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Critical Success Factors to Motivate Citizens to Participate In a Public Safety Smart City Project

by

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January 2020

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In a Public Safety Smart City Project

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Dissertation

submitted in fulfilment of the requirements for the degree

Master of Commerce

In

Information Systems

In the

Faculty of Management and Commerce

of the

University of Fort Hare

Supervisor: Prof Roxanne Piderit

January 2020

Abstract

Currently more people reside in urban areas than previously. The population shift from rural to urban results in increased problems with Public Safety. Public Safety initiatives were introduced to address such issues and help reduce the increasing number of urban problems. It is the citizen's responsibility to report the Public Safety issues they observe or experience for authorities to respond quickly in emergency situations, thus maintaining a safer living environment for all citizens.

A Public Safety Smart City Project was introduced in the city of East London, South Africa to help improve Public Safety in the city. However, in order for this to be successful citizens need to contribute by reporting Public Safety issues and suspicious activities. This study is therefore focused on motivational factors to improve citizen participation in a Public Safety Smart City Project.

The Design Science Methodology and a mixed method approach guided this research study. Keller's (2010) Attention, Relevance, Confidence, Satisfaction (ARCS) Theory of Motivation provided the theoretical base for this study. A questionnaire was used to gather data on the motivational factors for participation in a Public Safety Smart City Project. Five Critical Success Factors were developed to motivate citizens to participate in a Public Safety Smart City Project. These Critical Success Factors are: Ensure user satisfaction by providing a toll-free number, Citizens should be able to participate due to their concerns of safety for others, Citizens should be given the opportunity to make a difference in their community, Public Safety initiatives must provide adequate response to citizens and Citizens should be given incentives after participating. The Critical Success Factors were refined and verified through two rounds of expert review. Five factors were identified in the findings as factors that contribute towards motivating citizens participate. These factors include User Satisfaction, Making a difference, Response from Public Safety initiatives, Concern of safety for others and Incentives. The factors were included on the Critical Success Factors.

Keywords: ARCS Model, Citizen Participation, Motivation, Public Safety

Declaration

I, Mbali Tuswa, hereby declare that:

- The work in this dissertation is my own work.
- This dissertation has not previously been submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognised educational institution.
- I am fully aware of the University of Fort Hare's policy on plagiarism and I have taken every precaution to comply with the regulations.
- I am fully aware of the University of Fort Hare's policy on research ethics and I have taken every precaution to comply with the regulations. I have obtained an ethical clearance certificate from the University of Fort Hare's Research Committee and my reference number is the following: **FLO04SPID01**.(See Appendix A)
- The views and opinions expressed in this manuscript are the author's and do not necessarily reflect those of the National Research Foundation (NRF) and International Business Machines Corporation (IBM).

Acknowledgements

- I would like to express my sincere gratitude and appreciation to my supervisor, Prof. Roxanne Piderit for her valued advice, guidance, coaching, support and encouragement throughout this study and for ensuring the completion and submission of this dissertation.

- I would like to express special thanks to Prof Stephen Flowerday, for involving me in a Public Safety Smart City Project, allowing me to gain added insight and knowledge.

- I would like to express further gratitude to the Govern Mbeki Research Development Centre (GMRDC) of the University of Fort Hare and the National Research Foundation for their financial support.

- I am grateful to the proofreader for reviewing my writing skills and providing me with helpful and informative feedback.

- I would like to thank my family, friends and the father of my wonderful daughter, Lusisipho Badi, for all their endless support, encouragement and understanding throughout my Master's degree.

- I would like to thank God for giving me the strength to help me cope with all the stress and completing my dissertation.

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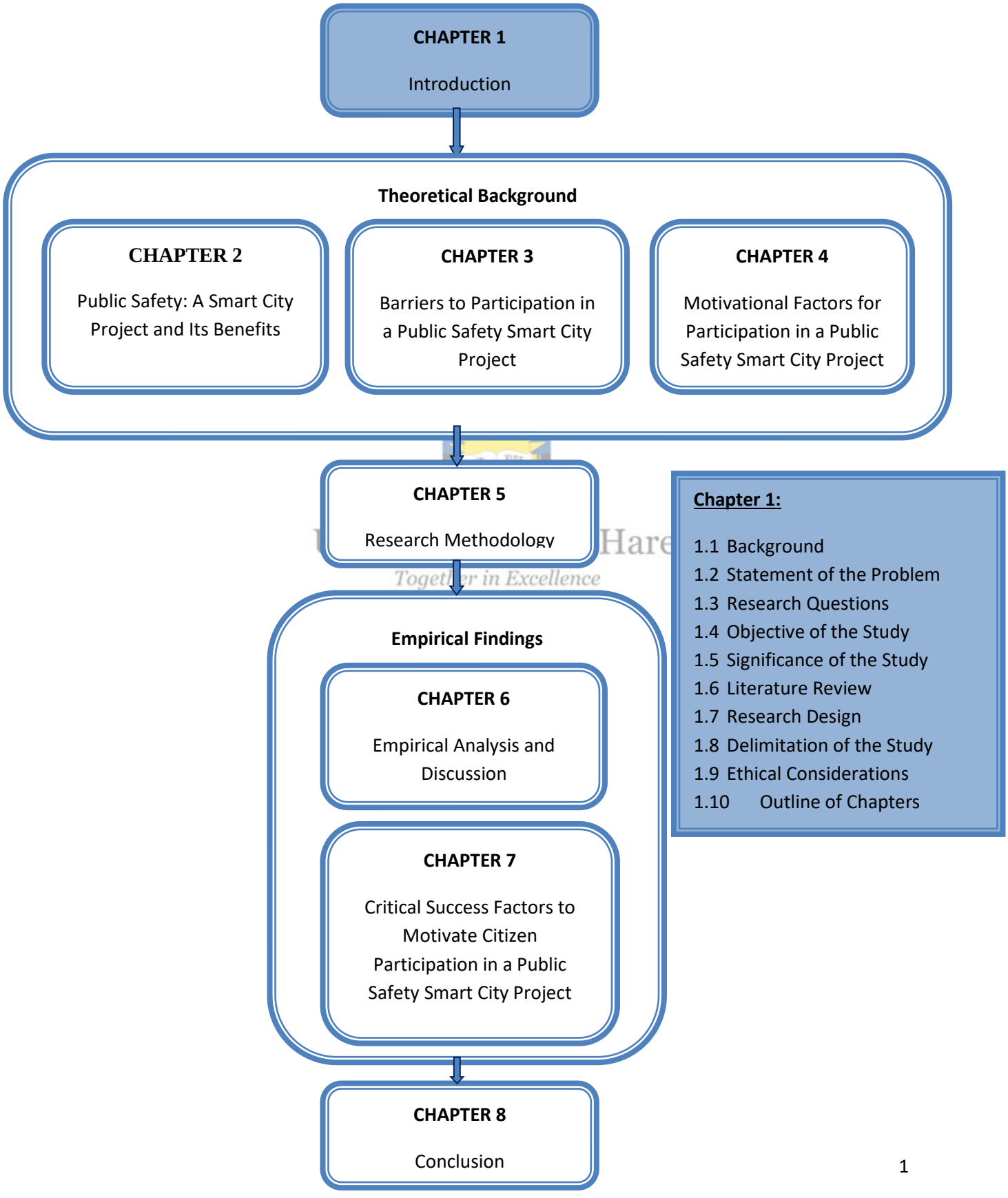
Introduction



Chapter 1:

1.1. Background

More people live in urban areas now than previously (Chourabi, et al., 2012). For the next few decades, this shift from rural to urban populations is predicted to continue (Chourabi, et al., 2012). As a result, waste management, scarcity of resources, air pollution, health concerns, traffic congestion, Public Safety issues and inadequate, deteriorating and aging infrastructure are the problems cities experience (Malchenko & Smirnova, 2019). These lead to an increased rate of Public Safety matters in the cities. For this reason, governments, businesses and communities are relying on technology increasingly to overcome the challenges from rapid urbanisation, thus leading to the prominence of Smart City initiatives (Washburn & Sindhu, 2010). The conditions of city resources are monitored and integrated by a Smart City, which plans its preventative maintenance activities and monitors security aspects (Walravens, 2014)
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According to Washburn and Sindhu (2010), a Smart City is made smart by a combined use of software systems, server infrastructure, network infrastructure, and client devices. This serves to better connect the seven critical city infrastructure components and services, namely: city administration, education, healthcare, Public Safety, real estate, transportation, and utilities (Washburn & Sindhu, 2010). There are six recognised components of Smart Cities namely: Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment and Smart Living. This study will look at one of Smart Living aspects, Public Safety. The other smart living aspects include consists of quality of life like culture, health, housing and tourism and education (Malchenko & Smirnova, 2019). Specifically, Public Safety is the focus of this study. Smart Living is the quality of life, it includes the integration of innovative and advanced construction materials and processes, along with technology to make lives earsier and more efficient (Wintjes, Avigdor, Gauders, Mielech, & Santuccio, 2014).

As urbanisation increases, police, fire and other Public Safety authorities need to respond more quickly to emergency situations and Public Safety matters (Washburn & Sindhu, 2010). Bhana and Flowerday (2013) define Public Safety as any incident that can create or have the potential to create harm to citizens such as criminal activities, forest fires, floods, road damage and infrastructure damage. There are emergency units such as police officers and fire fighters that need to respond quickly to Public Safety issues and must concurrently maintain a safe living environment for every citizen (Bhana & Flowerday, 2013).

Public Safety programmes have been identified and created to overcome such issues and to connect citizens to Public Safety officials and to local government technology (Perlman, 2012). The technologies also increase and extend the reach of desired services beyond traditional delivery mechanisms (Western Cape Government, 2012). Public Safety agencies have long recognised the need for citizen involvement to enable Public Safety agencies to receive, process, and make use of high volumes of tips and leads in making crowdsourcing searches and investigations more feasible (O'Connell, 2013). This is a key reason why local governments are shifting from traditional systems of public safety to service-based systems that view citizens and their involvement as essential to shaping their own city. However, these initiatives will not succeed without citizen participation, thus the central theme of this study focuses on the motivational factors that will ensure participation.

This study is investigating what motivates citizens to participate in a Public Safety Smart City Project in East London. The primary goal is the contribution of citizens to the creation of a safer environment by reporting suspicious activities and Public Safety matters, thus eliminating and minimising criminal activities and encouraging citizens to take responsibility for their own and other's safety. In order to improve citizen participation, it is crucial to investigate the factors that citizens are motivated by to participate. These motivational factors are the focus of this research project to enhance citizen participation in a Public Safety Smart City Project.

This introductory chapter begins by outlining the statement of the problem being investigated in this research project. This is followed by the research questions, objectives and the significance of the study. A brief outline of the theoretical and empirical literature, research design and research methodology follows. The delimitation of the study, ethical considerations and outline of the chapters conclude this chapter.

1.2. Statement of the Problem

The Public Safety Smart City Project was implemented in East London as a platform for citizens to address Public Safety matters through an Interactive Voice Recognition (IVR) system in conjunction with IBM. The aim of the Public Safety Smart City Project is to collaborate with citizens of East London partners in matters on Public Safety. For it to be successful it relies on citizens reporting the Public Safety matters they observe and experience (Piderit & Flowerday, 2013), thus citizens need to be motivated to participate. If citizens do

not report Public Safety matters they observe, this can lead to serious issues being left unattended or unresolved because people did not report them (Simonofski, Valle, Serra & Wautelet, 2019; Simonofski, Asensio, De Smedt & Snoeck, 2019). Thus, there is a need to motivate and attract the attention of citizens to participate, in order to improve citizen's participation in a Public Safety Smart City Project.

1.3. Research Questions

1.3.1. Primary Research Question

In order to investigate the above mentioned research problem, the following primary research question was formulated.

- **What are the factors that motivate East London citizens to participate in the Public Safety Smart City Project?**

To answer the primary research question the following secondary research questions will be addressed:

1.3.2. Secondary Research Questions

- **What perceived benefits of a Public Safety Smart City Project could motivate citizens to participate?**

This sub-question investigates the perceived benefits of participation in a Public Safety Smart City Project to citizens and the city. According to Perlman (2012) the benefits of participating in a Public Safety project include preventing and solving crime issues, quick emergency responses in a catastrophic incident, and alert broadcasting in disaster mitigation. Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) also believe that improved quality life of citizens is a notable benefit.

- **What are the barriers to participation in a Public Safety Smart City project?**

This sub-question investigates the barriers to participation in a Public Safety Smart City Project. This is to find out what hinders citizens from participating. According to Malchenko and Smirnova (2019), barriers such as time and cost constraints, trust, security, awareness and privacy can prevent an individual from participating.

- **Which motivational factors are relevant for enhancing citizen participation in a Public Safety Smart City project?**

The last sub-question investigates motivational factors for citizens to participate in a Public Safety Smart City Project. The motivational factors can include the promise of a safer living environment, improved quality of life and more efficient handling of Public Safety incidents. These are therefore important to improve citizen participation in a Public Safety Smart City project. Naranjo-Zolotov, et al (2019) identify the need for improvement and incentives as motivational factors that can trigger citizen participation.

1.4. Objective of the Study

The main purpose and objective of this study is to determine the critical success factors for motivating citizens participate in a Public Safety Smart City project. These critical success factors ensure that motivational factors that affect citizen participation in a Public Safety Smart City Project are addressed. The Critical Success Factors are discussed in Chapter Seven.

1.5. Significance of the Study

This study focuses on motivating citizens to participate in a Public Safety Smart City Project in East London. This is a Smart City project that is related to the management of city resources to ensure that they are managed efficiently and effectively to prevent and solve Public Safety matters. The citizens of the city (East London) need to be motivated to participate by reporting Public Safety matters that they observe or experience as these matters are of relevance to the citizens. Information from these reports will be provided to the relevant authorities to respond to incidents and assist in future planning, allowing local government to act proactively (Piderit & Flowerday, 2013). If these matters are not reported, local government and emergency units may find it difficult to identify Public Safety matters. This leads to a slow response from local government, or the relevant unit, to the incident. The success of the project will provide a secure and safe environment for every citizen in the city and will assist authorities to prevent and solve Public Safety matters quickly, thus enhancing the lives of people living in East London and improving Public Safety. This will therefore provide a better management of Public Safety

issues and giving proper attention to Public Safety issues (Kożuch & Sienkiewicz-Małyjurek, 2014).

1.6. Literature Review

Motivation is demonstrated by an individual's choice to engage in an activity and the intensity of effort or persistence in that activity (Richter, Raban, & Rafaeli, 2015). Jansen (2009) defines motivation to be a motive, a wish, intention or drive to engage in a specific activity. Motivation can be achieve through interactions of multiple values, beliefs and goals. To investigate prospective citizen's motivation for the study, the ARCS Theory of motivaton will be intergarted in the study using it's four components to identify motivational factors.

1.6.1. Theory Used

This study made use of Keller's (2010) Attention Relevance Confidence Satisfaction (ARCS) Theory of Motivation. This theory is established in the expectancy–value theory that signifies that motivation of an individual to perform an activity is driven by perceived success, or expectancy, and perceived satisfaction of personal needs, value (Keller, 2010). Keller's (2008) motivation theory states that there are four factors that should be considered to ensure motivation: attention, relevance, confidence and satisfaction. The theory is depicted in Figure 1.1 below.

