. It provides the communication capability to the entire Dubai Metro line which connects different units and keeps everyone informed and updated of any security warnings. The protection of this vital feature of the system has been emphasized as important in ensuring the overall security of the Metro line (Hina and Dominic, 2018; Coffelt, Baker and Corey, 2016). It facilitates communication between the employees and passengers in case of an emergency and can help to cancel any potential attack (Coffelt, Baker and Corey, 2016).

The evaluation of the existing system also shows planned actions of the Dubai Metro to embark on state-of-the-art security inspections systems at metro and tram stations to enhance the safety and security of the rail system. An updated comprehensive database on security and safety statistics in the global transport sector is also maintained which keep the security unit informed of developments in security situations. This is aimed at enhancing the development of an evolving security system that can easily accommodate current and future security risks.

5.6.3 Theme Emergent System / Model

The second theme evaluates possible emergent situations of terrorist attacks in the Metro rail transportation and the preparedness of the security units in managing emergent situations which is the focus of the third research objective. It also provides answers to the research question "What are the emergent situations of terrorist attacks that impact on the security of Metro rail transportation?"

The theme identified the important role for planning for emergency procedures which helps to establish different security scenarios of possible criminal and terrorist attacks to formulate adequate and appropriate security systems for Dubai Metro. The scenarios and the formulation of possible security measures are also designed to take account of the changing safety and security needs of the system in future.

The theme also evaluated Police planning and preparedness which resulted in the establishment of two separate organizational units responsible for transport and communications, the development of technical standards and the protection of trains, and the safety and operations of the trains.

The theme also highlighted the important outcome of the planning which I integrated state operations and all state regulations concerning transportation and security. The aim is to enhance the capability of the security units across the different units to effectively manage security within the organisation. The integration thus enables fast response to security threats, and improved efficiency and effectiveness.

The increasing role of passengers and staff in the design of a security system was highlighted in the theme to play a big role in ensuring safety and security on the Metro line. It was noted that the education of the passengers and their level of awareness of security concerns in the rail system enhances the preparedness of the system, passengers and the staff to cope with any emergencies. It increases their level of participation in the design of the security system and creates an atmosphere of safety and an increase in confidence in the system.

The need to consider the human element as a new approach to achieving a secured Metro line was also highlighted thereby requiring a communication system that is technology-powered and also people-powered which makes communication with passengers during emergencies easy and effective. A shift from the traditional security management systems to more people-centred security management systems that are user-friendly is thus required to effectively manage any emergent situations.

5.6.4 Theme - Deferred Action/System - Security Management Tools and Interactive Lens

This theme identified concepts and issues that provide answers to the research question "What are the possible deferred actions or modalities for an improved security system in the Dubai Metro to accommodate emergent situations?" and the achievement of the research objective "To identify and formulate possible deferred actions or analytical model (MetPass) for an improved security system in the Dubai Metro capable of accommodating emergent situations?"

The theme highlights activities that blend planned action and emergence as a response to emergent systems. The findings show how through training of personnel and passengers, and the use of new technology and automation of processes plus periodic evaluation of the current system, the existing system including its main features such as organizational infrastructures and planned actions can be adapted and used to respond to emerging situations.

The findings, therefore, emphasize that employees and passenger training is a critical factor for improving the safety and security of Dubai Metro Trains. This data supports the generalization that training will improve safety and security management at Dubai Metro Trains.

This is corroborated by literature that proper employee motivation, training, communication enhances loyalty, participation and productivity while the adoption of technology-supported security learning and planning system help in achieving enhanced security against terrorists' threats (Oglesby *et al.*, 2014; Cao *et al.*, 2013; Yu, Patterson and de Ruyter, 2013).

5.7 Improved Dubai Metro Trains Security Management System

The findings and the discussion on the identified themes show the importance of the three main constructs of the conceptual framework based on the deferred action theory (Patel, 2007). It shows the interrelationships / inter-dependencies between the three constructs of existing systems / planned actions; emergent situations; and deferred actions for improvement.

The analysis and the findings show the need to regularly evaluate existing security systems usually based on past planned actions to achieve old organizational goals in terms of its efficiency to cope with current or future security requirements. This periodic evaluation would highlight areas of weakness of the existing system and what needs to be done to make it fit for purpose in the current or future dispensation.

The second theme which reflects the second construct of emergent situations provides the platform to reflect on current and future security requirements and needs of the organization. It shows the importance of reflecting on the reality of the situation and gaining an understanding of possible emergent situations. The understanding of these possible emergent situations and insight of the weaknesses of the existing system/planned actions would therefore create the platform to formulate plans and strategies (deferred actions) of meeting the new challenges of the existing system.

The third theme, therefore, provides the platform to formulate activities that blend planned action and emergence as a response to emergent systems. The activities would be based on the findings of the weaknesses identified in the evaluation of the existing system (Planned Actions) and the new requirements such as training of personnel and passengers, and the use of new technology and automation of processes.

The formulation of activities for the improvement of the Dubai Metro security system is therefore based on the understanding and examination of the concepts and constructs identified in this research using the conceptual framework. Furthermore, it demonstrates the use of deferred action theory in emergent situations which provides organizations with the opportunity to identify relevant actions based on current and future requirements and blend those actions with existing planned actions to cope with emergent situations.

The main purpose of this study was to evaluate and propose an improved Dubai security management system. As Chapter 3 notes a pragmatist researcher is concerned with searching for theoretical and conceptual knowledge for solving practical problems. Improving the Dubai Metro Trains Security Management system with MetPass would categorize the organization as a CAS, an institution that demonstrates spontaneous order (self-organizing). Interactions between systems that were initially disorderly trigger a connection that

introduces inclusiveness to resolve employee feedback on designing artefacts that are user-friendly to resolve insecurity, and address design mismatch. After evaluation of the four modules of the MetPass model, the researcher identified elements required for improving the Dubai Metro Trains Security management as shown in Figure 9 below.