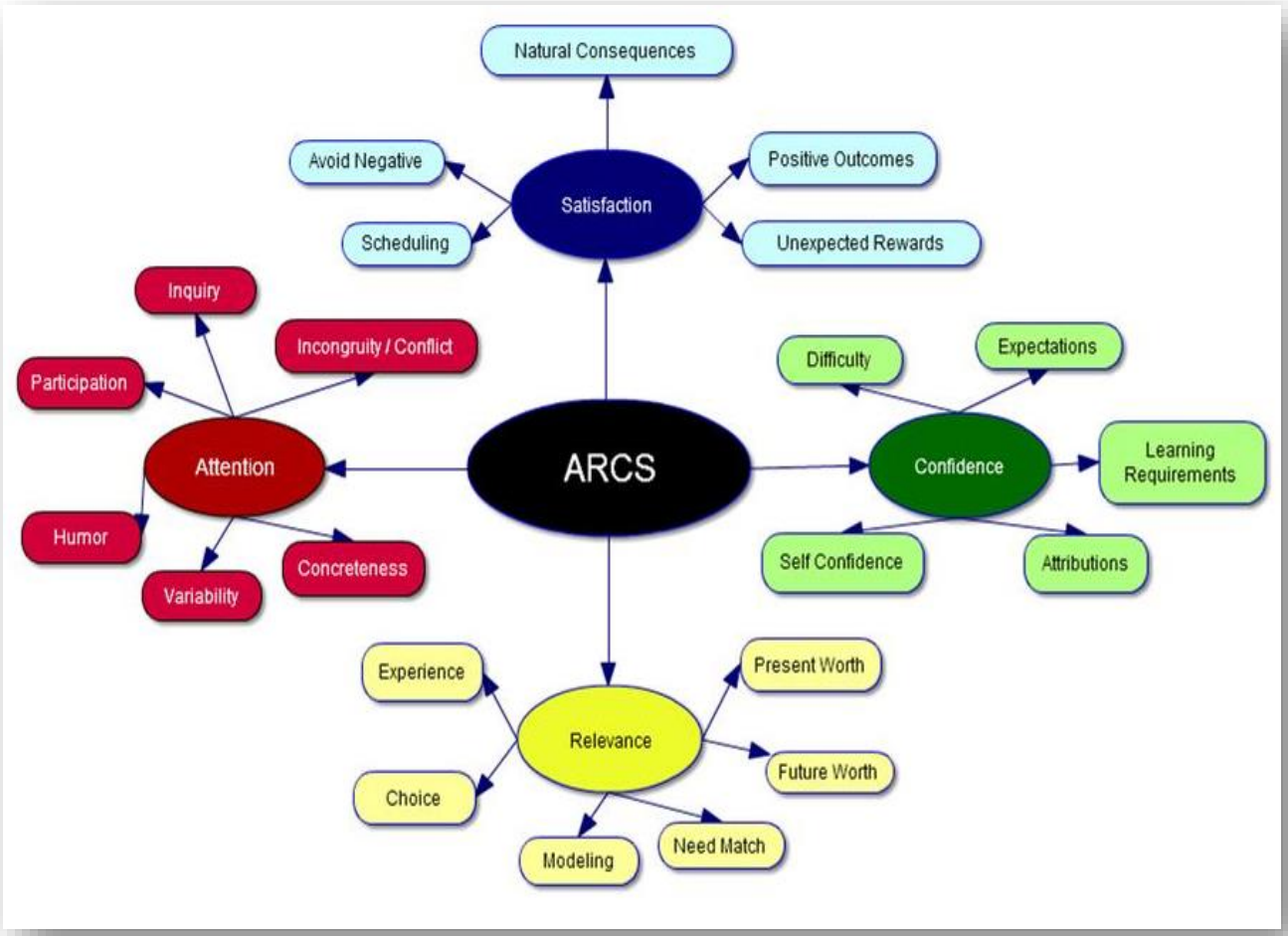


Figure 1. 1: Keller's Motivation Theory (Keller, 2010)

The ARCS theory of motivation is relevant to this research project as the four factors (attention, relevance confidence and satisfaction) will be used to investigate the motivational factors necessary to encourage citizens to participate in a Public Safety Smart City project. These four factors will be described in more detail in Chapter 4. The definition and application of each of these factors to this study is summarised in Table 1.1 below.

Table 1. 1: ARCS Model in Public Safety Smart City Project Context (Adapted from: Keller, 2010)

Factor	Definition	Application in this study
Attention	Attention can be gained using interesting things and building curiosity and sustaining active engagement in an activity.	In terms of attention, the ways in which the attention of the citizens can be gained and maintained by the use

		of airtime incentives as motivation to participate was studied.
Relevance	Relevance is based on the experience being meaningfully related to end goals.	In terms of relevance, the citizen's expectations about the feedback they should receive from the system were investigated.
Confidence	Confidence refers to a participant's belief that they can succeed in mastering the task	In terms of confidence, the user experience when reporting a Public Safety matter was analysed.
Satisfaction	Satisfaction is necessary for positive feelings about the experiences, to develop, thereby providing further motivation.	In terms of satisfaction, the citizen's views about how the Public Safety Smart City Project can contribute to the creation of a safer living environment were investigated.

1.6.2. The Concept of Public Safety: The Smart City Project and its Benefits

Perlman (2012) states that assurance of safety is certainly one of the greatest assets a city can have in promoting growth. Thus, by providing an opportunity to create a safer living environment, the Public Safety Smart City Project aims to manage the city resources of East London to allow for proactive responses to Public Safety concerns. Citizens participate in these platforms by providing the city with information about Public Safety matters such as accidents, thefts, fire, floods and road damage so that city resources can be managed effectively and efficiently. In this way crimes will be solved, and natural or man-made disasters can be dealt with (Dirks, Gurdgiev, & Keeling, 2010).

Perlman (2012) state that Public Safety projects allow the city leaders to capitalize on the knowledge of their constituents to fight crime and ensure safety in the event of a disaster. They also provide communities with greater access to up-to-date Public Safety information. In the process of improving Public Safety keeping citizens engaged can strengthen communities and civic participation overall. This can help cities become not just safer, but better places to live in (Perlman, 2012). The benefits of the Public Safety Smart City Project also include increased wellness of the environment, creating opportunities for growth in the city, crime prevention, and quicker emergency response (Dirks, *et al*, 2010; Naranjo-Zolotov, *et al*, 2019).

1.6.3. Participation Barriers for the Public Safety Smart City Project

A Public Safety Smart City Project monitors the physical environment in an unobtrusive way for optimal quality, thus creating an enhanced living environment that is secure and efficient as well as improving the quality of life and safety of citizens (Bhana & Flowerday, 2013). Biggar (2010) supports this statement that Public Safety initiatives have the potential to enable citizens to address environmental problems. However, there are barriers that exist which deter citizens from participating in a Public Safety Smart City Project in East London. These include security, privacy and trust (Al-Shafi & Weerakkody, 2010). Security involves confidentiality, availability and integrity of information. While, privacy regards to the expression of numerous legal and non-legal norms regarding the right to private life. Trust revolves around assurance and confidence that people's data or information will function in expected ways (Naranjo-Zolotov, Oliveira, Cruz-Jesus, Martins, Gonçalves, Branco & Xavier, 2019). Piderit and Flowerday (2013) acknowledged telephone costs and intimidating experience as barriers to citizen participation in a Public Safety Smart City Project. Thus, there is a need to investigate the motivational factors to strengthen the involvement of citizens to participate in Public Safety Smart City as there are a number of benefits to both citizens and the city.

1.6.4. Motivational Factors Related to Participation in a Public Safety Smart City Project

Ohmer (2007) defines citizen participation of individuals as an active involvement in changing problematic conditions in communities that affect the quality of their lives. Therefore, it is important to motivate citizens to participate in the project as they will understand its importance and benefits through their participation. According to Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) motivation is an essential factor in voluntary participation. Lamb, Hair, McDaniel, Boshoff, Terblanche, Elliot and Klopper (2010) concur that motives are the driving forces that cause a person to satisfy specific needs and motivation can be accomplished through understanding these motives.

Ohmer (2007) identifies self-efficacy and empowerment as motivational factors in which citizens can actively participate in efforts to improve their communities. Marisa and Yusof (2014) consider rewards as the most common factor that can influence citizens to be motivated to do something. They then identify recognition and achievement as motivational aspects, because people are more comfortable with life if they are recognised for the work they do (Marisa & Yusof, 2014). Additionally, Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) identify reciprocity as a motivational factor that can enhance participation.

Lamb, et al (2010) believe that for citizens to be motivated, it is also important to identify and fullfill their needs. He then explains that safety needs are the most important needs for citizens. Therefore, there is a need to motivate citizens to participate as they benefit and their quality of life will improve (Lamb, et al., 2010). Therefore, this study will look at how the citizens can be motivated to participate and the various factors that influence their participation.

1.7. Research Design

This section describes the research design for this study, through a description of the research paradigm, research method, data collection methods, sample and population and the data analysis methods used in the study.

1.7.1. Research Paradigm

According to Collis and Hussey (2009) in any research a research paradigm is required to guide how the research should be conducted. An intepretive approach was applied in this study. Positivism is based on the belief that reality is independent of us and the goal is the discovery of theories based on empirical research (observations and experiments). On the other hand, interpretivism is based on the belief that reality is highly subjective because it focuses on the meaning of the social phenomena rather than measurement (Collis & Hussey, 2009). Collis and Hussey (2009) suggest that there are two extreme research paradigms and they are classified on a continuum that incorporates various levels of interpretivist and positivist characteristics (shown in Figure 1.2 below).

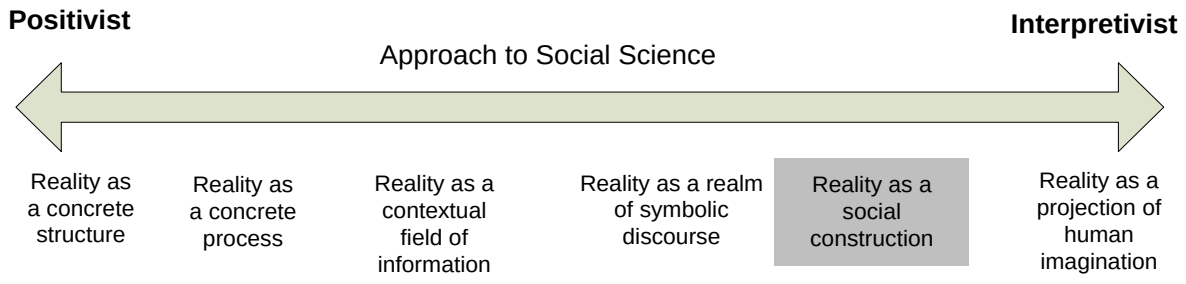


Figure 1. 2: Continuum of Core Ontological Assumptions (Collis & Hussey, 2009)

Figure 1.2 illustrates the positivist and interpretivist extremes in a continuum described by Collis and Hussey (2009). The research paradigm used for this study is highlighted, namely

reality as a social construction. By so positioning this research on this continuum, the influence of both positivist and interpretivist elements of the study are acknowledged. However, the study does rely on the interpretive paradigm.

1.7.2. Research Approach

This research study adopted a mixed methods approach to provide a textual description of the motivational factors associated with the Public Safety Smart City Project in East London. The mixed method approach has gained increased popularity in the Information System (IS) field (Creswell, 2009). Mixed method refers to a system whereby data collection and analysis for both quantitative and qualitative procedures are combined in a single study (Saunders, Lewis & Thornhill, 2009). In the mixed method approach, qualitative and quantitative data may be integrated at different stages of the research process. A combination of open ended and close-ended questions may be involved in the collection of data (Creswell, 2009). Integration may also occur at the analysis stage of the data, whereby both qualitative and quantitative data are interpreted concurrently (Creswell, 2009). The quantitative research approach will involve the analysis of the questionnaire collected from participants, from which results will be drawn in order to identify the barriers to participation and factors that motivate citizens to participate. The qualitative research approach will be used in this study include expert reviews to evaluate the proposed critical success factors.

A mixed method approach is considered appropriate for a study of factors for motivating citizens to participate in a Public Safety Smart City Project as the domain involves people and the technology they interact with daily. A thorough analysis of the primary data (questionnaire and expert reviews) can therefore be done with a mixed method. This is in alignment with the interpretive paradigm adopted for this study.

1.7.3. Research Methodology

In this study, the Design Science methodology will be used. The Design Science Methodology is used for the creation and innovation of artefacts. Hevner, March, Park and Ram (2004) believe that Design Science is a problem-solving process as it involves the creation and innovation of artefacts to solve problems. For this study, the formulated critical success factors to motivate citizens to participate are the artefact, which will be refined using expert reviews. The Critical Success Factors will help in achieving the goals of the project and addressing issues faced while in a Public Safety Smart City Project.

The Design Science Methodology consists of seven guidelines that need to be considered to effectively utilise this research methodology (Hevner, *et al*, 2004). The seven guidelines are displayed in Table 1.2 and their application to this research study are described.

Table 1. 2: Design Science Guidelines (Adapted from: Hevner, March, Park, & Ram, 2004)

Guideline	Description	Application
1. Design as an Artefact	Design Science research must produce a viable artefact in the form of a construct, a model, a method, or an instantiation.	This study will produce critical success factors for motivating citizens to participate in a Public Safety Smart City project.
2. Problem Relevance	The objective of Design Science research is to develop technology-based solutions for important and relevant business problems.	In this study the problem investigated is that some citizens do not report Public Safety matters they observe, thus leading to serious issues being left unattended or unresolved because people did not report them. Thus, it is necessary to determine how to enhance citizen participation in a Public Safety Smart City Project.
3. Design Evaluation	The utility, quality and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.	The critical success factors were evaluated through the application of expert reviews to ensure credibility of the research contribution.
4. Research Contributions	Effective Design Science research must provide clear and verifiable contributions in the areas of the design artefact, design foundation, and/or design methodologies.	The design artefact for this study is in the form of critical success factors that will ensure citizen participation is enhanced through motivation.
5. Research Rigor	Design Science research relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.	The critical success factors will be founded on an extensive literature review supported by empirical data collected from questionnaires. Expert reviews will be carried out to refine the final artefact.
6. Design as a Search Process	The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment.	The critical success factors will be formulated from the close-ended questionnaires to ensure relevance to the problem area. The questionnaire itself is based on extensive literature review.
7. Communication of Research	Design Science research must be presented effectively both to technology-oriented as well as management-oriented audiences.	The findings of this research project have been submitted to an academic journal (see Appendix C) and made available for future use. The contribution is applicable to a technology-oriented audience as it describes the pre-requisites for implementation of a technology solution. The management-oriented audiences are provided with motivational factors to encourage participation.

The next section discusses the sample and population of this study.

1.7.4. Sample and Population

The population for this study is the citizens of East London who have registered for the project. The study made use of one of the most commonly used non-probability sampling methods, namely a convenient sample of all the registered participants on the website of the Public Safety Smart City project. The registered participants were selected because they are available to participate in the study. The convenient method will help to gain initial data regarding motivational factors, barriers and benefits of Public Safety Smart City Project; this would be easy and most convenient way for the sources of primary data for the research study. For the expert reviews, two experts in the Smart City field were used to refine the artefact over two rounds of review.

1.7.5. Data Collection Methods

The primary data collection techniques that were used in this study consist of a case study, close-ended questionnaires and expert reviews. The case study took place in East London only on the citizens of the city. The citizens of East London were selected because the Public Safety Smart City Project is being conduceted in the city, which gave initial access to the city. The East London citizens are considered to be the perfect representatives of the city as they are the ones who experience and observe the Public Safety issues on daily basis.

The second instrument was web-based questionnaires and were distributed online to citizens of East London who registered for the Public Safety Smart City Project (see Appendix B) and reported Public Safety issues. The perceptions of citizens about the factors that motivate them to participate in a Public Safety Smart City Project were sought. A pilot study was conducted in order to test the adequacy of this research instrument. The findings from the questionnaires were used to formulate the critical success factors for motivating citizens participate.

Expert reviews were used to validate the constructed critical success factors. These critical success factors were derived from an extensive literature review (secondary data collection) and the empirical findings from the questionnaires. Yousuf (2007) define expert reviews as a process used to collect and survey opinions of experts on a particular subject. Two experts in motivation, citizens participation and Smart City projects were asked to participate through two rounds of review. The data clollected for this study was analysed using the methods outlined below.

1.7.6. Data Analysis Methods

The purpose of data analysis is to provide a depiction of the relationships between concepts, constructs and variables in the data collected (Cooper & Schindler, 2010). The secondary and primary data (from questionnaires) was analysed and grouped deductively. The questionnaires were analysed through descriptive statistics with the use of Microsoft Excel and pattern matching. The data was interpreted in the form of charts and graphs. Some explanatory analysis was conducted to analyse the data collected from the case study and expert reviews. Recommendations from the expert reviews were taken into considerations in the refinement of the critical success factors.

1.8. Delimitation of the Study

The study focuses on improving citizen participation in a Public Safety Smart City Project in East London and will not include other cities. However, some cities could face the same challenges faced in motivating citizens to participate in a Public Safety Smart City Project. The study is based on voluntary participation (or crowdsourcing) not crowd sensing, thus citizens voluntarily report Public Safety matters such as natural disasters, crime incidents and accidents. The reporting of other city-related matters, such as infrastructure and service delivery, were not considered in this study.

1.9. Ethical Considerations

Resnik (2011, p.1) define ethics as a "method, procedure or perspective for deciding how to act and for analysing complex problems and issues and to promote the aims of the research it is important to adhere to ethical norms in research, promote values that are essential to collaborative work, help to ensure that researchers are held accountable to the public and help to build public support for research".