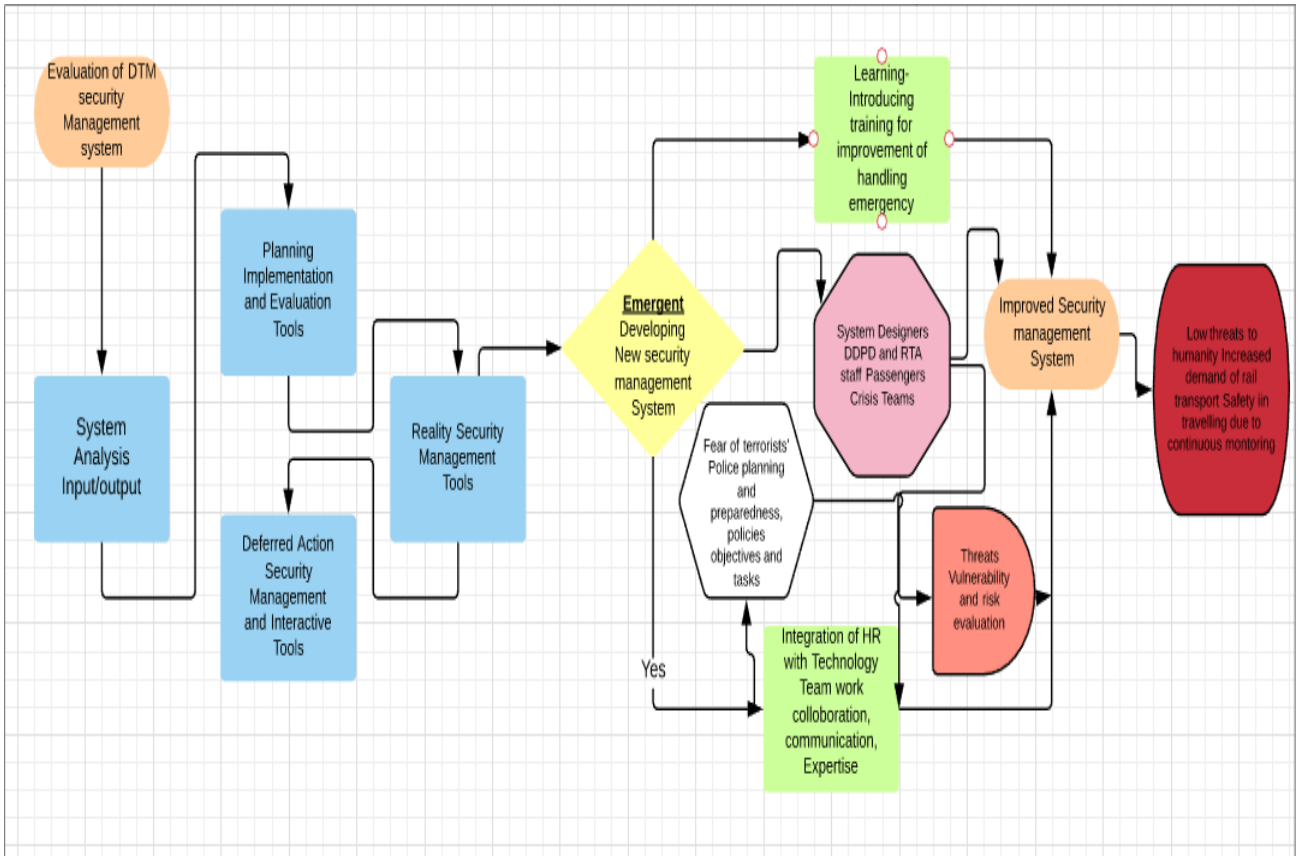


Figure 9 - Improving the Dubai Metro Trains Security Management System

The input/output security management system module of the MetPass epitomizes DTM as a security management organization allowing employees, passengers, stakeholders and strategists to use several technologies and methods for a wide range of security management. The main actors, representing an organization CAS with a common objective of promoting the security of the Metro trains were employees, managers, passengers, stakeholders and strategists all these are relevant for improving the Security management systems.

The actors criticized the absence of an effective design for the existing security management system that is designed through the participation of all key employees and managers (RTA 1,4,6 and DPD 3,4,6). Their contributions as presented in this Chapter, suggests that the research could contribute to effective security management systems with integrated human resource factor with technology and collaboration between senior and junior employees. The theoretical applicability of the MetPass model is validated, as an actuality model for and evaluating and improving security management in Dubai Metro Trains to cater for changing terrorists' behaviour.

The interpretation of the data confirms the security management system model represents a complex adaptive system that can change through continuous engagement of the actors through discussions (feedback) and collaboration. The data advance the 4 modules varied viewpoints which through continuous analysis would bring transformative growth. Consultation of the different elements of the security management system such as policies, objectives, risk register, preparedness for emergency and capacity building were confirmed by system users' weekly reviews, emails, and feedback to warrant the model applicability in security management. The empirical data formalize the perspectives that interactions between users of organizational systems emerge as planned, emergent or deferred as illustrated in the three modules of the MetPass.

The study findings reveal that deferred action-based strategies for evaluation and improvement as useful factors for improving the security management system to address the reality of daily operations of the Dubai Metro Trains.

5.8 Conclusion

The data analysis integrated the various data sources for data analysis. The researcher used NVivo 12 software for this cause. The fusion of the raw data from the three sources is

harboured with ease using the Nvivo12 software. This facilitated the case study researcher to set up the case study research raw data from the five sources, into nodes and categories. From this, the researcher used Nvivo12 to assist in the design of diagrammatical flow patterns. From this, the researcher was able to identify associations and trends from the analysis. From the data analysis, the researcher draws the understanding that employee training, awareness, passenger training, employee planning are the four most frequent factors affecting the security management system. Reflecting on these findings, the researcher gained an understanding of how to develop an effective security management system in an emergent organization. These findings were considered with the deferred MetPass analytical model to develop the conceptual framework to assist Metro Trains in security management systems. This tool-assisted the researcher in addressing the Metro train security management system problems in Chapter 1. The MetPass is applicable in emergent organizations facing the challenges of insecurity. The theory of deferred action assisted the researcher's approach. The analysis of data supports the three components of the data viz planned action, emergence, and deferred action. These are the essential features of security management systems. This assisted the researcher in understanding the phenomenon by classifying data into planned action, emergence or deferred action. This was observable throughout the data analysis process.

Additionally, some of the periodical problems that the researcher identified from the data analysis are training, planning, integrating the human factor, policies and procedures, and preparedness. The researcher through analyzing and cross-referencing the patterns identified relevant results from the data sources. The analysis assisted the researcher to gain an excellent perspective on how to address the security management system to subdue the emergent problems of the existing security management system. The researcher from the data analysis confirmed that the deferred model of reality is appropriate to evaluate the security

management system of Dubai Metro Trains. The recommendations made by a large number of participants endorse the reliability of the MetPass model, advanced in Chapter 3, for evaluating the Dubai Metro Trains security management system to enhance security management.

The majority of participants are comfortable with the model. Although there emerge some issues, the overall results do not affect the participants' support for the conceptual framework. The results also show that most of the participants could relate to the components of the conceptual framework. The results concur with the qualitative method applied in the research. The overall views indicate that the proposed components of the conceptual framework are enough in evaluating and improving Dubai Metro trains security management systems. Some participants gave simple yet affirmative answers. The results from in-depth interviews, focus groups and document analysis indicate that the overall framework has been approved and accepted by the respondents' views. Positive views were generated regarding the proposed conceptual framework to evaluate and enhance the security management of Dubai Metro trains. The role of training was important directly to evaluate and improve the security management of Metro Trains. Adoption of modern technology would achieve the expected outcomes of improving safety and security.

The participants through the interviews pointed weaknesses in the existing model, the participants were optimistic that concerted attempts of individuals and departments for re-designing the existing safety and security management systems would bring the desired results. The participants sought reliability in this study, by applying deferred action theory to propose a conceptual framework based on evidence, the conceptual framework model, for evaluating and improving the security management systems of Dubai Metro trains. The research was seen as a potential renaissance for transforming Metro trains into a safe and secure hub.

The wide range of comments by the different participants validates the credibility of the deferred model for re-designing and evaluating the security management systems for Dubai Metro Trains. From the participants' input, we can conclude that our system needs proper IT, communication, planning, employee training, integrating human resource factor with technology, and preparedness are the main elements of our security management system. The findings from the analysis of the data are quite pleasing, leading us to conclude that from the emergent themes the proposed model (structure) will improve the security of Dubai Metro trains. We have found deeper knowledge and understanding of the best design for the security management system at Dubai Metro Trains. We have developed the appropriate design through invention, and knowledge that is capable of predicting the safety and security of Metro Trains. In the next chapter, we will present the design and action of our deferred model action, this design will alter the existing one and it will invoke change. The deferred action has given us insight into natural design in the surroundings of rational design. The design includes empirical knowledge, as well as, theoretical constructs. The design will address the theoretical problem. The new design is a subset of individual action, a subset of natural design and a subset of natural action. Our design will explain how formal design will work in reality.

In the next chapter, the theory of deferred action will elaborate on the possible design and the outcomes. The design and designers are defined in this chapter; the roles of the design are distinguished in this chapter. Within the case of Dubai, the deferred model designed through this study would be suitable for later use with limited to no vulnerabilities that could affect the running system of Dubai’s Metro Train. When addressing issues of security and safety our deferred model will supplement rational design with the combination of natural design. The recommendations plus other analyzed ethnographic evidence in this Chapter are

organized in Chapter 6. The Chapter will exhibit the MetPass model implications on the evaluation of the Dubai Metro Trains security management system.

6.0 Research Overview, Contributions, Limitations and Future Research

6.1 Overview of the Research

This research was guided by the insights stemming from the theory of complexity, specifically the theory of deferred action. It holds the view there is no cause-effect explanation of reality; instead, the reality is complex and the complexity is emergent. The research questions were; therefore, designed by developing the MetPass model as the conceptual framework. The framework postulates that any design of organizational artefacts should cater for three dimensions namely: planned action, emergence and deferred action to provide for emergence. The findings of the study contributed to the empirical evidence of deferral in the security management system. The principles of deferred design facilitated the researcher in designing the evidence-based conceptual framework.

The findings of the study indicate that generally, like the MetPass security management system, many business processes design methodologies assume that the processes can be contrived rationally basing on one design –planned action. From the literature review in Chapter 2, the study assumed that the planned action is the best in maximizing rationality. The study proposed the conceptual framework based on the deferred action theory that has three dimensions for designing social systems; planned action, emergent organization and deferred action. Through a synthesis of these three dimensions, there is an occurrence of business processes that can respond to the emergence of emergent security needs. Generally, designing artefacts that can function in changing environment should be based on the

dimensions of the deferred theory. The researcher opined that unpredictable events such as a change in terrorists' behaviour in the emergent process can be catered for by using the deferred dimension approach. One objective was to understand how to pinpoint emergence and the other objective was to improve the security management system. So the researcher proposed the MetPass model to evaluate and improve the Dubai Metro trains security management systems. Through a case study approach, this study investigated the effectiveness of emergence on security management processes using the MetPass model and how to design security management process in the context of emergence.

The security management of Dubai Metro trains and the design gaps advantaged the case study researcher to evaluate critically and analyze the MetPass model for improving the security management system of Dubai Metro trains. Using the ideas of deferred action theory to understand how Dubai Metro trains can design effective security management systems in reality to attain transformative growth. To interpret the phenomenon, the researcher explored literature on the design of trains and railways, integrating human resource factor with technology and capacity building and prepared to achieve expected performance. The repercussion of failure to plan in reality has adverse outcomes on the security management system development.

The Dubai security management system design is different from the researcher's evidence-based framework, the MetPass security management model. Using the theory of deferred action, the researcher understands how Dubai Metro Trains can plan and collectively manage their security systems to gain transformation growth. The researcher reviewed the literature on railway systems, security of railway systems, and modern technology used in railway systems to gain knowledge of the phenomenon.

The researcher in the introductory Chapter introduced the aims and objectives of the research which authorized the researcher to evaluate the research outcomes with the plan of the study. The researcher employed a case study approach to achieve the research aims and objectives. This approach empowered the researcher to explore the social aspects placed between the evidence-based MetPass model and the evaluation, and improvement of the Dubai Metro trains security management system. The case study methodology authorized the researcher to consolidate the social features into both theory and practice. The primary objective of this research is to critically evaluate the current Dubai Metro trains security management system, and identify the strategies for strengthening security. By undertaking the case study approach, the researcher was able to answer the main research question: "How can the Dubai Metro trains design an effective security management system that supports emergence in organizations?" Other secondary questions are:

1. What is the relevant literature on train transport security management; train systems and their components; security issues: threats and vulnerability of train systems, terrorism and its causes as attributable to different theories, and the strategies for security?

2. How effective are the current Dubai Metro train security measures?

3. What are the strategies for tightening up the Dubai Metro train security measures?

4. How can Dubai Metro Trains design an effective security management system to enable continuous safe service delivery?

Conducting this research using the case study research methodology, the researcher established after completing the research that the posed research questions were not only suitable for this research but also assisted the researcher in fulfilling the presented research aims and objectives through the MetPass analytical model previously discussed in Chapter 3.

In Chapter 2 the case study researcher discovered that the different modules would be practical in critically analyzing and evaluating the current security management systems. The case study researcher data in this review of the literature chapter supported the claim of police preparedness training, and train designs to enhance security management. The researcher generated themes from the case study research data to show the relationship between the different MetPass model in Chapter 5. The review of the literature in Chapter 2 assisted the researcher in adopting a befitting theory to address the research. The researcher used the theory of deferred action which enhanced a more decipherable understanding of the phenomenon. This complies with (Grant and Osanloo, 2015) articulating that the theory selection should assist the researcher in organizing their ideas, generate reasoning, and refine their predictions. The researcher achieved this through the lens of the MetPass deferred model of reality conceptualized in theory.

Chapter 3 described the theoretical and conceptual framework of the research. First, the researcher looked into the application of the deferred action theory to determine its applicability to the current study. The researcher proposed a conceptual framework to enhance understanding of the Dubai Security trains management systems. The researcher applied the theory of deferred action to facilitate the MetPass analytical tool to critically evaluate and analyze the current safety and security management systems of Dubai Metro trains. The MetPass model draws on the fundamentals of socio-technical systems to assume that planned police training and awareness and design of railway security systems should be designed flexibly to enable agents to reorganize layout to meet the security management systems requirements to achieve a secure organization.

In Chapter 4 the researcher explains their epistemological and ontological position. The researcher adopts an intrepretivist paradigm that social action is emergent. The case study researcher re-evaluated the cooperation between methodology and the purpose of the research

to select a qualitative approach and the case study method. The researcher chose the qualitative research position which is backed by (Gilbert, 2008). However, (Johnson and Onwuegbuzie, 2007; Ortiz, 2009; Clark and Creswell, 2011; Given, 2012; Taylor, 2013b; Leal Filho and Kovaleva, 2015; Tashakkori, Teddlie and Johnson, 2015) suggests that researchers should use mixed research approaches. The researcher maintains that utilizing mixed methods regenerated a conflict with the epistemological and ontological perspectives of the research.