Canterbury Christ Church University (2006) suggests that when providing information, researchers must ensure that participants are given sufficient detail about the nature of the research and the procedures involved. In this study participation was voluntary as participants were not forced to complete the questionnaire and the views and attitudes of those participants who participate will not be identified in the public domain as the questionnaires do not require

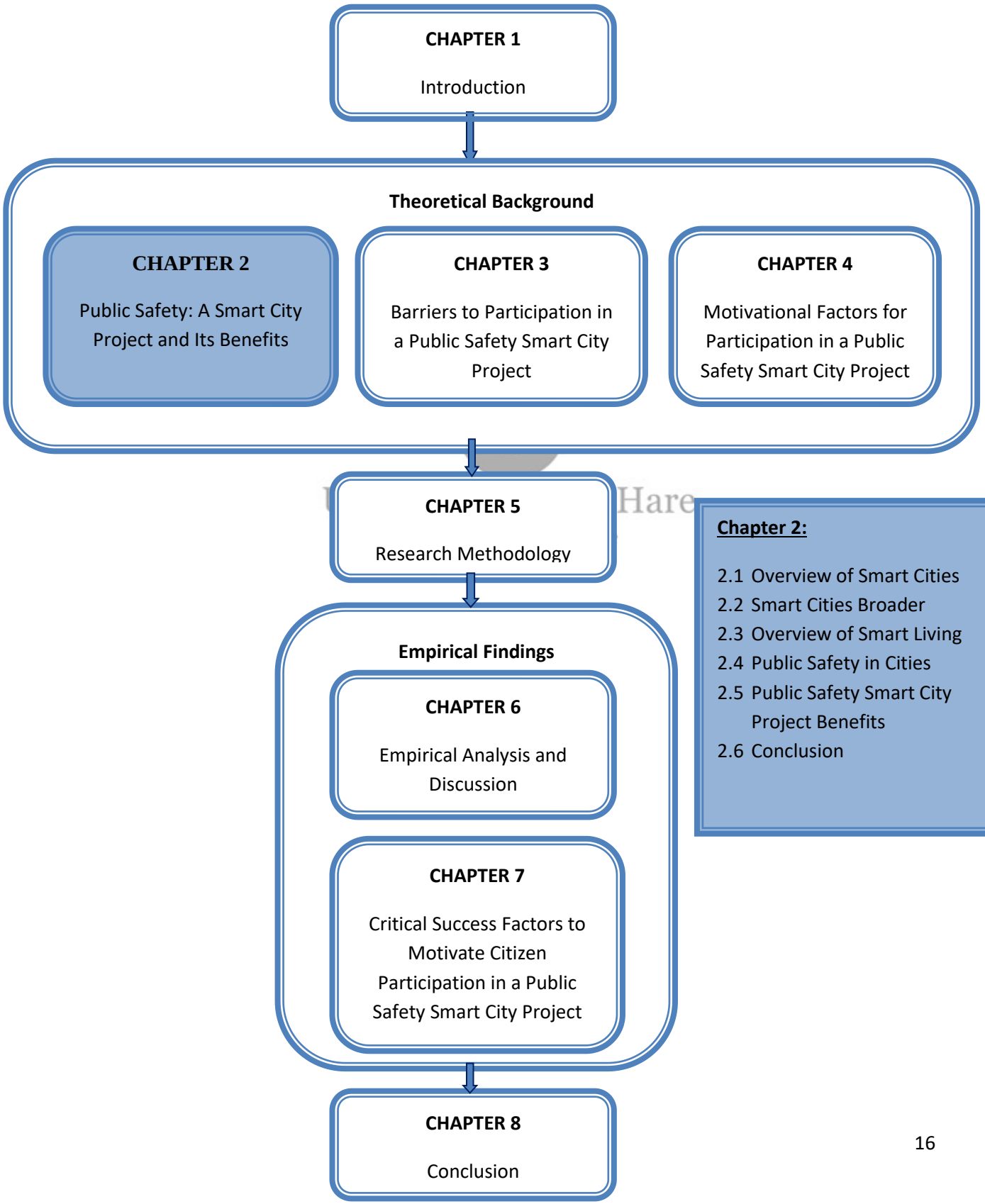
personal information. Canterbury Christ Church University (2006) states that voluntary participation implies that participants make informed choices while informed consent assumes that information given is accurate. The information gathered from the questionnaires was only used for research purposes as participants were questioned on their experiences and how they feel about the way the project was conducted. The participants were made aware of what they were committing to and the use of the information they have provided. Additionally, before citizens participate in the research study ethical clearance was attained from the University of Fort Hare (see Appendix A).

1.10. Outline of Chapters

Chapter 1 provides the introduction of this study. The introduction chapter includes a background of the study, the statement of problem, the objective of the research study, the research hypothesis, significance of the study, a brief literature review, the research methodology, the delimitation of the study and ethical considerations. **Chapter 2** focuses on the concept of Public Safety, the Smart City and the benefits of participating in a Public Safety Smart City project. **Chapter 3** addresses the citizen participation barriers of the Public Safety Smart City Project in East London, while **Chapter 4** discusses the motivational factors for improving participation and the use of the Public Safety Smart City Project.

Chapter 5 discusses the study's research design and methodology, which employed to investigate the motivational factors. This chapter describes the methods used for data collection and data analysis. **Chapter 6** details and discusses the empirical findings of the study. These empirical findings include findings from the case study and web-based questionnaires. **Chapter 7** presents the contribution of this research project in the form of proposed critical success factors that can motivate citizens participate in a Public Safety Smart City project. Additionally, the findings from the expert reviews are discussed and used to refine the Critical Success Factors. **Chapter 8** provides the conclusion of the research study and suggestions for future research.

Chapter 2:
Public Safety: A Smart City Project and Its Benefits



Chapter 2:

2.1 Overview of Smart Cities
2.2 Smart Cities Broader
2.3 Overview of Smart Living
2.4 Public Safety in Cities
2.5 Public Safety Smart City Project Benefits
2.6 Conclusion

2.1. Overview of Smart Cities

A Smart City is referred to an urban environment that, in order to improve the overall quality of citizens it should be supported by pervasive ICT systems and must offer advanced and innovative services to citizens (Piro, Cianci, Grieco, Boggia, & Camarda, 2014). In the future a Smart City aims to surround people living in urban areas with omnipresent digital eco-system made by internet-connected equipment's such as vehicles, smart buildings, Global Positioning System (GPS) navigating devices, smart phone, tablets and sensors willing to interact to each other, thus create a business competitive and attractive environment aimed at the well-being of citizens (Piro, Cianci, Grieco, Boggia, & Camarda, 2014) .

Smart Cities consist of six components namely:

1. **Smart Economy**: relates to competitiveness and is concerned with how attractive a city is concerning factors such as entrepreneurship, productivity, innovation and flexibility of labour market.
2. **Smart People**: relates to social human capital. It is concerned about helping people learn and increasing participation in public life.
3. **Smart Governance**: relates to participation, ensures delivery of government services to citizens and encourages active citizen participation in the community's decision-making process.
4. **Smart Mobility**: relates to transportation and ICT, ensures that there is availability of ICT infrastructure and the development of a safer, sustainable and innovative transport systems in the city.
5. **Smart Environment**: relates to natural resources. Promotes attractiveness, sustainability of resource management and aim to protect the environment.
6. **Smart Living**

This research project addresses the Smart Living component. This is described in detail in the section that follows. There are dimensions that seem to exist in Smart Cities and these are discussed in the next section.

2.1.1. Dimensions of a Smart City

Previous studies delineated that the affirmation of infusing intelligence into each subsystem of a city one by one is insufficient to create a Smart City, as it should be treated as an organic whole (Albino, Berardi, & Dangelico, 2015). However, researchers have tried clarifying what constitutes a Smart City and separated the concept into many features and dimensions and

justified their decision of managing smart cities concept in a holistic way (Albino, Berardi, & Dangelico, 2015). Komninos (2011) identified four possible dimensions of a Smart Cities as the features of an intelligent city, including:

1. The application of a wide range of electronic and digital technologies to create a cyber, digital, wired, informational or knowledge-based city.
2. The use of information technology to transform life and work.
3. To embed ICT in the city infrastructure.
4. To bring ICT and people together to enhance innovation, learning and knowledge.

The dimensions discussed above together with the six components characterize smart cities. The six components are associated with the different aspects of urban life, on which the researchers depend on traditional and neoclassical theories of urban growth and development, regional competitiveness, transport and ICT economics, natural resources, human ad social capital, quality of life, and participation of community members (Albino, *et al.*, 2015). In addition to the four dimensions described above, Albino, *et al.* (2015) identifies the most common characteristics of a smart cities emerging from different researchers:

- A city's networked infrastructure that enables political efficiency and social and cultural development.
- An emphasis on business-led urban development and creative activities for the promotion of urban growth.
- Social inclusion of various urban residents and social capital in urban development.
- The natural environment as a strategic component for the future.

The Smart City core infrastructure elements are discussed in the next section.

2.1.2. Smart City Core Infrastructure Elements

Kumar (2015) identifies 10 core infrastructure elements in a Smart City or elements that Smart cities must have. These elements are listed below:

- Adequate water supply
- Assured electricity supply
- Sanitation, including solid waste management
- Efficient urban mobility and public transport
- Affordable housing, especially for the poor
- Robust IT connectivity and digitalization

- Good governance, especially e-Governance and citizen participation
- Sustainable environment
- Safety and security of citizens, particularly women, children and the elderly
- Health and education

The objective of smart cities is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment. The elements listed above focus on sustainable and inclusive development (Kumar, 2015). Thus, the Smart City features are discussed in the next section.

2.1.3. Smart City Features

In Smart Cities, Kumar (2015) acknowledges that there are some typical features that are comprehensive for the development of Smart Cities. These eight features are described below:

1. Promoting mixed land use in area-based developments (planning for unplanned areas containing a range of compatible activities and land uses close to one another in order to make land use more efficient.
2. Housing and inclusiveness (expand housing opportunities for all).
3. Creating walkable localities (reduce congestion, air pollution and resource depletion, boost local economy, promote interactions and ensure security. The road network is created or refurbished not only on vehicles and public transport and for pedestrians and cyclists and necessary administrative services are offered within walking or cycling distance.
4. Preserving and developing open spaces, parks, playgrounds and recreational spaces in order to enhance the quality of life of citizens, reduce the urban heat effects in areas and generally promote eco-balance.
5. Promoting a variety of transport options, Transit Oriented Development (TOD), public transport and last mile para-transport connectivity.
6. Making governance citizen-friendly and cost effective increasingly rely on online services to bring about accountability and transparency, especially using mobiles to reduce cost of services and providing services without having to go to municipal offices and form e-groups to listen to people and obtain feedback and use online monitoring of programs and activities with the aid of cyber tour of worksites.

7. Giving an identity to the city based on its main economic activity such as local cuisine, health, education, arts and craft, culture, sports goods, furniture, hosiery, textile, diary, etc.
8. Applying Smart Solutions to infrastructure and services in area-based development in order to make them better (for example, to make areas less vulnerable to disasters, using fewer resources and providing cheaper services).

The Smart City features discussed above may differ from city to city as they depend on the development of each city, as some cities may have already achieved some of the features. The potential benefits of smart cities are discussed on the following section.

2.1.4. Smart City Benefits

There are benefits that Smart Cities can provide. The benefits of smart cities benefit citizens, the government and the environment. ISO/IEC JTC 1 (2014) recognises six benefits of a Smart City:

1. Better and more convenient services for citizens.
2. Better city governance.
3. A better life environment.
4. More modern industry, that is greener and more people friendly.
5. Smarter and more intelligent infrastructure.
6. A dynamic and innovative economy.

2.1. Smart Cities Broader

According to Lee, Hancock, and Hu (2014) at the begning of 2013 there were 143 Smart City projects approximately ongoing or completed. North America had 35 projects, Europe 47, Asia 50, South America 10 and the Middle East and Africa 10. Table 2.1 shows some of the Smart City projects done and in progress in other cities.

Table 2. 1: Smart City Projects in Other Countries

Cities	Smart City Projects
Canada	• Enhancing business, local government and community through the use of internet resources.
United States, Riverside, California	• Improving traffic flow and replacing aging water, sewer and electric infrastructure through a tech-based transformation.

United Kingdom	• Developed a multi-application smart card for public transportation, recreation and leisure-related transactions.
Tallin	• Developed a large-scale digital skills training program, extensive e-government and an award-winning smart ID card. • Harnessing ICT by fostering high-tech parks.
China	• Introducing ICT during the construction of new infrastructure, with some attention to environmental issues but limited attention to social aspects.
Asia (Singapore, Taiwan, Hong Kong, Korea)	• Promoting economic growth through smart cities programs. • IT2000 plan was designed to create an "intelligent island" with information technology transforming work, life and play. • Completed the Wireless@SG goal of providing free mobile internet access anywhere in the city. • Supporting the country's economy to improve the quality of living through a series of government projects for creating e-governance and ubiquitous possibilities. • Installation of a tele-presence in every apartment on a new town built from the ground in order to create an urban space in which every resident can transmit information using various devices, whereas a city central brain should manage the huge amount of information.

Smart Cities mean different things to different people. Therefore, the conceptualisation of Smart City varies from city to city and from country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city citizens (Naranjo-Zolotov, Oliveira, Cruz-Jesus, Martins, Gonçalves, Branco & Xavier, 2019).

Smart City Measures of Performance

There are different methods and measurements that have been developed according to the several concepts of smart cities. These indicators are used to assess the smart cities initiatives and the indicators are for each of the six discussed Smart City components shown in Table 2.2 below (Albino, *et al.*, 2015). According to Piira and Pinto-Seppa (2015) it is important to

measure the Smart City intiatives in order to monitor progress by means of a commonly accepted and applied framework, to objectively verify the impacts of projects, to create trust in projects and solutions, to build confidence that solutions can also be applied in other contexts and cities and to enable stakeholders in projects or cities to learn from each other.

Table 2. 2: Key Performance Indicators for Smart Cities Assessment (Adapted From: Albino, Berardi, & Dangelico, 2015)

Smart City Component	Indicators
Smart Economy	Public expenditure on R&D, Public expenditure on education, GDP per head of city population and Unemployment rate.
Smart People	Percentage of population with secondary-level education, Foreign language skills, Participation in life-long learning, Individual level of computer skills and Patent applications per inhabitant.
Smart Governance	Number of universities and research centres in the city, E-government on-line availability, Percentage of households with internet access at home and E-government use by individuals.
Smart Environment	Ambitiousness of CO_2 emission reduction strategy, Efficient use of electricity, Efficient use of water, Area in green space, Greenhouse gas emission intensity of energy consumption, Policies to contain urban sprawl and Proportion of recycled waste.
Smart Living	Proportion of the area for recreational sports and leisure use, Number of public libraries, Total book loans and other media, Museum visits Theatre and cinema attendance, Pollution, Innovative spirits, CO_2, Transparent governance, Sustainable resource management, Education facilities, Health conditions, Sustainable, innovative and safe public transportation, Pedestrian areas, Cycle lanes, Green areas, Production of solid municipal waste, GWh household, Fuels, Political strategies and perspectives, Availability of ICT infrastructure and Flexibility of labour market.

These are the kind of decisions that need performance measurement and figure 2.1 below shows the type of decision that need to be measured based on performance (Piira & Pinto-Seppa , 2015).

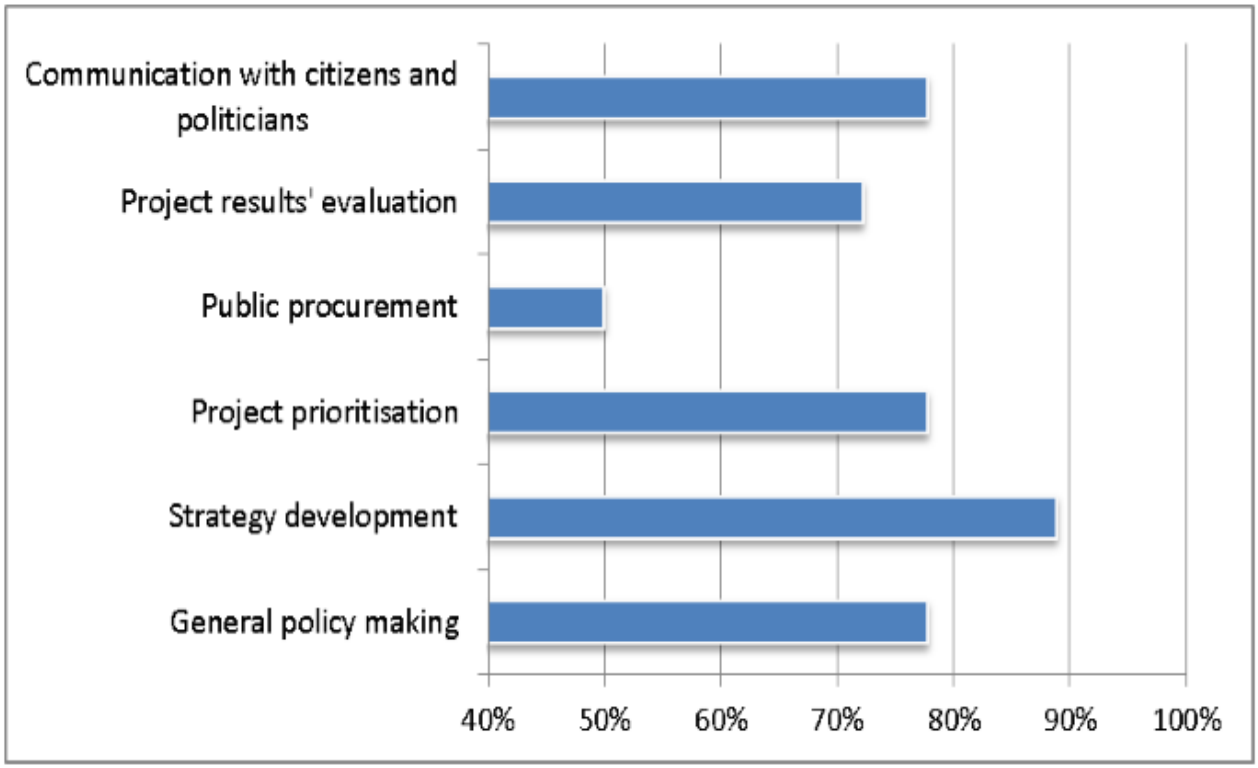


Figure 2. 1: Performance Measurement Decisions (Adapted From: Piira & Pinto-Seppa , 2015)

Any city is a complex system. As a complex system, cities have unpredictable behaviours and when some actions are set up: reactions and feedback can be obtained (Lombardi, Giordano, Farouh, & Yousef, 2012). Thus, it is important to measure performance to identify where there are flows and things that need to corrected or improved.