The researcher in Chapter 2 described the ethnographic background of the case study. The case study background could not have been understood without considering Dubai City, the arena of Dubai Metro Trains. The researcher had to look at the context of RTA and DPD where he gathered most of the ethnographic data. The two institutions are responsible for the security management and development of Dubai Metro trains. The Dubai Metro trains are assumed to be an emergent organization with the processes and structures continually changing. Using the research methods analyzed in Chapter 4, the MetPass model is validated with empirical data collected from Dubai Metro trains to conclude that the model is applicable in critically analyzing and evaluating the Metro Trains security management system.

In Chapter 5 the researcher compiled all the data from different sources together for data analysis purpose. The ethnographic researcher used NVivo12 software package for data analysis. The researcher enrolled on a course on how to utilize the software package. The software package is easy to use and has a user-friendly layout. The layout is based on Microsoft Outlook 2012. The researcher approached a thematic interpretive approach to identify patterns in the data and the relationship between data and the security management modules.

6.2 Research Importance

The researcher identified the research problems through the methodological fusion of existing literature from the theory of deferred action. The researcher critically employed the qualitative case study research approach where the formulated conceptual framework based on concepts from literature and the theory of deferred action was used to critically evaluate and analyze the security management system of Dubai Metro Trains using the ethnographic data from Dubai Metro trains. This demonstrates contributions to the body of knowledge for deferred action researchers. The inputs of the research correspond to the critical analysis and evaluation of the Dubai security management system, the theoretical application in addressing the design problems in reality, and the suitable methodological approach which could be ideal for the study phenomena in security management.

6.3 Contributions of the Research through Theory and Approach

The research may have had different definitions and interpretations widely. Nonetheless, what is evident it needs to contribute to knowledge on how the deferred model is used to critically analyze and evaluate the security management systems of Dubai Metro trains an emergent organization.

The use of the conceptual framework which reflects on the three main constructs of the theory of deferred action provides the platform for organizations to view their existing systems as planned actions based on planned organizational goals and objectives which may change based on current or future environmental situations. It also provides the opportunity to reflect on current and future security requirements and needs of the organization using the emergent construct. This shows the importance of reflecting on the reality of the situation and gaining an understanding of possible emergent situations that could disrupt the existing system and its inadequacies. The theory also can provide organizations with the platform to

formulate activities that blend planned action and emergence as a response to emergent systems.

One of the practical benefits of the theory of deferred action is thus highlighting the need and enabling a regular evaluation of existing security systems usually based on past planned actions to achieve old organizational goals in terms of its efficiency to cope with current or future security requirements. This periodic evaluation would highlight areas of weakness of the existing system and what needs to be done to make it fit for purpose in the current or future dispensation.

The second practical benefit is the platform provided to reflect on current and future security requirements and needs of the organization. It shows the importance of reflecting on the reality of the situation and gaining an understanding of possible emergent situations. The understanding of these possible emergent situations and insight of the weaknesses of the existing system/planned actions would therefore create the platform to formulate plans and strategies (deferred actions) of meeting the new challenges of the existing system.

The research results amicably make contributions to researchers and the Dubai Metro trains employees. The inputs are condensed in Table 13 with a few probable areas of improvement.

Research Approach	Contribution
Theory	The researcher recognized the emergence phenomenon in the literature review and endorsed the theory of deferred action in the evaluation and analysis process by applying the MetPass model.
Practice	The researcher used the conceptual framework based on the three main

	constructs of the theory of deferred action to critically evaluate and analyze the security management systems of Dubai Metro trains. This conceptual framework and the theory of deferred action can be employed in other emerging organizations with a security challenge.
Methodological	The researcher used data triangulation and pluralism in data analysis, a combination of thematic interpretive analysis. The combination of the two approaches enhanced a broader interpretation of the ethnographic data to the participants' which they may use in re-designing the existing security management system. The data from different sources were validated as there were no conflicts in the data

Table 9 - Research Process Contributions

6.3.1 Practical Contribution

The application of the theory of deferred action facilitated the formulation of the conceptual framework which guided the successful investigation of the study phenomena and the effective achievement of the research objectives. The constructs of the theory which formed the main features/concepts of the framework provide platforms for research investigation, problem/system evaluation and systems reengineering in any organization.

The construct of planned action can be used to carry out regular evaluation of the existing system and the organizational goals and objectives it is founded on. The fit for purpose of the existing system may therefore be easily examined in terms of its efficiency to cope with current or future organizational requirements. This periodic evaluation would highlight areas of weakness of the existing system and what needs to be done to make it fit for purpose in the current or future dispensation.

The second construct of emergent situations provides the platform to reflect on current and future security requirements and needs of the organization. It shows the importance of reflecting on the reality of the situation and gaining an understanding of possible emergent situations. The understanding of these possible emergent situations and insight of the weaknesses of the existing system/planned actions would therefore create the platform to formulate plans and strategies (deferred actions) of meeting the new challenges of the existing system.

The third construct of deferred action provides the platform to formulate activities that blend planned action and emergence as a response to emergent systems. The activities would be based on the findings of the weaknesses identified in the evaluation of the existing system (Planned Actions) and the new requirements such as training of personnel and passengers, and the use of new technology and automation of processes.

The findings thus demonstrate the practical use of the theory of deferred action in emergent situations which provides organizations with the opportunity to identify relevant actions based on current and future requirements and blend those actions with existing planned actions to cope with emergent situations.

6.3.1.1 Applicability of the MetPass Model in Critically Analyzing and Evaluating the Dubai Security Management System

The MetPass model classifies Dubai Metro Trains as a secure organization, enabling senior, junior staff, and passengers to use the trains and the agents to use technology and train designs to offer fast, reliable transport. The primary agents of Dubai Metro trains, composed of CAS, with the common objective of promoting an effective security management system, were the RTA, the Dubai Government, The DPD, and researchers. A small number of people were drawn from each of the agents who used unanimity to achieve mutually agreed security management objectives. The objectives may, however, vary with those of the Metro train

staff who have clearly defined roles and prescribed policies and procedures to achieve passenger security aims. Other external partner groups and institutions like the Dubai University whose input directly affect the Dubai Metro trains security management systems were part of agents whose contributions were relevant in evaluating the security management system and proposing a redesign.

The participants in both DPD and RTA faulted the absence of a practical design and analysis and evaluation models for the existing Dubai Security management system (Interviewees 1, 4, 5, and 3). The participants' contributions as interpreted in Chapter 6, propose that the research would greatly contribute to effective evaluation and improvement of the security management system with the participation of both junior and senior employees, and advanced communication. The MetPass model theoretical importance is justified as the model of reality, for evaluating and recommending designs for the security systems, in reality, to contain changing security needs and improve the passengers' security.

The ethnographic data interpretation reasserts the assumption that the MetPass module is a CAS, entrenched in corporate decisions, for the agents' incessant involvements. The ethnographic data asserts the MetPass model varied the employee training and passenger training which could be analyzed conjointly and ceaselessly from different points of observation to unearth the desired outcomes. The junior and senior employees held informal meetings to justify the applicability of the MetPass model in practical evaluation and analysis of the existing security management system. The ethnographic data certify the observation that the four modules of the MetPass model interactions emerge as the byproduct of security management systems evaluation as described in the below MetPass modules.

The MetPass model employs passenger safety emergency training and passenger safety emergency training to define the planned critical evaluation tools of the Dubai security

management system. The study looked at employee motivation criteria, management supervision, and communication among employees, as elements of planned action dimensions of the deferred action theory. These are considered as the critical secondary characteristics of the MetPass model. The ethnographic data confirms the proposed attributes are continuous employee training on how to operate modern equipment to avert terror attacks. For user-friendly equipment, there is a need to integrate the human resource factor with modern technology. The management powers and organizational planners influenced the researcher interview questions without adequately taking into account the emergent factors (DPD interviewees 2, 3, and 6).

The police planning and emergency procedures module lies within the strategic understanding of Dubai Metro trains security management systems as planning should be achieved and evaluated intentionally. Police planning of emergency procedures is a prerequisite and should be undertaken frequently. The planning should be done flexibly, in the context of the research to address changing security demands to enable Dubai Metro Trains to improve the passenger security management objectives continuously.

The terrorists' attacks awareness module of MetPass model is vital for analyzing the security management system which is unknown and unpredictable but emergent. This enhances the self-organizing of the security management system to adapt to terror threats. This emergent factor of the module could assist the Dubai Metro Trains agents in evaluating the effectiveness of their security management system in recognizing unknown problems and provide solutions to them in actuality to reinforce security management. Planning for emergence is a requisite for abolishing the failures attached to the implementation of organizational systems design. Due to these reasons, junior staff involvement is authorized. Their participation is an adequate condition in evaluating the current security system and

implementing recommendations successfully for (re)designing the security management systems for improved passenger security.

The planned capacity building for the Dubai Metro Train employees MetPass model module employs symbiotic principles to clarify how Dubai Metro trains could analyze and evaluate their security management system to achieve secure organization objectives. This module charts from the dimensions of the theory of deferred action interconnecting planned and emergent reality for successful designs. The module, in that event, describes all evaluation elements which interconnect with the researcher's choices for critically analyzing, evaluating planned employee training, emergent effects influencing the success of the scheduled training including the type of training for deferred evaluation opinions. These opinions are demonstrated by the observations of a unified RTA and DPD in which the actions of the two departments could be managed in reality. Adopting the MetPass model could save the resources of the Dubai Metro Trains, which could lead to time and cost benefits and an enhanced security management system.

From the empirical data interpretation, the following analysis and evaluations were made that are critical in passenger security management. The approaches of management should incorporate the educational aspects and training sessions within the security management department. The training policy should be sufficient to enhance the overall efficiency of safety management in Dubai Metro Trains. The Ministry of Education should work in cooperation with the relevant authorities in ensuring that employees have the necessary skills (DPD, 2, and 4).

Another evaluation factor of the MetPass model is technology-supported security planning learning. Designing of the security management system should incorporate human resources with technology. The curriculum should be designed on technology-enhanced training such

as packages on emerging security threats. The design of the security management systems is sufficient to maintain the security of their passengers and employees. For efficient communication between employees, they should install CISCO wireless communication integrated with the passenger warning system (PIS). Based on the PIS transmission of high-definition signals in real-time will be enhanced (DPD, 1).

Train operators go through training; this complies with the requirements of the traffic act. There are numerous programs in which our employees are enrolled to give them insight into the security management system. The new policy stipulates that the officers must undergo training and some tests before entering the job; they must pass the tests and training to become operators of the train security management system. Psychological tests are conducted; due to the critical operations of the train in which the worker is responsible for the lives must be sure of the integrity of his mental and psychological (DPD, 5).

Findings from the study indicate the evaluation opinions as useful factors for redesigning the security management system in the future. The MetPass model efficiently analyzed and evaluated the Dubai Metro train security system.

6.3.2 Theoretical Contribution

The theoretical research contributions are recapped as follows. The idea of deferred models, the theory of deferred action has become apparent as a post-modernism organization ‘the deferred tool,' and finally, the conception of continuously training employees to improve security management. The deferred notion explains the synchronous interplay between practical actions and emergence as an inseparable pair for constructing social artefacts in emergent organizations. Social artefacts represent the deferred model of actuality to plan interactions of individuals in the study to reflect changing organizations. The theory of deferred action has been applied mainly in organisational design, KMTS/IS/IT design; it has also been applied in research and practice, and it has been successfully applied in the

evaluation and analysis of security management systems. The theory has primarily been relied upon developing IS/IT systems.

The deferred action theory applicability is further evident in the way the research findings endorse the suitability of the theory in analyzing and evaluating the security management system, along with its general belief for all Metro Trains security systems where it, heretofore, it is empirically unconfirmed. The contribution of generalisability relates to applying the techniques learned in Dubai Metro Trains security management to another Metro Train in a different country. Just as the researcher employed the knowledge of deferred action learned in the development of WBIS using Kadar Matrix (Ramrattan and Patel, 2009, 2010a) in the context of Dubai Metro Trains. This is from one country to another.

Another contribution, deferred security management systems, a new feature of deferred designs have been added to the contributions of achieving security management by predicting the behaviour of terrorists. This is where prescribed employee training is enhanced in the deferred model of actuality. These contributions extend employee training skills training to achieve a more efficient training process for producing transformative growth in the emergent Metro trains. The deferred training unifies the employees of both RTA and DPD to a coherent understanding of the relativity of security management systems to achieve a secure Dubai Metro train environment and planned actions are untenable.

The analytical tool (MetPass model) has been designed from the deferred ideology and accepted with the empirical data findings from the DPD and RTA to exhibit how to evaluate and analyze the security management systems, in reality, to address insecurity and terrorism in a changing environment and to continuously achieve improved transformation. Transpiring from the theory of deferred action, the MetPass model implores the doctrines of the theory to challenge the security system (structured systems) ideology for their lack of active modules

to resolve design breakdown in dynamic organizations. This confirms the relevance of the deferred action theory in designing organizational structures and systems in an emerging context. The theory of deferred action confirms the theoretical support of the MetPass model. This is sequentially confirmed with the ethnographic data from DPD and RTA to legitimize the deferred model's exhaustive theoretical contributions. The deferred model is, for this reason, observable for making reasonable contributions to the deferred action theory. The model justifies its applicability as an evidence-based model for critically analyzing and evaluating the security management systems in an emergent organization to support a secure organization. The MetPass model provided an analytical tool for achieving the highest-order security management systems analysis and evaluation which would enable the prediction of future unforeseeable security threat. The model is thence, a reality-based security management framework that proffers inclusive change in social systems. The limitations of the MetPass model for future research will be later explained in Section 7.4 of this chapter.