2.3. Overview of Smart Living

Smart Living is one of the Smart City components that focuses on improving the lifesyle, behaviour and consumption of city dwellers. Smart Living also focuses on ensuring healthy and safe living for citizens in a culturally vibrant city with varied cultural facilities, good quality housing and improved quality of life (Policy Department A, 2014). According to Neirotti, De Marco, Cagliano, Mangano and Scorrano (2014) Smart Living involves delivering healthcare services to inhibit and diagnose diseases, public security to help protect citizen's integrity and their goods, capitalising on an education policy to creating more opportunities for students and teachers and promoting cultural events. Smart Living consist of components that make it easy

for citizens to live in a better and sustainable environment. The components include health, culture, housing, education and Public Safety(Simonofski, Valle, Serra & Wautelet, 2019). Figure 2.2 shows some of the Smart Living components and how they relate to each other.

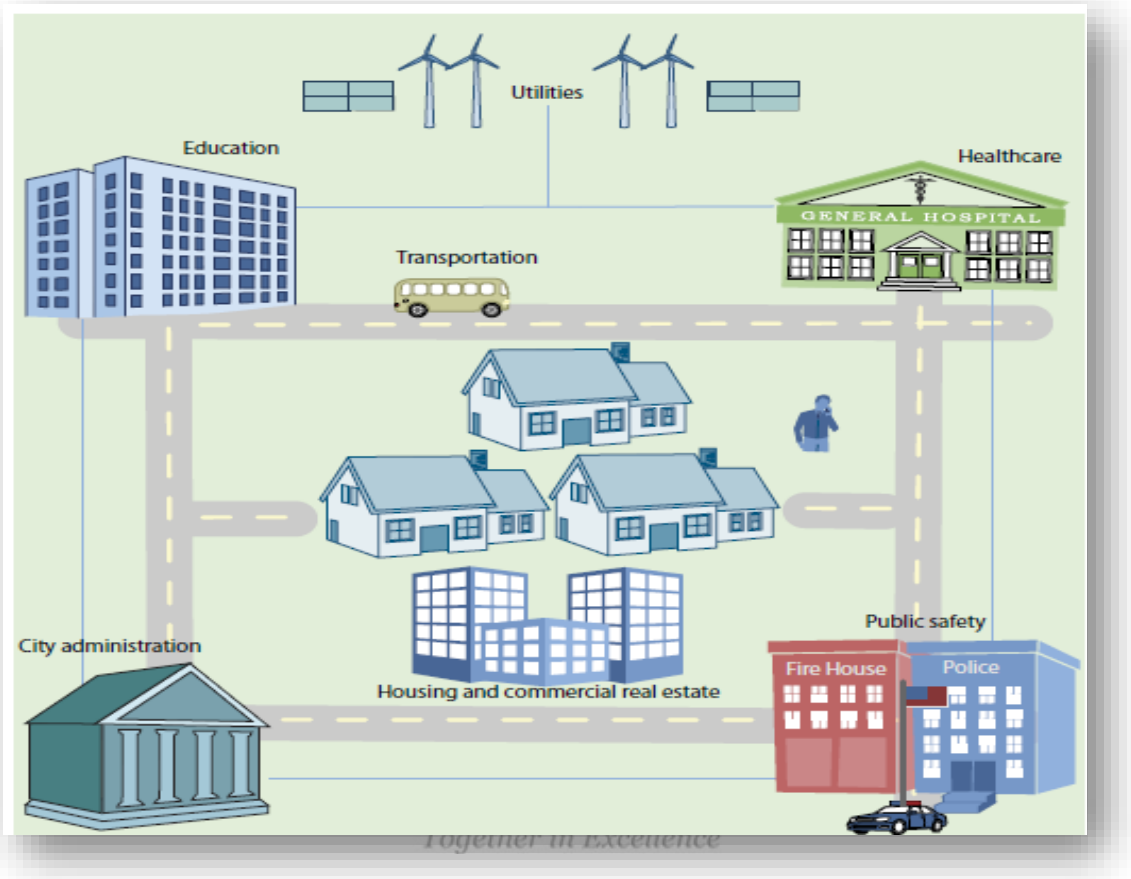


Figure 2. 2: Smart Living Components (Washburn & Sindhu, 2010)

Each of the Smart Living components are described in the sections that follow.

2.3.1. Healthcare

Healthcare as a Smart Living component refers to the delivery of high quality, economically efficient healthcare in urban areas. Smart healthcare involves the distribution of computing, information and networking technologies to aid in preventing disease, improving the quality of care and lowering overall cost (The Role of Basic Computing Research, 2011). In terms of Smart Living, the goal of healthcare is to accelerate the "improvement of advanced approaches that can support the desirable transformation of healthcare services from reactive and hospital-centred to preventive, proactive, evidence-based, person-centred and focused on well-being rather than disease" (Chen, 2013, p.1).

According to Washburn and Sindhu (2010) healthcare systems are built to increase the availablity of healthcare services and provide more rapid and accurate diagnosis to patients. Patient records are stored and shared electronically whenever they are needed (Washburn & Sindhu, 2010). Healthcare systems enable quick response by emergency services. This is supported by Dirks, Gurdgiev and Keeling (2010) who state that healthcare systems allow for better quality of care, early disease detection and prevention and enable appropriate access to healthcare data. Smart healthcare systems significantly contribute to the reduction of hospitalisation and increased success in long term therapies. Smart healthcare systems are also expected to reduce the costs of long-term care (Rocker & Maeder, 2011). Smart healthcare systems save more lives from the reduction of errors, increased efficiency and achieves better quality outcomes as it reduces risks to health (Dirks, *et al*., 2010).

2.3.2. Education

Smart education refers to the transformation of a city's educational system to empower teachers, engage more with students and develop a teaching workforce with high value and global skills (IBM, 2011). Bătăgan and Boja (2011) recognises that education systems provide teaching support to deliver education and training in order to realise change. When smart education systems are used student data can be analysed electronically by teachers. This includes information about academic results and attendance. This is supported by Washburn and Sindhu (2010) who view education systems as key to increasing access, improving quality and experience, and reducing costs.

Bătăgan and Boja (2011) assert that education systems provide interconnectivity for different technology resources used in education to be shared; accumulation of essential data through instrumentation; and intelligence used in making decisions that improve the learning process.

2.3.3. Culture

Smart culture is about recognising heritage, knowing current and past leaders (Washburn & Sindhu, 2010). Culture in a Smart Living environment refers to health, safe living in a cultural vibrant city with diverse cultural facilities and incorporating old housing and accommodation (Working Group 1A, 2010).

2.3.4. Housing

Smart housing involves the need to identify an affordable house as city's limited resources are strained as more people migrate to urban areas. Smart housing involves providing a better place with low cost of living, thus managing reources better (Washburn & Sindhu, 2010). Smart

housing means that living a lifestyle, behaviour and consumption are enabled by ICT (Working Group 1A, 2010). In a smart house a combination of connected devices such as sensors, actuators, computing power and wireless commucation on the hardware side interacting with applications and bid data on the software side allow different devices to understand their environment by alerting users (Wintjes, Avigdor, Gauders, Mielech, & Santuccio, 2014) .

2.3.5. Public Safety

Public Safety is conceptualized as a term that refers to the expectancy of emergency response units that their equipment and tools remain operational during an immediate or following a major natural disaster (The National Public Safety Telecommunications Council, 2014). Jin, Zhao, and Hu (2012) define Public Safety as natural disasters, accidents, public health incidents and social security events that can harm citizens. Ding, *et al*, (2014) view the role of Smart Living for Public Safety as the use of information and communications technology (ICT) to predict, prevent and reduce: crime, new and emerging threats and improving emergency disaster planning and response.

Public Safety and Crime Prevention (2012) believe that Public Safety does not only mean abolishing crime levels and violence that have an impact on the daily lives of citizens, but also delivering life saving rescue services, preventing fires and preparing for and responding effectively to natural disasters. The increased concern about Public Safety is caused by the increased rates of Public Safety issues, hence there is a concern to overcome those issues and finding ways to resolve them. The Public Safety aspect of Smart Living is the focus of this study. Therefore Public Safety issues and initiatives are described in the section that follows.

2.4 Public Safety in Cities

In most cities Public Safety initiatives were introduced to help decrease the increasing rate of Public Safety issues. However, public action to prevent Public Safety issues is dependent on the level of concern about Public Safety. Some individuals have negative perception of citizens who migrated from rural-urban areas living in their city have a poor perception of Public Safety (Nielsen & Smyth, 2008).

2.4.1 Public Safety Issues

Various issues and concerns relate to Public Safety. These include issues like criminal activities, natural disasters such as fire and floods, road traffic, road accidents and infrastructure damage.

Texas Department of Public Safety (2013) views ***crime*** as a Public Safety issue that threatens the freedom, safety and security of citizens. Crime reflects the social and economic health of a community and is a key element in determing the quality of life in a community (Public Safety Issues , 2001). Each of these Public Safety issues are described in this section.

2.4.1.1. Crime

Crimes committed differ, and comprise of crimes such as burglary, robbery, murder, rape, assault, and theft. These types of crimes are the major crimes and might be violent. There are also less traumatic crimes that include vandalism, fraud, driving under the influence and disturbing the peace (Public Safety Issues , 2001). Table 2.3 below shows the East London crime statistics from year 2009 to 2013. The descriptions of crimes listed in Table 2.3 are discussed bleow.

1. **Contact Crimes (crimes against the person)**

Contact crime involves physical contact between the criminals and victims. Contact as such may last from a second or two to an ordeal of several days. Contact crime mostly consists of violence against the person irrespective of the nature of such violence. Physical contact between criminals and victims will always have a more serious psychological impact than in which property is stolen from the victims in the latter's absence (South African Police Service, 2011). It includes offences such as the following offences:

- Murder:
- Attempted Murder
- Assault with the intent to inflict grievous bodily harm
- Common assault
- Common robbery
- Robbery with aggravating circumstances (carjacking, truck hijacking, bank robbery, robbery at residential premises and robbery at non-residential premises).

2. **Contact-Related Crime**

Contact-related crimes cover the crimes of arson and malicious injury to property. These types of crimes can flow from either an individual behaviour or collective behaviour. Contact-related

crimes can cause disruption and losses into millions to both the private and public sectors (South African Police Service, 2011).

3. Property-Related Crimes

Property-related crimes excluding some cases of theft out of or from vehicle and burglary mostly occur in the absence of the victims or when the latter is unaware of the occurrence. Therefore, property-related crimes do not involve violence except damage to property in some cases (South African Police Service, 2011). These types of crimes in this category include:

- Burglary at non-residential premises
- Burglary at residential premises
- Theft of motor vehicle and motorcycle
- Theft out of or from motor vehicle
- Stock- theft

4. Crime Detected As A Result of Police Action

In this crime category types of crimes that fit include unlawful possession of firearms and ammunition, drug-related crimes like use of, possession of and dealing in drugs and driving under the influence of alcohol or drugs. The above-mentioned crimes are usually not reported to the police by public members they mainly come into attention as a result of police activities such as roadblocks, searches and intelligence collection (South African Police Service, 2011).

5. Other Serious Crime

Other serious crime includes all theft not mentioned elsewhere, commercial crime and shoplifting. All theft not mentioned elsewhere is also known as other theft that refers to all theft except theft of motor vehicles and motorcycles, theft out of or from motor vehicles, house breaking at both residential and non-residential premises and stock theft. Other theft involves stealing of smaller items in most cases that are easy to carry, can be used by the thieves themselves in most cases and are easy to hide or sell (South African Police Service, 2011).

Table 2. 3: East London Crime Statistics *(South African Police Service, 2014)*

CRIME CATEGORY	April 2009 to March 2010	April 2010 to March 2011	April 2011 to March 2012	April 2012 to March 2013	April 2013 to March 2014
CONTACT CRIMES (CRIMES AGAINST THE PERSON)					
Murder	51	50	47	39	34
Total Sexual Crimes	166	171	152	162	123
Attempted murder	21	22	17	14	13
Assault with the intent to inflict grievous bodily harm	603	579	581	490	421
Common assault	496	477	460	441	401
Common robbery	228	231	204	231	248
Robbery with aggravating circumstances	377	425	502	372	441
CONTACT-RELATED CRIMES					
Arson	22	21	10	8	3
Malicious injury to property	323	327	398	362	399
PROPERTY-RELATED CRIMES					
Burglary at non-residential premises	716	775	472	505	475
Burglary at residential premises	744	1013	1196	846	762
Theft of motor vehicle and motorcycle	197	219	249	179	167
Theft out of or from motor vehicle	756	803	1064	745	720
Stock-theft	28	14	12	22	15
CRIME DETECTED AS A RESULT OF POLICE ACTION					
Unlawful possession of firearms and ammunition	18	13	26	25	24
Drug-related crime	169	166	253	303	311
Driving under the influence of alcohol or drugs	784	782	570	604	527
OTHER SERIOUS CRIMES					
All theft not mentioned elsewhere	1 613	1607	1538	1286	1656
Commercial crime	778	678	686	706	651
Shoplifting	534	548	434	364	377

SUBCATEGORIES OF AGGRAVATED ROBBERY					
Carjacking	20	14	14	21	18
Robbery at residential premises	23	26	20	25	26
Robbery at non-residential premises	23	39	44	30	64
OTHER CRIME CATEGORIES					
Culpable homicide	19	22	26	18	27
Public violence	5	3	2	1	4
Crimen injuria	90	96	66	52	39
Kidnapping	3	5	5	6	12

From Table 2.3, most of the crimes in 2013/2014 decreased but marginally. However, there are serious crimes which had previously declined but in 2013/2014 have increased. These include crimes such as robbery, malicious injury of property, theft and drug related crimes. These serious crimes need to be resolved, thus there is a need to introduce a Public Safety Smart City Project to overcome crime challenges and provide citizens with a crime free and liveable environment.

2.4.1.2. Natural Disasters

Natural disasters are events that causes serious disruption, leading to widespread human, material or economic losses beyond the coping capacity of a given society (ICSU Regional Office for Africa, 2007). Natural disasters are events such as floods, tornados, hurricanes, drought, wind storms, hail storms and wild fires which represent a continued and highly unpredictable Public Safety threat. These type of disasters result in deaths, loss of infrastructure and bilions of dollars in personal property damage and economic losses (Texas Department of Public Safety, 2013). This statement is supported by Yu, *et a.l* (2013) who state that these natural disasters become serious threats to the living quality of a city's citizens and safety of people's lives and properties, as they frequently cause deaths, serious injuries and huge property loss.

2.5.1.3. Road Accident and Traffic

Road traffic and accidents are types of Public Safety issues that are incurred by human beings and would affect a city's Public Safety records (Yu, *et al*., 2013). Hughes, Newstead, Anund, Shu, and Falkmer (2014) state that in the top ten major causes of mortality and morbidity

worldwide, road traffic is listed. It is estimated that more than 1.2 million people die as a result of road traffic crashes and 50 million are injured per anum (Hughes, *et al*, 2014).

Road traffic can be triggered by stormy weather or harsh weather conditions, road works, peak hours or accidents. Accidents are caused by human error such as reckless drivers' speeding and bad driving habits which results in accidents leading to death. Mphela (2011) supports this statement that a large proportion of road accidents are caused by human error, resulting from road users who take decisions to disobey or break the road rules. Strategies (or Public Safety Initiatives) were introduced to understand and reduce such events.

2.4.1.4. Infrastructure Damage

According to Washburn, *et al*. (2010) the rapid population growth poses challengs for city services and infrastructure. Infrastructure include components such as bridges, drinking water, energy, roads, schools, transportation and water. Infrastructure is not only damaged by the population but by also natural hazards such as foods, earthquakes and fire . Infrastructure damage is a situation that threatens or cause damage to property, disruption of supply of energy and fuel, disruption of a system of communication, disruption of facilities for transport or disruption of services relating to health (Cabinet Office, 2011). Gorvement need to build resilience in infrastructure in order to reduce vulnerability to natural hazards.

2.4.2 Public Safety Initiatives

Public Safety initiatives were formed as emergency responses. Therefore, there are first responders and emergency personnel at the scene of any major disaster (Moore, 2014). Public Safety initiatives are grouped into four categories namely: law enforcement, fire management, emergency medical services and road traffic management. Each category is responsible for preventing and fighting different Public Safety issues that occur. The categories consist of emergency responders that respond to the reported incidents such as police, paramedics or fire fighters. Each of these categories are discussed in the sections that follow.

2.4.2.1 Law Enforcement

Law enforcement prevents, combats and investigates crime to maintain a safe environment. It provides protection to citizens and the city and maintains the safety and security of citizens and their property. Law enforcement includes the police who come up with strategies to reduce accidents and fatalities, and includes the use of penalties to ensure road rules are obeyed and compliance improves (Mphela, 2011). Law enforcement is aimed at providing citizens with a secure environment from in crime is being reduced and investigated. Citizens need assurance

that they can live freely from crime and violence, this initiative is committed to reducing crime and the impact of crime on individuals. It involves crime prevention in which the causes of crime are analysed.

2.4.2.2 Road Traffic Management

Road traffic management intends to improve the safety and flow of traffic, reduce traffic issues and ensure effectively operating road traffic (Road Department, 2010). The purpose of this initiative is to prevent and reduce traffic accidents and road crashes. Specifically, the influence of road traffic injuries is important, as they are a rising Public Safety issue affecting vulnerable road users, including the poor (World Health Organization, 2004). As supported by Dirks, *et al*. (2010) traffic congestion negatively influences the quality of life in a city as it descreases personal and business productivity, lowers air quality and creates noise pollution. Thus, there is need to overcome such Public Safety issues in order to povide well-managed and easily accessible transportation.

2.4.2.3 Fire Management

Due to urbanization, South Africa is now becoming more vulnerable to wildfires. Wild fires are a risk to life, property and environment. Fire Management can be divided into elements, namely: fire prevention, fire protection and fire protection. These elements manage fire risks, eliminate the risks, protect assets against fire, and ensure all the necessary equipment, protective clothing and trained personnel is available to extinguish fires and do everything in their power to stop a fire from spreading (Silviculture, n.d). Fire Management is for quick response and early detection to fire accidents, thus reduce fire hazards.

2.4.2.4 Emergency Medical Services

The emergency medical services (EMS) focus is to save lives through proactive interventions. This department includes having sufficient resources and capacity to respond to emergencies such as fire and road accidents. It provides fire safety, disaster management and emergency medical services. Figure 2.2 demonstrates how EMS responds to an incident and what forms part of the EMS.

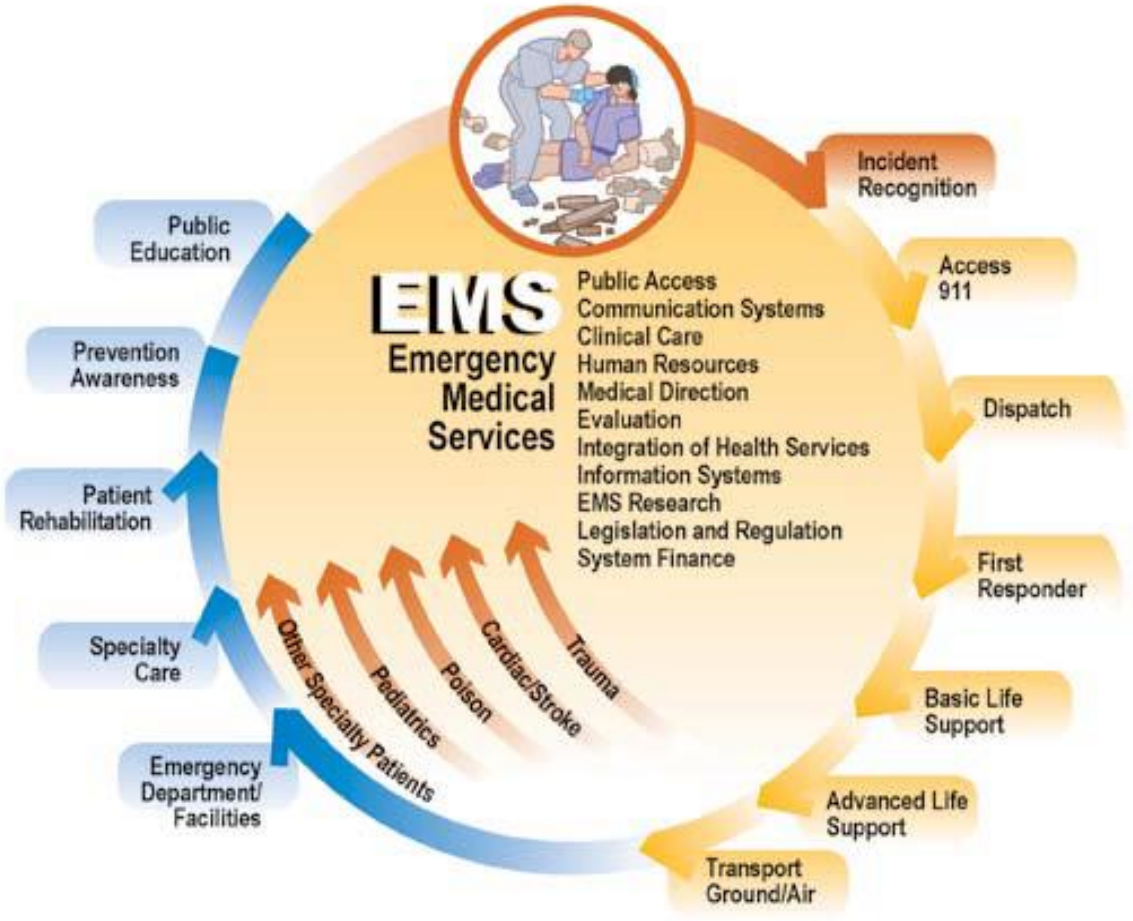


Figure 2. 3: Emergency Medical Services (Emergency Medical Services, 2007)

Figure 2.3 above shows how the data collection process of Public Safety matters would work together with the Public Safety initiatives. It lays out the vision of a smarter Public Safety environment. This means that citizens are provided with a safer and more desirable environment through the five key competencies, shown in the diagram (IBM, 2012).

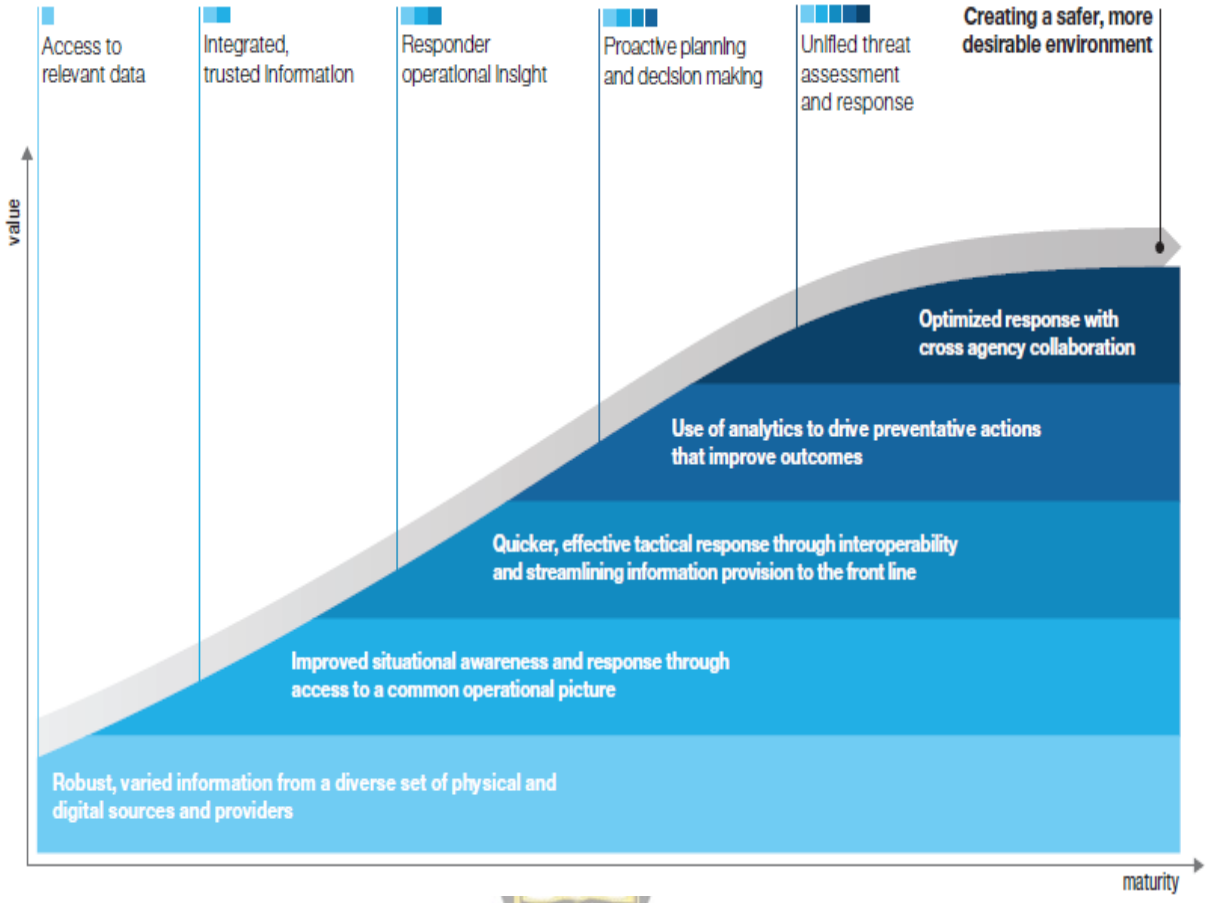


Figure 2.4: Range of Competencies that Support a More Effective and Agile Response to Public Safety and Security Threats (IBM, 2012)

Figure 2.4 is relevant to this study as it shows how data regarding Public Safety matters flows from citizen to relevant authorities. This figure shows how rapid response can be given to citizens or how Public Safety matters can be reported and solved through following the processes highlighted. The Public Safety Smart City Project would use this diagram to provide a better and easy way of managing Public Safety matters.

2.4.3. Public Safety Entities

Assocham (2013) state that there are four entities that collectively form part of a smart Public Safety and they are detection and integration, analysis, decision and action. The entities are defined below and shown in Figure 2.5:

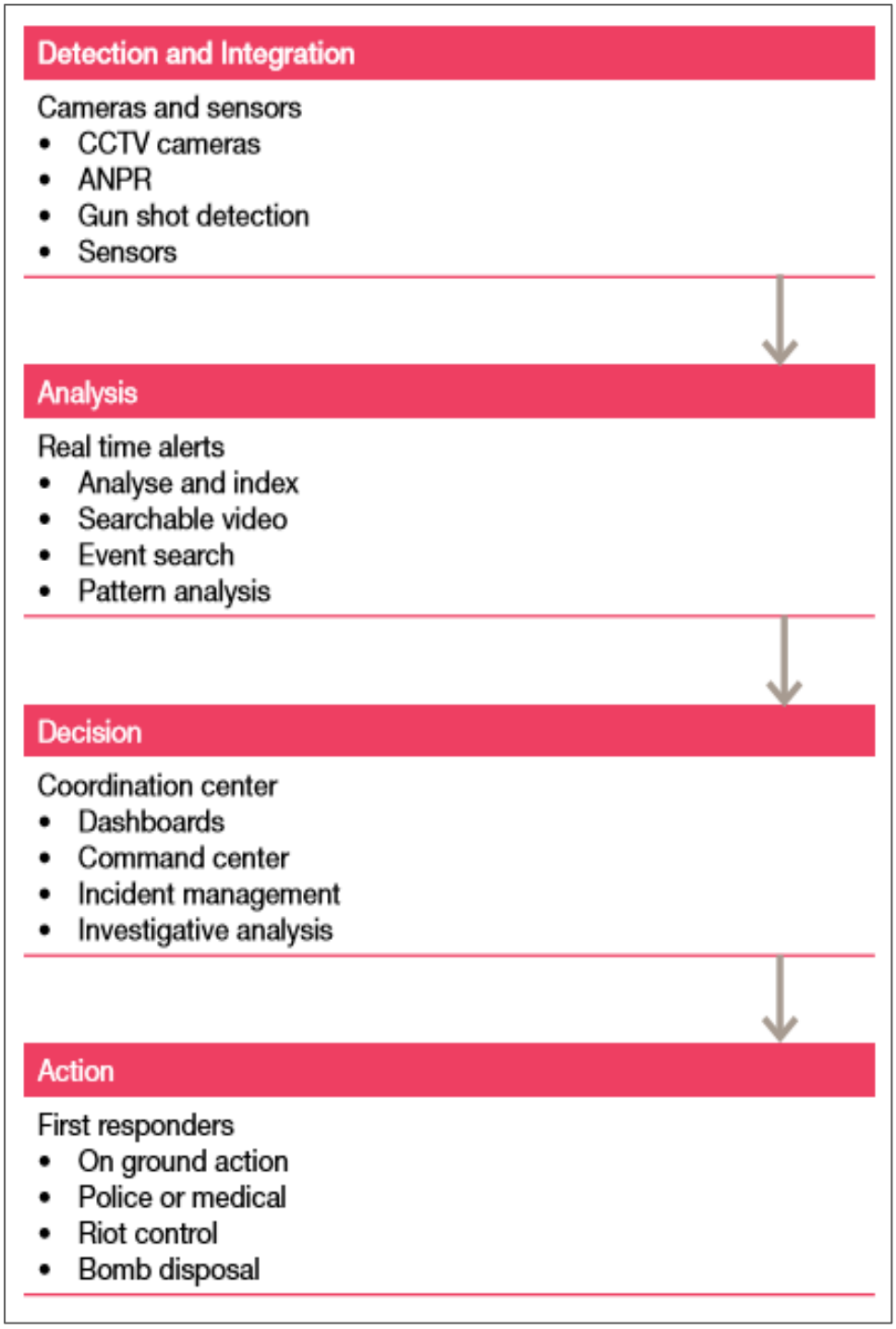


Figure 2. 5: Public Safety Entities (Adapted From: Assocham, 2013)

Detection and Integration: The lifeline of a Public Safety Project is capturing and collecting data in real time, particularly data that relates to an incident leading to a security threat. The idea is to collect date from a wide range of different sources in digital formats so that it can be efficiently processed and used in real time and it can be driven electronically using high

definition CCTV cameras, infrared radars (IRs), lasers, handheld devices or an incident reported by a citizen.

Analysis: It is important that the collected information is made available to the relevant authorities, as it will help them use the information better, so that it can help in proactive planning and to improve the strategic and tactical decision-making including anticipation, prevention and resource deployment.

Decision: It is equipped to accommodate decision makers and facilitate decision-making, reporting, incident management and investigative analysis of the data collected using the real time information. The established infrastructure enables effective and efficient decision making with easy access to information.

Action: The first responders to an emergency for disaster management. This the threat assessment and response team that will have ready access to the information base which will prepare them to handle incidents and emergencies better. The first responders will be equipped to respond to on ground action like riot control, bomb disposal and any other police or medical emergency.

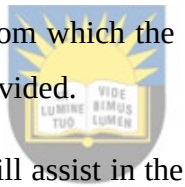
2.5 Public Safety Smart City Project Benefits

There are benefits that arise from the deployment of Public Safety projects. Awareness about the benefits offered by the projects is a critical factor in a Public Safety projects implementation. Thus, citizen participation can be view from the perspective of benefits to be gained. The following are the benefits that can be gained from active participation in a Public Safety Smart City Project: citizens can provide the desired information about Public Safety matters, citizens will learn in what way one can make desired change and finally citizens learn to understand and appreciate ones' needs and the interests of the city (Wandersman, *et al*, 2000). Wandersman and Florin (2000) state that there are other benefits resulting from citizen participation including: improved quality of an environment, increased feelings of control over the environment, development of an environment that better fits the needs of citizens an increased feeling of helpfulness and responsibility (Ohio State University Fact Sheet, 1986).

Chileshe and Dzisi (2012) recognises decrease in accidents, safer environment, management peace of mind, improved work perfomance and reduced insurance payments as benefits of Public Safety projects. In a Public Safety Smart City Project commitment from the citizens is required to improve Public Safety and to strengthen it motivation for citizens to participate has

been identified. However, citizen lack motivation in a Public Safety Smart City as participation has been relatively low (Piderit & Flowerday, 2013). Thus, there is a need to motivate citizens to participate in the project. The Public Safety Smart City Project provides the citizens, local government and the city with greater benefits. The benefits are as follows: citizens will be protected from danger of any physical harm, therefore safety of the citizens will be enhanced, and crime rates that are rising will be reduced. Thus, in order to effectively combat crime citizens need to play a role and their support is a strategy to crime reduction. Thus, the Public Safety Smart City Project uses citizens to improve Public Safety. Therefore, the citizens' contribution citizens will make the city a better community with security protection.

Road traffic and injuries can be prevented as interventions to reduce them and adverse consequences have been done through road safety awareness campaigns, but some people who migrate from rural to urban areas have lower levels of education and lack understanding of urban transport and meet more risks of traffic accidents (Sun, Yang, & Chen, 2013). Thus, the Public Safety Smart City Project gives citizens the opportunity to report suspicious activities to enhance good road user behaviour from which the reduction of road accidents and traffic congestions in transportation will be provided.