6.3.3 Methodological Contribution

The case study researcher employed pluralism in qualitative data interpretation. Pluralism is considered a postmodernist where pluralism considers both and not either. The researcher made sense out of the ethnographic empirical data from the theory of deferred action to explain how the MetPass Model can be used to evaluate and analyze the security management systems critically. Interpretive thematic analysis assisted the research in developing themes and criticizing the limits of the security management system and its failures through an intimate comprehension of the components failures (holistically). Thematic analysis identified emerging themes that assisted the researcher in unveiling essential components required for redesigning the security management system. The interpretive phenomenological analysis assisted the researcher in capturing the experiences of the various groups of people. The combination of the two data analysis approaches gave the

researcher a lens to comprehensively interpret the data for the participants' use with the opportunity to re-design the existing Dubai security management systems to support enhanced passenger security.

The theory of deferred action was, therefore, applied to propose the MetPass framework to prescribe how the Dubai Metro Trains could evaluate and improve their security management systems to avert any threats of terrorism and promote transformative growth. MetPass is security management of reality that draws on socio-technical systems to presume that, planning for emergency processes including integrating the human resources factor with technology should be designed using the feedback of junior and senior employees to modify the design to reflect the actual security management systems commanded to achieve transformative growth goals for the organization.

Applying critical research methods and design, the MetPass model was validated with empirical data from the DPD and RTA to conclude that, the MetPass model could be used to evaluate and improve the security management of the Dubai Metro Trains. Through this the case study researcher was guided by the primary research question: 'How can the Dubai Metro trains design an effective security management system that supports emergence in organizations?' Achieving this was with challenges and limitations as described in sub-section 7.4.

6.3.4 Recommendations of the Study

Sustainable organizational systems were the guiding elements for developing the evidence-based MetPass model. Being sustainable is all but, being able to evaluate and continuously improve the security management to bring the desired safety management from terrorism. From the feedback provided by the DPD and RTA participants across this study, it is clear that there is a need to evaluate and improve the Dubai Metro Trains security management. From the study, 5 recommendations have been made which can be used as a guideline to

evaluate and improve security management. The recommendations are divided into the structure, interaction and design.

Structure – The current security management system should be improved using the feedback of system users. A bottom-up approach should be adopted when developing the security management system to maintain continuity of information flow. Links to more information should be included, such as government stakeholders, the army in providing the required information for designing the security management system.

Interaction – The design of the security management system should integrate the human resources factor with technology. Security management systems do not solely depend on preventing security threats, but rather, they as well depend on humans who use the system and act in a certain way in the system environment. The core challenges are from non-technical ills, for instance, human issues. It is, therefore, necessary to understand and address issues that relate to human factors.

Design – The design of the security management should be improved. Due to changing terrorists' behaviour, the system should plan for an emergency. The system should allow for flexibility. The improvement should allow junior employees to take great ownership and responsibilities in the design and implementation of the security management system for enhanced security management.

Embracing the usable model of actuality, such as the deferred model for evaluating and improving the Dubai Metro trains security management would save the organization resources and time and bring immeasurable benefits.

6.4 Research Limitations and Future Research

It can expostulate that the basic element of every doctoral study is a portion of a component of future research that can be commenced as a result of investigating the previous study. Verily this research has not proved otherwise. The actual essence of research is about choice and can always lead to varying storylines. As the researcher analyzed the ethnographic data more and new fascinating features were unearthed. This is the inescapable truth about research which by its original nature is continuously evolving. The theory of deferred action has limitations that the researcher cannot forget to mention. As Kaplan (1964) postulates, "A theory is a far-reaching theory." Theories, therefore, describe a phenomenon or provide propositions and interconnections where there is no observed data. Scientific theories, for example, encompass prognosis which is later verified through experimental tests or observed data. The deferred action theory is traditionally in this position. The theory can be substantiated through instantiations. Some instantiations were debated earlier this, however, does not observe emergence substantially and its consequences on the design of the security management systems. Further theory development work can address this. It is the researcher's interpretation that governs when and how to defer the design. The research, nonetheless, has to be considered despite the limitations. There is no ideal research; every research has its weaknesses and limitations a comprehensive and flawless research never exists (Lin, 2000).

Limitations expressed in this research introduce the conventional limitations of the theory and practical issues together with the research design approach. Had the researcher employed a combined qualitative and quantitative approach he would have had more profound insights and knowledge of the phenomenon. The following limitation interprets the research: The analytical tool (viz MetPass) designed to assist the researcher in evaluating and critically analyzing the security management systems of Dubai Metro trains is limited to being used in an emergent organization. Testing the same analytical model in a different environment

context is required to give advanced clarification and boost credibility to the MetPass analytical tool (Ghanim, 2018). The applications as mentioned earlier would further experiment with the theoretical explanation especially the theory of deferred action.

The theoretical framework of the research provides knowledge for developing the MetPass model and the process of developing the deferred model. But a lot needs to be done, some to subdue the limitations of the research. The limitations may be caused by validity, findings generalizability and reliability of data. A flexible research design is needed as the research progresses to avoid the limitation 'sampling frame' (Saunders *et al.,* 2011).

The effective use of the conceptual framework would depend very much on the availability of organizational data and social/environmental data including company policies, regulations, goals, criminal records, etc. The use of simulation techniques to simulate emergencies may not also give accurate predictions.

The participants are found randomly depending on who and what data was found before. This determines the emerging sampling to reinforce the theoretical framework. The researcher attempted to identify anomalies in the data and the theoretical framework. But the sampling method was enough. This means the participants of the research were selected for the research.

The criteria used to select the sample participants is another limitation – in this study the junior and senior employees. The researcher ascertained that the sample corresponding to the hierarchy of the organization, junior and senior staff were identified based on their positions in the organization. This might be a limitation since these participants could have conveyed their interest without understanding it. The researcher attempted to overcome this by using directions from fellow staff and official documents to substantiate the interview participants.

The researcher was able to access all the security management processes and actors, therefore, the study was not limited by failed entry (Tuckett, 2004).

There is a possibility of limitations in data gathering and analysis methods (Saunders *et al.,* 2011). The methods used in this study were in-depth interviews, focus groups discussions and documents analysis. The type of data required to confirm the security management system using the analytical model was obtained using these techniques. The questions of the in-depth interviews were designed using the literature review and focus groups discussions. The data collected indicated the dimensions of the MetPass model and emergent points. A further set of questions by strategists on the perceived unpredictability and uncertainty could have enhanced further understanding.

Other limitations the researcher faced was, comprehending the research problem which required a comprehensive review of literature this was quite challenging for the researcher since it involved classifying literature into the related subjects within the four modules of the MetPass model. This coherent approach was applied to the design of railways and trains, police planning and emergency procedures, passenger safety emergency training, terrorists' attacks awareness, and planned training for Dubai Metro staff. The complexity of emergency planning requires a vast amount of data which was difficult to acquire. Theoretical constraints are corresponding to the specific situation reality is identified as a deferred point for interconnecting planned action and emergence to get transformative change (Ramrattan, 2009,2010). This is mostly an issue of the designers and managers designing security management systems for emergence. The Patelian theory takes emergence as a natural power to initiate planning in reality to address issues affecting transformation. The case study researcher reply to approach the context of reality is that situations vary to another affecting how the perceived organization agents interact with one another.

The researcher at some point applied personalized perception in classifying the literature. The researcher was required to think critically to achieve the research objectives from the research methodology used. This demanded the researcher's devotion and perseverance to submit beneficial and provocative research findings. The lengthy ethical procedures were disappointing as they involved committees in approving my involvement as a researcher due to the sensitivity of the study. Dubai Metro trains required redesigning the research procedure to meet their context. The process was time-consuming, tedious, and exigent, however, the researcher developed interesting insights which contributed to the body of knowledge.

Researching Dubai was costly for the research. It brought the problem of choosing the appropriate method of ethnographic data collection as Arabic is the common language. Analyzing data had its challenges as most interviews were done in Arabic. The researcher had to spend large amounts of time working on transcriptions and transcribing the interviews in English. Researching Dubai involved consistently travelling which was costly for the researcher. Choosing a rigorous data analysis method for data interpretation to satisfy the Metro participants' posed the greatest challenge. This challenge led the researcher to combine the interpretive approach to both primary and secondary data.

6.5 Reflecting on the Researcher's Approach

Besides the experience of the researcher, there exist factors that can limit the successful execution of a case study research. For example, case study research suffers from the observer effect (Hawthorne effect). The observer effect is a type of reactivity that occurs, and individuals alter their performance or behaviour when they become aware they are being studied or observed. The case study research is an intrusion in nature; this can have adverse effects on the study. Even though probable conflicts have been looked at and introduced in the study, there may exist some that are not evident within the environment of the case study.

Further investigation is required in regards to considering the time allocated for the research. The researcher discovered the thesis research questions proposed in chapter 1 as applicable to explore. This is reinforced by the data which identified related problems faced by security management systems in emerging organizations. The issues are lack of skills and training, and changing terrorists' behaviour. The researcher used a case study approach to explore these problems, and this approach assisted the researcher in answering the research questions. This approach enabled the researcher to employ the MetPass analytical tool in evaluating and critically analyzing the security management of Dubai Metro trains. Using a case study approach enhanced the collection of data necessary to answer the research questions. The researcher used different views to interpret the data. The different approaches to data analysis enabled the researcher to evoke answers from the data explicitly. This reasoning accelerated the building of small themes and patterns to establish whether there are evidence and correlation between modules of the MetPass model. The case study approach gave credence to effectuated themes and patterns. Therefore, the data interpretation approach is contemplated fit. Authors have expansively documented the process of conducting a case study approach; however, it is not comprehensible. This can be an area for future research within the restrictions of PhD research. PhD researchers with insufficient background knowledge in the case study approach field are unacquainted researchers; some though may have interesting notions. Nonetheless, unfamiliarity in common terms is not something that available literature on case study research takes into consideration.

6.6 Future Research

The purpose of this study was to evaluate and improve the security management of Dubai Metro trains using the deferred model (MetPass). The utility of the knowledge yielded from this study has been discussed in this Chapter. The study has highlighted how a security system designer can improve their understanding. The study has also ascertained the theory

of deferred action ability to explain security management within an advanced trains emergent organization context. The case study researcher, however, postulates that applying the MetPass model in various contextual environments will further usability and might bring forth a broad appeal to both academicians and practitioners.

The case study exploration discovered that the development of the security management system is problematic since the investigation displayed a continuous change in terrorists' behaviour and organization processes. The knowledge and understanding gained from the theory of deferred action facilitated the researcher in understanding emergent organizations. Using the theory of deferred action MetPass model of reality in the study helped the researcher in identifying none of the 5 theories of terrorism identified in the literature review could be successfully and systematically implemented from the beginning to the end due to emergent factors. The MetPass model enabled the case study researcher to understand an emergence phenomenon and furnish practical knowledge to address emergence in the development process.

The three-dimension models of the theory of deferred action are the underlying principles for the MetPass model. The MetPass model enhanced the researchers understanding of the emergence phenomenon and gained the practical knowledge to deal with the emergence in security management. The researcher also identified that none of the methodologies explored in the literature review could be successfully applied from start to finish due to emergent factors. This research has expanded the knowledge of researchers interested in deferred action theory research. The research has highlighted the improvement in understanding how the MetPass model is used to evaluate and analyze security management systems. The research as well verified the theory of deferred action ability to explain the insecurity Phenomenon within an emergent best ranked Metro Trains context. However, while the MetPass analytical model explains how to strategically plan to achieve an enhanced security

management system in a transformative organization, the quantitative advantage of an efficient security management system for Metro trains and other organizations is untouched. This research commandeered the deferred action theory in qualitative methodologies; the critical researcher lacked the freedom to explore the disparity in the MetPass model emerging from features transpiring from any changes, omissions of the three evaluation dimensions' that could affect the security management system. A proficient theory should provide researchable arguments that are logically extracted from the theoretical explanation of deferred action. The ToDA results in a few arguments: information, as explained by people, is progressive, actions and reactions of individuals are subject to change, emergence affects data and information, organizational structures and processes are emergent. It is thereby crucial to enhance the deferred action theory. The above arguments can be researched empirically. This allows future researchers to produce a MetPass model using the deferred model of actuality for evaluating the impact of insecurity on the security management of emergent organizations. Researchers can apply the MetPass models in different contextual environments which will further test the applicability of the model in reality and may generate an extensive interest to both academicians and practitioners.

Future research can further arise from two perspectives. First, it may be important to conduct further research to address the research weakness. The weakness stems from the research design itself, gathering of data and data analysis (purely qualitative approach). Second, further research may be necessary to explore the findings of the data analysis, which are the interpretations of the data analysis.

The notion of system tailorability is confined to organisational changes and there is the need to keep the systems relevant to changing organizational needs. The interpretations in the study may not apply to organizations where change is of minimal impact. Given the problem of designing security management systems or relevant changing security needs, the study has

assumed that allowing actors/users to design systems may offer a different view on some of the challenges strategists and system users face regarding security needs. The idea of user-design of security management systems may not be a feasible proposal in many organizations where there are authoritative and hierarchical organization structures are dominant rather than democratic and flat organizational structures.

Regarding the research design, it might be essential for the researcher to spend more time than had been assigned in the various Dubai Metro Trains departments as an observer. This would provide the case study researcher with additional information on how the security management systems are developed and utilized. The empirical data gathered through observation, which was not part of the previous research design, could be compared with the data from the in-depth interviews and focus groups discussions. The comparison would be utile since it would either support the interpretations or contribute to their revision.

The interpretations may be also improved by conducting longitudinal research of similar organizations or other trains across the world. This one-time study may have been a result of biased data collection and interpretation since organizations need change. The results may be evaluated in other similar organizations to check the strength of generalization.

Finally, as discussed in section 3.6, one merit of employing the case study research method is that it generates concepts that may be used for future research. The topic of deferred systems is a significant concept for developing and improving ‘living security management systems in any organization. The idea of developing ‘living’ security management systems requires to be ascertained. Specifically, queries arise as to how the idea can be integrated with the development of security management systems and usability such that the idea of designing a tailorable system is operational.