The Public Safety Smart City Project will assist in the identification of Public Safety matters as they occur, is reliable and accessible anywhere and anytime in an event of a Public Safety matter and provide all reported Public Safety matters immediately to relevant authorities quickly respond. Citizens can identify issues through defining their reality, shaping their new identity and transforming their lives. Citizen participation can make the running of the project effective as it will increase public support from citizens, creating cooperation and trust. Citizens offer the opportunity to distribute information and assist in recognising Public Safety matters concerning them and thus supporting the project solutions (Piderit & Flowerday, 2013).

To make the benefits possible citizens will be motivated to participate in a Public Safety Smart City Project as it will the problems associated with Public Safety to make the city's investors and businesses perform effectively in an environment protected from Public Safety matters such as crime, emergencies, safety threats and disasters. The Public Safety Smart City Project will help protect assets of citizens and of the city. The Public Safety Smart City Project will provide reliable data to emergency responders during an emergency situation, communication during emergencies and daily operations will be improved. Thus, the emergency units will

respond more effectively, thus this will provide faster response times to Public Safety matters. As a result improved productivity and enhanced quality of life of citizens will be observed.

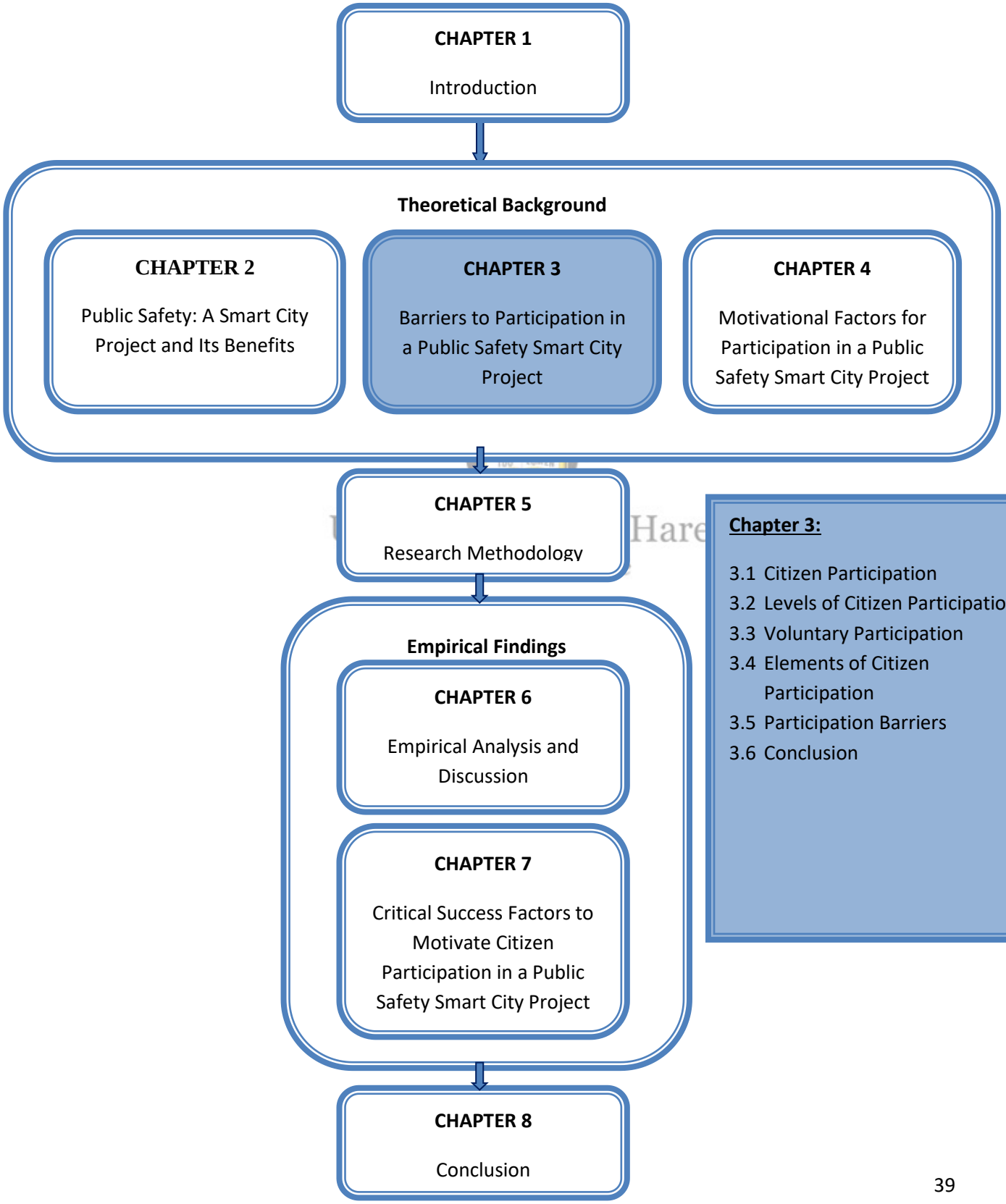
2.6 Conclusion

This chapter provided an overview of Smart Cities as well as an overview of Smart Living. It has been found that in the development of Smart Cities there are dimensions and features that exist and these were discussed in this chapter. This chapter further provided the application of Smart Cities in other countries, as well as the measures of performance in Smart City projects.

Smart Living components were discussed which include: healthcare, education, Public Safety, culture and housing. The study focuses on Public Safety. Public Safety issues and Public Safety initiatives were also discussed in this chapter. The Public Safety initiatives are categorized into four different departments. These departments include: Law enforcement, Road traffic management, Fire management and Emergency management services. The Public Safety Smart City Project was discussed and the benefits.

This chapter address the research problem by identifying the benefits of Public Safety Smart City Project that can attract the attention of citizens to participate. The Public Safety initiatives are also highlighted for emergency responses. Citizens need to participate in this project but there are potential barriers that can prevent citizens from participating. Chapter 3 will provide a more detailed discussion about the participation barriers.

Chapter 3:
Participation Barriers in a Public Safety Smart City Project



3.1. Citizen Participation

There are many perspectives or views of ctizen participation. Robino (2009) views participation as a technique, a methodology, a process, a value or a desirable outcome as means to increase projects' efficiency, effectiveness and sustainability. However, André (2012) defines citizen participation as a process on which people take part, whether on voluntary or obligatory basis. Monastyrski (2002, p.15) argues that "citizen participation is a community based process, where citizens organise themselves and their goals at the grassroots level and work together through non-governmental communty organisations to influence the decision making process".

Citizens address their concerns and best interests in improving quality of life through participation in Public Safety initiatives. Citizen participation is therefore very important in a Public Safety Smart City Project as citizens are involved in the project in order to contribute to managing Public Safety in the city. Citizens' inputs are significant in such a project as they help enhance the city create a better safer environment (Simonofski, Valle, Serra & Wautelet, 2019). It is believed that citizens participate more when the issues relate directly to them. In the case of the Public Safety Smart City Project citizens will participate in the identification of Public Safety issues that affect the citizens.

3.2. Levels of Citizen Participation

Sherry (2004) presented a ladder of eight levels of citizen participation. This is depicted in Figure 3.1.The ladder of citizen participation explains the different types of participation. It explains the important stages of citizen participation and provides better understanding of how each level of citizen participation differs. In a Public Safety Smart City Project citizens have the citizen power level, as the level is about citizens having more power to negotiate, to change status quo and their voices are heard and responded to. This level relate to this research study because citizens are important in the project as the project depends on their contribution of reporting Public Safety issues and their ability to change the city's environment.

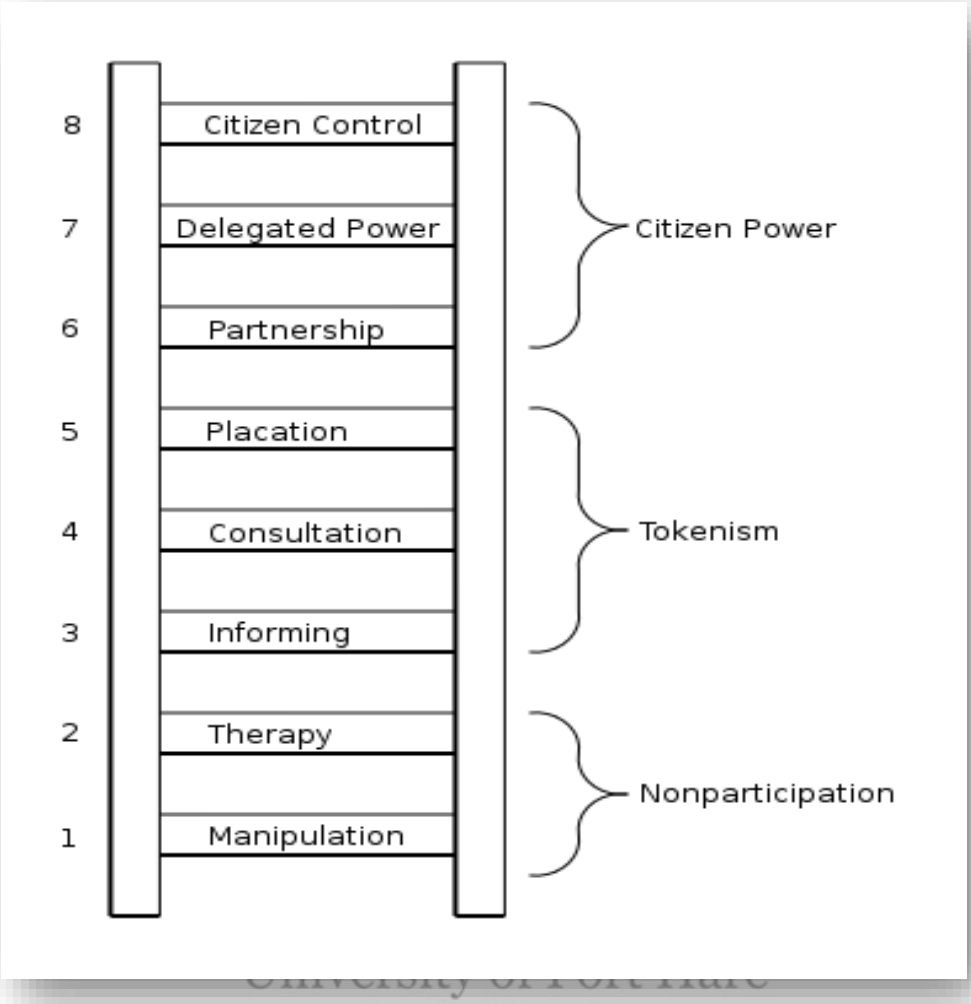


Figure 3. 1: A Ladder for Citizen Participation (Sherry, 2004)

The levels of citizen participation are discussed below.

The lowest level of citizen participation is nonparticipation which includes:

1. Manipulation – this type of participation signifies the distortion of participation into a public relations vehicle by power holders. People are placed on rubberstamp advisory committees for the express of educating them or engineering their support (Sherry, 2004).
2. Therapy – in this form citizen participation citizens are encouraged in extensive activity but the focus is on curing them their pathology. People participate on what they understand (Sherry, 2004).

3. Informing – this form of citizen participation citizens are informed of their rights, responsibilities and options. There is only one flow of information from officials to citizens with no channel provided for feedback (Sherry, 2004).

The middle level is tokenism, which includes:

1. Consultation – citizens' opinions are invited in this type of participation there is no assurance that the citizens' concerns or ideas will be taken into account (Sherry, 2004).
2. Placation – in this level the citizens begin to have some degree of influence. Citizens are allowed to plan or advice but retain for power holders the right to judge the legitimacy of the advice (Sherry, 2004).

The last and highest level is citizen power, which includes:

1. Partnership – in this rung citizens and power holders agree to share planning and decision making responsibilities (Sherry, 2004).
2. Delegated power – in this type of participation citizens can achieve dominant decision-making authority over a particular plan or program through negotiations with the public officials (Sherry, 2004).
3. Citizen control – citizens in this type of participation can govern a program or an institution be in full charge of a program and be able to negotiate the conditions under which outsiders may change them (Sherry, 2004).

3.3. Voluntary Participation

There are different types of participation, which include voluntary participation and civic participation. Civic participation involves ways in which citizens participate in their communities to improve conditions and shape the community. While in voluntary participation, citizens decide on their own whether to participate or not participate they are not forced to participate (Ohmer, 2007). Most of the times there are costs for not participating and for being active.

Voluntary participation requires individual choice and absence of coercion. In citizen participation benefits come with no costs and usually citizens' participate when they see the benefits will outweigh the costs. Costs can be personal or maybe geared to a group and involves things like time, money, skills, hostility, loss, sunning and prestige (Sepasgozar, Hawken,

Sargolzaei & Foroozanfa, 2019). This study is focused on voluntary participation as the project is conducted on a voluntary basis and citizens participate voluntarily. Ohmer (2007) highlights that in voluntary participation, members dedicate their time and energy and are the most important resources.

3.4. Elements of Citizen Participation

Monastyrski (2002) recognises that for constructive citizen participation, the following elements are important:

1. **Desire to make a difference** - Citizens must want to participate and not be forced to take part in. In a Public Safety Smart City Project citizens participate voluntarily and it their desire to report Public Safety to make a difference in the city.
2. **Dedication to the issue** - Citizens have to be persistent and be committed to the issue. The Public Safety Smart City Project offered citizens' incentives to keep committed in participating and to keep them motivated.
3. **Knowledge of citizen participation methods** - All participants have to be aware of citizen participation methods, how they work and what can and cannot be done in certain areas. Flyers were issued out to citizens containing the information about the Public Safety Smart City Project, the number for reporting Public Safety matters, the website and as well as the mobisite. The types of Public Safety matters that citizens need to report were provided in the flyer.
4. **Awareness** - Citizens have to be aware of their rights in the project and the processes of the project. Citizens were made aware of the Public Safety Smart City Project processes as they highlighted on the flyer. The project processes were also included in a Public Safety Smart City Project website.
5. **Each citizen has to benefit** - Citizens will only actively participate if the issue either directly affects them or they will somehow benefit from it. Citizens participate in a Public Safety Smart City Project as Public Safety affect them and they will benefit as the Public Safety matters will be solved by the authorities.

These five elements need to be considered before citizens participate. They promote citizen participation and enhance information for citizen participation, therefore leading to successful participation as citizens will have all the information they require. In citizen participation there are challenges or barriers that seem to exist that would make people reluctant to participate. Understanding and anticipating these barriers is important. The participation barriers are

discussed in the next section. Gaventa and Valderrama (1999) support this that there are barriers to citizen participation and suggest the need to fully understand the barriers.

3.5. Participation Barriers

Citizens have taken participation in a Public Safety Smart City Project lightly. Thus leading to slower the response from the Public Safety initiatives as some Public Safety issues are not reported. Thus, it is important to identify the barriers to participation in the project. The success of the project depends on citizens providing information about Public Safety matters. The information received from citizens about Public Safety matters is then given to the relevant emergency units (Public Safety initiatives).

There are barriers that prevent citizens from participating in a participatory program. These barriers are problematic and need to be looked at before the program or project commences. Some citizens may not participate even though they have valuable information that can assist the success of the project. Piderit and Flowerday (2013) identified two participation barriers in a Public Safety Smart City Project that prevent citizens from participating and these barriers include telephone cost and intimidating experience. In support of these findings, Chileshe and Dzisi (2012) establish that some of the barriers that prevent citizens from participating in a Public Safety Project include time restrictions, cost, lack of knowledge or skill, lack of information and guidance.

Smart Method of Public Policy (2010) state that citizens do not participate in programs to solve community problems due to a lack of impact of personal participation, lower socio economic status, limited time and money, lack of information and knowledge (or awareness) and lack of confidence in their ability to be effective. Malchenko and Smirnova (2019) highlight that difficulties in participating in development programs in urban areas include low-income, lack of experience in participation, lack of skills necessary for participation and low sense of personal efficacy.

Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) supports the above-mentioned participation barriers and identifies the following: lack of trust, limited access to information, fear of the unknown, lack of self-confidence, lack of participation skills and lack of resources (particularly experience, time and funds). All of these barriers hinder citizens form partcipating. Wang and Van Loo (1998) highlights that it is challenging to gain participation in certain developmental programs because citizens see development as a threat and probably costly.

The different barriers are discussed in the section that follow and how they relate or affect citizens particating in a Public Safety Smart City Project.

3.5.1 Self-efficacy

Self-efficacy is described as "an individual's self-judgement about his or her capabilities to organise and execute the actions necessary to achieve desired goals" (Ohmer, 2007, p.110). It has been shown in research that actively engaging citizens to improve their communities is associated with increased feelings of self-efficacy and empowerment. Self-efficacy is seen as a participation barrier when individuals have self-doubts and believe that they have a little control over impediments and convince themselves frequently that their efforts will be ineffective (Barati, Abu Samah, Ahmad, & Idris, 2013).

Individuals are most likely to engage in activities for which they have high self-efficacy and less likely to engage to those they do not (Van der Bijl & Shortridge-Baggett, 2002). Self-efficacy are usually measured in three basic scales: magnitude, streng and generality. The three scales are described below:

- **Self-efficacy magnitude** – measures the difficulty level an individual feel is required to perform a certain task (Van der Bijl & Shortridge-Baggett, 2002).
- **Self-efficacy strength** – refers to the amount of conviction an individual has about performing successfully at diverse levels of difficulty (Van der Bijl & Shortridge-Baggett, 2002).
- **Generality of self-efficacy** – refers to the degree to which the expectation is generalized across situations (Lunenburg, 2011).