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Appendix

The Interview Questions

Questions for Interviewees from Dubai Police Force

High-Rank officers

1. What is the main purpose of the metro train transport? How is it different from the key purposes of other forms of road transport?
2. How safe are the metro train passengers during commuting on the train?
3. What potential dangers could make passengers feel worried when commuting on metro trains?
4. How likely are terrorist attacks occurring on the metro train or station?
5. In your opinion, what could motivate people to cause terrorist attacks on metro trains?
6. What would be the potential effects on passengers and businesses if terrorist attacks have occurred on metro trains?
7. How prepared is the high-rank police officers of Dubai Police to respond to terrorist attacks on metro train transport?
8. How prepared is the Dubai Police to respond to terrorist attacks on metro train transport?
9. What kind of terrorist-related training has Dubai police staff received to deal with terrorist attacks particularly on metro trains? How was the training planned and who was involved in the planning?

10. How can the junior police officers contribute to training design that could identify and prevent likely terrorist attacks?

General Staff

1. What is the main purpose of the metro train transport? How is it different from the key purposes of other forms of road transport?
2. How safe are the metro train passengers during commuting on the train?
3. What potential dangers could make passengers feel worried when commuting on metro trains
4. How likely are terrorist attacks occurring on the metro train or station?
5. In your opinion, what could motivate people to cause terrorist attacks on metro trains?
6. What would be the potential effects on passengers and businesses if terrorist attacks have occurred on metro trains?
7. As a junior police staff, are you confident enough to respond to terrorist attacks on metro train transport? Please explain why you do/don't feel prepared.
8. As a staff of Dubai police do you think the Dubai police has the capacity to respond to terrorist attacks on Dubai Metro? Please explain your answer by giving examples.
9. What terrorist related training have Dubai Police received to deal with terrorist attacks particularly on metro trains?
10. Is the training effective to identify terrorists' behavior? Please explain why and how it is or it isn't

Questions for Interviewees from Dubai Railroad Transport Agency

Senior Staff

1. What is the main purpose of the metro train transport? How is it different from the key purposes of other forms of road transport?
2. How safe are the metro train passengers during commuting on the train?
3. What potential dangers could make passengers feel worried when commuting on metro trains
4. How likely are terrorist attacks occurring on the metro train or station?
5. In your opinion, what could motivate people to cause terrorist attacks on metro trains?
6. What would be the potential effects on passengers and businesses if terrorist attacks occurred on metro trains?
7. How prepared is the managerial staff of RTA to respond to terrorist attacks on metro train transport?
8. How prepared is the Dubai Metro Train Transport, in particular, to respond to terrorist attacks on metro train transport?
9. What specific plans do the executives of RTA have in place to prevent terrorist attacks on Dubai Metro Train Transport?
10. What kind of terrorist-related training has Dubai RTA staff received to deal with terrorist attacks particularly on metro trains? How was the training planned and who was involved in the planning?

General Staff

1. What is the main purpose of the metro train transport? How is it different from the key purposes of other forms of road transport?
2. How safe are the metro train passengers during commuting on the train?
3. What potential dangers could make passengers feel worried when commuting on metro trains
4. How likely are terrorist attacks occurring on the metro train or station?
5. In your opinion, what could motivate people to cause terrorist attacks on metro trains?
6. What would be the potential effects on passengers and businesses if terrorist attacks occurred on metro trains?
7. As an RTA staff are you confident enough to respond to terrorist attacks on metro train transport? Please explain why you do/don't feel prepared.
8. As an RTA staff do you think the Dubai Metro Train Transport has the capacity to respond to terrorist attacks on metro train transport? Please explain your answer by giving examples.
9. As an RTA staff, what terrorist related training have you received to deal with terrorist attacks on metro trains? Is the training you have received effective to identify terrorists' behavior? Please explain why and how it is or it isn't?
10. What specific things can the Dubai Metro Train Transport do to support passengers in case of terrorist attacks?

Focus Group Questions

Sample Focus Group Discussion Questions for Dubai Police Force

Higher Rank Group

1. In your capacity as a high-rank officer, have you ever experienced a security breach case in Dubai metro? How did the Dubai Police deal with the case?

2. Think back over all the years that you have work in Dubai Police as senior staff and tell us when did you find the force most successful in dealing with attacks to the Dubai Metro system?

3. Think back over all the years that you've worked in Dubai Police as senior staff and tell us when did you find the force least successful in dealing with attacks to the Dubai Metro system?

4. What needs improvement?

5. Suppose that you were in a decision-making position and could make one change in policy that would make the security of the metro system perfect. What would you do?

6. What can each one of you do to improve the security of the metro system in Dubai?

7. Suppose that you had one minute to talk to the minister of interior and minister of transportation about securing the Metro system against terror attacks. What would you say?

Staff Group

8. Have you ever been experienced a security breach case in the Dubai metro? How did the Dubai Police deal with the case?

9. Think back over all the years that you've worked in Dubai Police and tell us when did you find the Police most successful in dealing with attacks to the Dubai Metro system?

10. Think back over all the years that you've worked in Dubai Police and tell us when did you find the Police forces least successful in dealing with attacks to the Dubai Metro system?

11. What needs improvement?

12. Suppose that you were in charge and could make one change that would make the security of the metro system perfect. What would you do?

13. What can each one of you do to improve the security of the metro system in Dubai?

14. Suppose that you had one minute to talk to the highest-ranking officer about securing the Metro system against terror attacks. What would you say?

Sample Focus Group Discussion Questions for Dubai Railroad Transport Agency

Senior

1. In your capacity as a senior officer, have you ever been experienced a security breach case in Dubai metro? How Dubai RTA dealt with the case?

2. Think back over all the years that you have work in Dubai RTA as senior staff and tell us when did you find the force most successful in dealing with attacks to the Dubai Metro system?

3. Think back over all the years that you've worked in Dubai RTA as senior staff and tell us when did you find the force least successful in dealing with attacks to the Dubai Metro system?

4. What needs improvement?

5. Suppose that you were in a decision-making position and could make one change in policy that would make the security of the metro system perfect. What would you do?

6. What can each one of you do to improve the security of the metro system in Dubai?

7. Suppose that you had one minute to talk to the minister of interior and minister of transportation about securing the Metro system against terror attacks. What would you say?

Staff Group

1. Have you ever been experienced a security breach case in the Dubai Metro? How Dubai RTA dealt with the case?

2. Think back over all the years that you've worked in Dubai RTA and tell us when did you find the RTA most successful in dealing with attacks to Dubai Metro system?

3. Think back over all the years that you've worked in Dubai RTA and tell us when did you find the RTA least successful in dealing with attacks to Dubai Metro system?

4. What needs improvement?

5. Suppose that you were in charge and could make one change that would make the security of the metro system perfect. What would you do?

6. What can each one of you do to improve the security of the metro system in Dubai?

7. Suppose that you had one minute to talk to the highest-ranking officer about securing the Metro system against terror attacks. What would you say?"