Lunenburg (2011) consider self-efficacy as some kind of self-confidence or a task-specific version of self-esteem that has a powerful effect on learning, motivation and performance.

3.5.2. Time and Cost Constraints

Time and cost constraints are belived to be barriers that prevent citizens from participating. Some citizens may find it time consuming and expensive, as some programs require citizens to use their own money to participate and some citizens are employed and find it time consuming to participate while they have work to do (Community Planning Toolkit, 2014). There are also citizens who also find it time consuming to participate in a project that they do not see as important and does not bring about change in their environment.

In a Public Safety Smart City Project these two constraints were taken into consideration as the project focuses on reporting Public Safety matters. To make a call approximately cost R1 airtime to report an incident and it is convenient for every citizen as they only participate when an incident occurs and have to report it. Additionally, a mobile web platform was available as a more cost-effective option.

3.5.3. Trust

Barraud-Didier, Henninger, and El Akremic (2012, p.3) define trust as a "psychological state which consists of accepting the vulnerability resulting from the positive expectations of the intentions or behaviours of the other". It is argued that in participation, trust plays an important role (Uslaner & Brown, 2005). Lutz (2013) presented the diagram in Figure 3.2 to show the importance of trust related to participation.

Lutz (2013) state that trust in participation leads to serendipity. If a project is beneficial, citizens can easily participate and may have trust in it. Trust in a project is important as citizens will participate as they will hope for the best and serendipity drives more participation. In a Public Safety Smart City Project trust is considered in a manner that citizens can report Public Safety matters hoping that they will be resolved as they affect their living conditions. Citizens can have trust in a Public Safety Smart City Project through seeing results after participating.

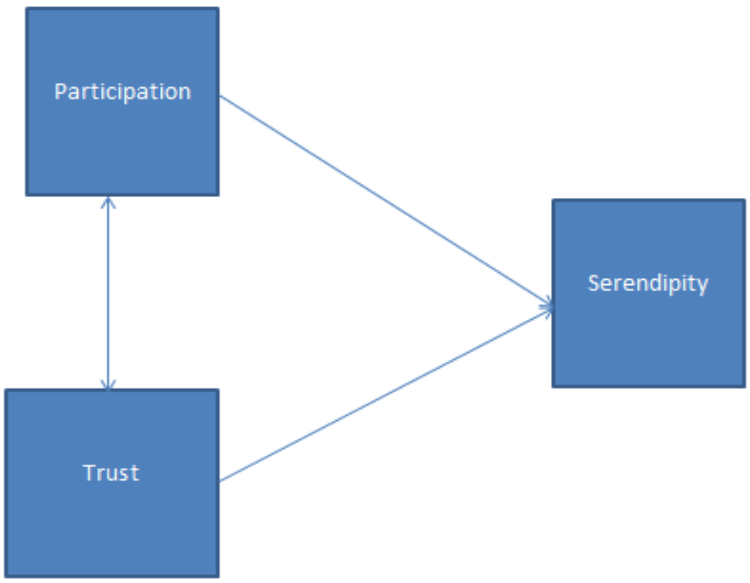


Figure 3.2: Participation, Trust and Serendipity – Adapted from: (Lutz, 2013)

Trust prevents citizens from participating and those citizens will be less likely to participate in a Public Safety Smart City project. Citizens may lack trust in a project because they do not know how the receiver will use the information provided. Some citizens may not trust the project as they do not see how they will benefit from it. Therefore, a feedback mechanism to the citizens is important.

3.5.4. Awareness

There are programs that are conducted in a community and citizen participation is expected but some citizens would not be aware of such information. Some citizens may not have information about the program being conducted. Citizens would have no knowledge related to the program and thus see no need to participate. Therefore, it is important to conduct awareness and educating citizens about the program before it begins for effective citizen participation. Awareness also involves providing citizens with the information about the project, when it is starting, how it will work and what citizens need to do in order to participate. It is essential to make citizens aware of the project and its importance as well as the benefits.

In case of the Public Safety Smart City project, the citizens were provided with all the information about the project. Flyers were sent out to the citizens of East London and adverts were distributed through newspapers and social networks. Information about the Public Safety Smart City Project was provided on the website.

3.5.5. Security and Privacy

Elmaghraby and Losavio (2014) view security as tied to safety, as an assurance that a person may go about his or her life without an injury to life, property or rights. There are three areas that need to be secured:

1. ***Privacy and confindentiality of the information****:* refers to the protection of personal information about an individual and confidentiality is concerned with the secrecy of information kept in trust. For example using data encryption for ensuring confidentiality and disclosure of personal information to third party without the consent of the owner.
2. ***Integrity and authenticity of the information:*** involves ensuring that information provided is accurate and it protected from unauthorised parties. For example using backup to store information.

3. ***The availability of the information for its use and services****:* ensure that information resources are available when needed. For example having a disaster recovery plan that will safeguard data against loss.

Security is perceived as a participation barrier due to the fact that many citizens do not feel protected in a program from intruders. Kemp and Moore (2007) defines privacy as control over personal information of an individual and when, what and how it is communicated to others determined by the individual. Citizens fear the lack of privacy on their personal data and identity as they do not know how the project is secured. In a Public Safety Smart City Project citizen's personal information was not required and they did not have to provide their identification as they were only reporting Public Safety matters.

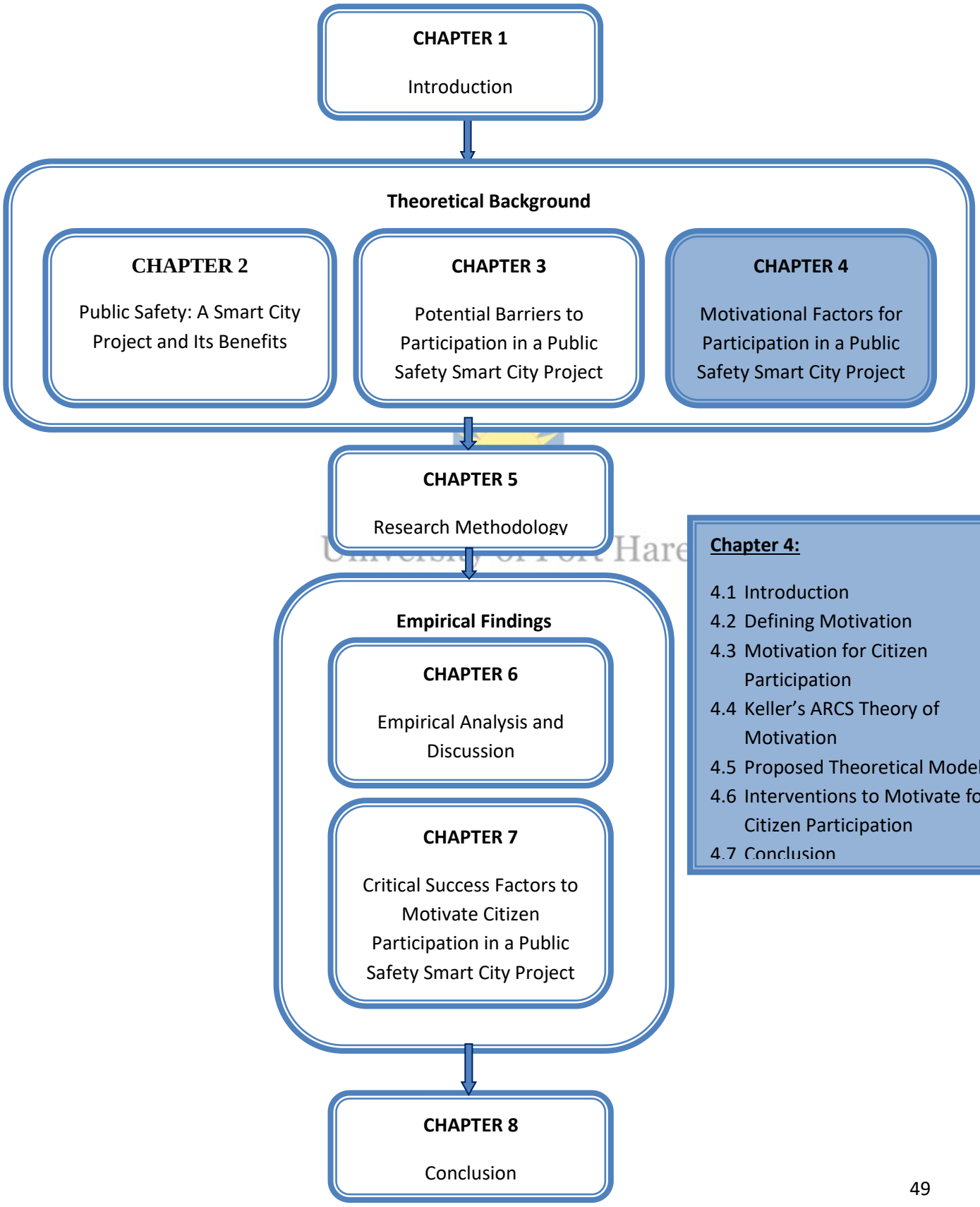
3.6. Conclusion

Citizen participation is still an issue in a Public Safety Smart City Project. Citizens lack the motivation to participate. Citizen participation is important and plays a key role in expressing the needs and concerns of citizens. Citizen participation is defined as process for citizens to take part. Citizens participate in order to benefit and it is believed that citizen participation should not only be conducted on special conditions but every day.

In this chapter citizen participation is discussed followed by levels/types of citizen participation. Motivation to participate in a Public Safety Smart City Project and benefits of citizen participation were presented. Participation barriers such as: self-efficacy, time and cost constraints, trust, awareness and security and privacy were presented. There are different types of citizen participation and this study is based on voluntary participation, where citizens participate on voluntary basis.

Therefore, there is a need to address the participation barriers that prevent citizens from participating. This can be done by providing motivation to citizens through the benefits. Nevertheless motivating citizens to participate is discussed in the next chapter.

Chapter 4:
Motivational Factors for Participation in a Public Safety Smart City Project



Chapter 4:

4.1 Introduction
4.2 Defining Motivation
4.3 Motivation for Citizen Participation
4.4 Keller's ARCS Theory of Motivation
4.5 Proposed Theoretical Model
4.6 Interventions to Motivate for Citizen Participation
4.7 Conclusion

4.1. Introduction

Today the need for participation in Public Safety initiatives is the strongest in most countries and citizens who participate play a key role. In such initiatives, motivation is a fundamental factor (Tijunaitiene, 2009). Citizens may not be active in participating and making a decision of whether to participate or not. Thus, there is a need to motivate citizens to participate. Naranjo-Zolotov, Oliveira, Cruz-Jesus, Martins, Gonçalves, Branco and Xavier (2019) assert that motivation refers to reasons that underlie behaviour and is characterized by willingness and volition. These attributes move people to do or not do something.

Motivation greatly affects performance and well-being in different contexts. Motivation can be intrinsic which represents an example of a self-determined motivation and interest and enjoyment of the activity motivate an individual to participate. Motivation can also be extrinsic that means the respective activity is instrumental to a goal that can be separated from itself (Guntert & Wehner, 2015).

Motivation is important in this study as participation in a Public Safety Smart City Project has been lower than expectations. Motivation will assist in identifying the factors that can motivate citizens to participate as well as attracting them to participate in a Public Safety Smart City Project. Citizens need to participate and motivation is an ideal solution to enhance citizen participation, thus this chapter mostly discuses motivation.

This chapter aims to provide a better understanding of motivation toward participation and the motivational factors involved. This chapter provides an overview of motivation by discussing in detail the definition of motivation. It further discusses the need for motivation in a Public Safety Smart City project. Keller's Attention Relevance Confidence Satisfaction (ARCS) motivational theory is discussed from which it identifies the motivational factors that can motivate citizens to participate. Lastly, this chapter assesses interventions that can motivate citizens to participate and their relevance in a Public Safety Smart City project.

4.2. Defining Motivation

According to Chepkilot (2005) organisations have long realised the importance of the concept of motivation in the role it plays in achieving the organisational objectives. Therefore in relation to this study, motivation is intended to play a key role in ensuring citizens participate. Thus increasing citizen participation and commitment is important for a Public Safety Smart

City project. Motivating citizens to participate is a way to attract them to contribute to the project, so that the project goals can be reached successfully.

Tijunaitiene (2009) asserts that in voluntary activities motivation is an essential factor. Tijunaitiene (2009) then declares that motivation is the system of stimulation of any behavior (actions or activities) caused by various motives. Therefore it is necessary to identify the motives that can develop and activate motivation. According to Purohit and Bandyopadhyay (2014) different researchers have described motivation differently. Howerver few researchers have made an attempt to define motivation. Choy (2005) states that motivation is a complex concept that has been defined in multiple ways. Motivation has been linked with achievement, goals, biological drives and learning strategies (Naranjo-Zolotov, Oliveira, Cruz-Jesus, Martins, Gonçalves, Branco & Xavier, 2019).

Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) defines motivation as the process that arouses, energises, directs and sustains behaviour and performance. Choy (2005, p.2) views motivation as a "process by which goal-directed activity is instigated and sustained". While Jansen (2009) states that motivation is a motive to engage in a specific activity and interactions of multiple values, beliefs and goalscan be achieved through them. Cadwallader, Jarvis, Bitner, and Ostrom (2010, p.220) provide a similar definition of motivation based on the motive to engage: "Motivation is a degree to which a person wants and chooses to engage in specified behaviours".

For the purpose of this study, the definition proposed by Goldman and Schaller (2004) is appropriate. Goldman and Schaller (2004) define motivation as an internal state that arouses, directs and maintains behaviour. Garudzo-Kusereka (2003) states that motivation is a driving force behind a person's action. The internal influences on motivation include enjoyment, curiosity and personal interest and needs. This type of motivation is called intrinsic motivation. Extrinsic motivation is worth examination beacause it has a significant negative effect on motivation by undermining free choice and self-reported interst in a given task (Richter, Raban, & Rafaeli, 2015). Both intrinsic and extrinsic motivation can produce the same amount of effort and end results but it is impossible to distinguish the two through observation (Goldman & Schaller, 2004). The Public Safety Smart City Project employed intrinsic motivation.

Choy (2005) state that intrinsic and extrinsic motivations describe the extent to which an individual engages with a task or activity. Intrinsic motivation is motivation to engage in an activity for its own sake, while extrinsic motivation is motivation to engage in an activity as

means to an end (Choy, 2005). Jarkas and Radosavljevic (2013) believe that intrinsic motivation relates to internal desires to perform a particular task or develop a certain skill, while extrinsic motivation refers to external factors which are unrelated to the task being performmed but provide satisfaction that the task itself may not provide.

Usher and Kober (2012) provide a similar view of intrinsic and extrinsic motivation: "Intrinsic motivation is the desire to do or achieve something because one truly wants to and takes pleasure or sees value in doing so, while extrinsic motivation is the desire to do or achieve something not for the enjoyment of the thing itself but because doing so leads to a certain result" (Usher & Kober, 2012, p.3).

This research project will consider intrinsic motivation only. Thus the definition mentioned above of intrinsic motivation is adopted for this study. The definition refers to one's decision and aspiration to take part in participating and seeing value in it. This study seeks to investigate the desires to participate, thus to ensuring the motivation factors to participate are acknowledged. Nov, Arazy and Anderson (2011) indicate that intrinsic motivation is the most salient motivational factor. Lai (2011) consider intrinsic motivation to be more desirable and to result in better participation outcomes. Individuals with intrinsic motivation seek out opportunities to learn more about the specific project being conducted (Choy, 2005). The Public Safety Smart City Project provides citizens the opportunity to learn not only about the project but also about Public Safety. Therefore, there is a need to motivate citizens to paarticipate as they will benefit.

4.2.1. Motivation to Participate

The motivation to participate is a function of the perceived costs and benefits of participation (Klandermans & Oegema, 1987). With the use of incentives, the Public Safety Smart City Project has used incentives as motivation to participate and therefore the benefit of participating in the project. Klandermans and Oegema (1987) believe that incentives are the most important determinant of willingness to participate. For the Public Safety Smart City Project incentives are given out to those who participated and provided a report on a Public Safety matter. Therefore this means that by just reporting a Public Safety matter that a citizen experiences or observes they get an incentive. Thus this aimed at attracting the attention of citizens and report Public Safety matters. According to ARSC model, motives, expectancy and effort influence motivation in the learning environment (Keller, 2008). Thus, learners are relevant to citizen participation as citizens are given the opportunity to make an effort and participate through

motives to contribute in the environment they live in. As citizens participate in a Public Safety Smart City Project they expect satisfying experience and students can also be the citizens who reside in the city and are to take part in participating in the project.

Usher and Kober (2012) identified four dimensions that learners need to have to be motivated. Researchers use different frameworks for thinking about motivation and essentially agree on these four dimension factors (Usher & Kober, 2012). The four dimensions applied in a Public Safety Smart City Project means that citzen participation can be improved on which citizen's skills and talents can be acceptable in helping identfy Public Safety matters. Competence, control/autonomy interest/value and relatedness. These dimensions were shown to improve learner motivation in the context of learning, therefore these are improtant to consider for a Public Safety initiative. Table 4.1 shows the summary of the dimensions.

Table 4. 1: Four Dimensions of Motivation (Adapted from: Usher & Kober, 2012)

Dimensions	Definition	Indicators	Relevance to Public Safety Smart City Project
Competence ***(Am I capable?)***	Belief that they are capable of dong something	The student believes that he or she has the ability to complete the task.	The citizens need to believe that it has the ability to partcipate and complete the task.
Control/autonomy ***(Can I control it?)***	The ability to set appropriate goals and see correlation between effort and outcome	The student feels in control by seeing a direct link between his or her actions and the outcome. The student retains autonomy by having some choice about whether or how to undertake the task.	The citizen feels in control by seeing a direct link between his or her actions and the outcome. The citizen retains autonomy by having some choice about whether or not to participate.
Interest/value ***(Does it interest me? Is it worth the effort?)***	A vested interest in the task and a feeling that its value is worth the effort to complete it	The student has some interest in participating in the project or sees the value of participating in it.	The citizen has some interest in participating in the project or sees the value of participating in it.
Relatedness ***(What do others think?)***	The need to feel part of a group or	Completing the task brings the student	Participating in a Public Safety Smart City Project

	social context and exhibit behaviour appropriate to that group	social rewards, such as a sense of belonging to a classroom or other desired social group or approval from a person of social importance to the student.	gives citizens the sense of making a difference to the community and being responsible for others.

The four dimensions are important in a Public Safety Smart City Project as they can help with how citizens value the project, because through these four dimensions of motivation citizens can be self-maotivated and have belief that they can participate and report Public Safety issues they observe or experience, citizens can make time and effort to participate, they can value the project and wants to give to the community by being concerned about the others.

4.2.2. Need for Motivation for a Public Safety Smart City Project

Citizens need to participate in a Public Safety Smart City Project because Public Safety matters reported are dealt with. Thus, they have to report Public Safety matters but they need to be motivated to participate. The need for motivation in the project is that citizens tend to be reluctant to participate in a project where they do not understand its benefits. Reporting Public Safety matters or incidents leads to the reduction Public Safety incidents, improved monitoring of the city resources and the city as a whole.

Rebori (2005) recognizes ten reasons why people participate in a community development program. The reasons are as follows:

1. The chance to make the community a better place to live.
2. To solve a particular problem.
3. To influence government policy.
4. To lend a hand to people who need help.
5. It is my duty as a citizen.
6. To do my share
7. To work with people who share my ideals.
8. To be with people I enjoy.
9. To learn about politics.
10. I find it exciting.

To relate to the Public Safety Smart City project, the following five reasons were relevant, namely:

- The chance to make the community a better place to live
- To solve a particular problem.
- To lend a hand to people who need help.
- It is my duty as a citizen.
- To do my share

In terms of the five reasons from Rebori (2005), citizens need to be motivated to participate in a Public Safety Smart City Project in order to make the city of East London a better place to live in through observing and reporting Public Safety issues. Problems with issues of Public Safety in the city can be solved when identified and reported, thus that could be one of the reasons of participating in the project. Citizens need to be motivated to offer help to those who experience incidents like an accident by reporting it and thus creates an emergency response to an incident as it will be reported immediately and helping the city managers to manage city resources better.

4.3. Motivation for Citizen Participation

Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) proposes three motivations for citizen participation:

1. Knowing that an individual can participate that promotes dignity and self-sufficiency within the individual.
2. Utilising the energies and resources of individual citizens within the community.
3. Providing a source of special insight, information, knowledge and experience that contributes to the soundnesss of community solutions.

Citizen participation is important for all citizens as citizens are the ones' that contribute to improve their city's quality of life by addressing their own concerns and best interests. The three motivations for citizen participation in a Public Safety Smart City Project assist with what motivates government to ask citizens to participate in the project. Citizens are used in conducting the project and the city was observed before the project was started with the involvement of government or city officials to identify the citizen's potential to observe and provide the information about Public Safety issues.

Monastyrski (2002) highlights that citizen participation should not be undertaken under special circumstances, but should be part of the everyday life of citizens. Motivating citizen participation is desirable because it can improve public service quality. Recently it was demonstrated that it is likely to encourage citizens to co-produce their experiences public service such make citizens feel ownership and responsibility (Goncalves, Kostakos, Karapanos, Barreto, Camacho & Zimmerman, 2013). Common aims, common values and sense of community can influence motivation to participate (Tijunaitiene, Neverauskas, & Balciunas, 2009).

4.4. Keller's Attention Relevance Confidence Satisfaction (ARCS) Theory of Motivation

Factors that influence motivation in a Public Safety Smart City Project are adapted from existing theories namely the Keller's ARCS theory of motivation. These factors are supported by existing literature.

John Keller developed the ARCS theory of motivation. It was proposed as a problem solving approach to create motivation in the learning environment. The approach is mostly used to stimulate and sustain student motivation to learn. In alignment with this research study, this approach is used to assess motivational factors in Public Safety to encourage and maintain citizens' motivation to participate in a Public Safety initiative. The ARCS theory of motivation includes four components, namely: relevance, confidence and satisfaction. Each component of the ARCS model has three elements. The table 4.2 below shows the summarised elements.

Table 4. 2: Keller's ARCS Model Summary (Adapted from: Huett, Kalinowski, Moller, & Huett, 2008)

Attention	Relevance	Confidence	Satisfaction
A1 Perceptual Arousal	R1 Goal Orientation	C1 Learning requirements	S1 Intrinsic Reinforcement
A2 Inquiry Arousal	R2 Motive Matching	C2 Success Opportunities	S2 Extrinsic Rewards
A3 Variability	R3 Familiarity	C3 Personal Control	S3 Equity

4.4.1. Attention

Attention is about providing something interesting to capture learner attention from the beginning. The three elements for attention can be used as approaches to gain learner attention. Shellnut (1996); Poulsen, Lam, Cisneros, and Trust (2008) describes the attention elements in the following manner:

- ***Perceptual arousal:*** use of strategies to gain initial interest.
- ***Inquiry arousal:*** use of problem solving, questioning, a sense of mystery and progressive disclosure to increase interest.
- ***Variability:*** use of variety for a change of pace.

4.4.2. Relevance

According to Poulsen, *et al;* (2008); Small (1997) relevance is about linking the learners' needs, wants and motives. The relevance elements are defined by as follows:

- ***Goal Orientation:*** present the objectives and useful purpose of the instruction and specific methods for successful achievement.
- ***Motive Matching***: match objectives to student needs and motives.
- ***Familiarity:*** present content in ways that are understandable and that are related to learner's experience and values.

4.4.3. Confidence

Confidence provides a sense of self-worth and success ability in challenging tasks, through three strategies (Shellnut, 1996; Small, 1997) define the three confidence strategies as follows:

- ***Learning requirements:*** providing a learner with learning and performance requirements and assessment criteria. Citizens are provided with the types of Public Safety matters they need to report.
- ***Success Opportunities:*** provide challenging and meaningful opportunities for successful learning. Citizens are provided with the opportunity to provide information about Public Safety matters they observe.
- ***Personal control:*** linking learning success to student's personal effort and ability. Public Safety links to citizens as it involves matters that citizens experience daily.

4.4.4. Satisfaction

Satisfaction is about providing learners with rewards and reinforcement (Poulsen, *et al*, 2008). Poulsen, *et al*. (2008) define the elements of satisfaction as follows:

- ***Intrinsic Reinforcement:*** Encourage and support intrinsic enjoyment of the learning experience.
- ***Extrinsic Rewards:*** provide positive reinforcement and motivational feedback.
- ***Equity:*** maintain consistent standards and consequences for success.

Keller (2010) come up with a model (Figure 4.1) that illustrates the interactive influences of the four components of the ARCS model. The model demonstrates how a person's curiosity (attention) and motives (relevance) combined with his or her expectancy for success (confidence) will determine which goals have the highest saliency to purposeful effort to accomplish a goal. The success of the project does not only depend on citizens reporting Public Safety issues but also, citizen's confidence that something will done once reported. The consequences of achievement combined with one's cognitive evaluations and reflections determine levels of satisfaction.

Performance is influenced by one's abilities, knowledge and skills. An individual's performance combined with the way in which reinforcement contigencies are administered it determines the cosequences of achievement wether it leads to an expected outcome. The consequences combined with one's cognitive evaluation and reflections determine levels of satisfaction with the process and outcomes (Keller, 2010). The satisfaction level feeds back into motives. The macro model has been useful in guiding inquiry on motivaiton and providing a basis for identifying design issues.

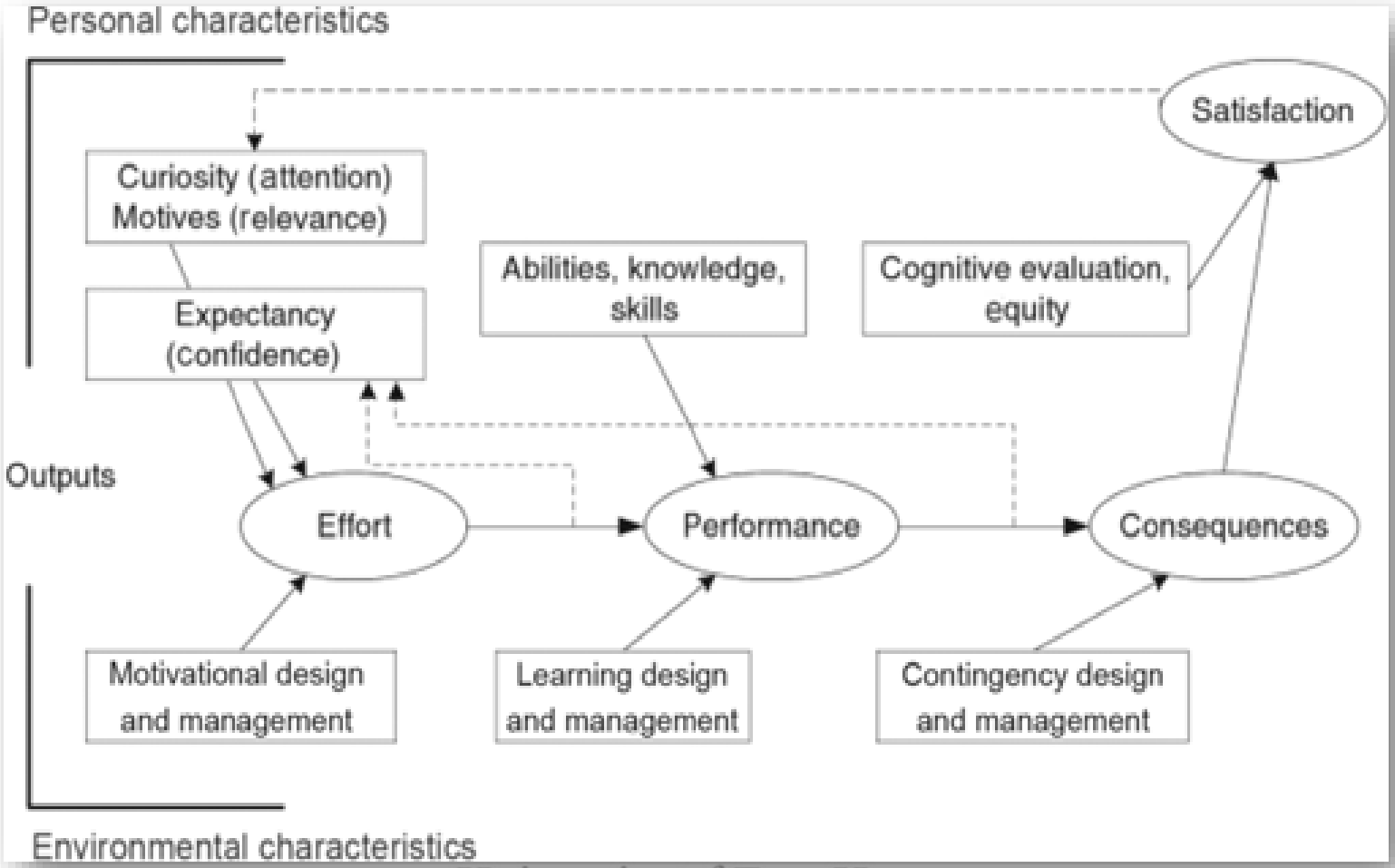


Figure 4. 1: A Macro Model of Motivation, Learning and Performance (Keller, 2010)

In relation to the research project the four components can be used to create motivation in Public Safety. The ARCS model can be used as a tool in Public Safety as depicted in the Figure 4.2. The diagram illustrates how the four components of the ARCS model translate in a Public Safety context. The Public Safety aspects fit in as follows:

- Usability - refers to the experience or usage of the IVR system to report Public Safety matters by citizens, if they found any difficulties in reporting issues and if it is useful. This to find out as well if the system is not time consuming.
- Public Safety Issues - The type of matters citizens can report on to make sure that they understand what forms a Public Safety Issue.
- Feedback -This is the response from the citizens after they have reported an incident, if they feel intimidated, fear they will make a mistake while reporting and to see if they find the system useful after they have reported an incident.

- Incentives - Citizens will be asked the type of incentives that motivate them to participate after they have reported an incident.

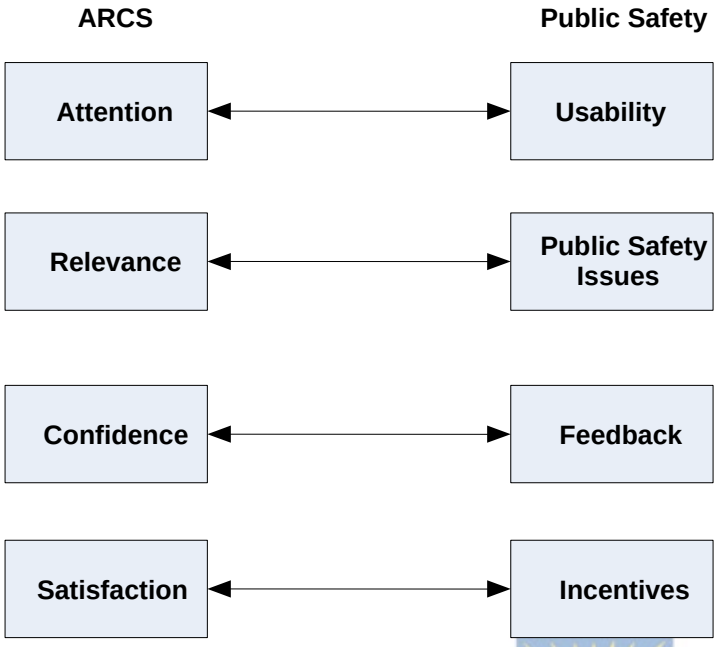


Figure 4. 2: ARCS Model as a tool in Public Safety (Adapted form: Poulsen, Lam, Cisneros, & Trust, 2008)

4.5. Proposed Theoretical Model

The ARCS model is a suitable framework for studying motivation on citizen engagement. The ARCS model has been applied to studies in the field of motivation to participate. This is because of the perspective that for individuals to actively participate in an activity they need to be motivated. Table 4.3 below shows how the ARCS model and from literature surveyed will aid with empirical investigation. Therefore, this theory is considered in this research study as to give guidance on how citizens can be motivated to participate in a Public Safety Smart City Project. As it discussed on the sections above citizen's motivation can be triggered through four components of motivation and these are presented on the table below for this study's investigations.

Table 4.3: Proposed Theoretical Model

ARCS Model	Citizen Engagement	Public Safety
Attention	Ease of use	Usability
Relevance	Concerns for others	Motivation
Confidence	Making a difference	Motivation
Satisfaction	Response	Incentives

4.6. Interventions to Motivate for Citizen Participation

The following motivational interventions are proposed in response to the elements of the ARCS theory of motivation. The below elements will address the 4 elements of ARCS that will help mitigate the issues faced in a Public Safety Project and in this case to motivate citizens participate and gather why some citizens prefer to be motivated in order to participate. This will also identify the factors that actually motivate one to participate in a Public Safety Smart City Project.

4.6.1. Incentives

Incentives are used to attract the participant's attention. Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) understands that incentives are an internal psychological mechanism that explains why some potential participants decide to participate and some not. Fransson and Frendberg (2008) state that incentives play an important role in motivation for the following reasons: to recognise and reward better performance, to attract and attain high quality people, to motivate people, and to influence behavior. Vesely (2015) argues that in some cases incentives do not seem to make a difference in motivation. Zhao and Zhu (2014) supports this that monetary incentives for involvement weaken intrinsic motives for participating. Incentives can become in form of points like badges given to participants (Richter, Raban, & Rafaeli, 2015). Incentives in Public Safety are used to improve citizen partipation and to keep citizen's involvement, thus strech engagement and reapeted usage of the Public Safety Smart City Project. Incentives in a Public Safety Smart City Project are given to those that have participated by reporting a Public Safety matter.

- **Motives**

A motive is the reason for doing something (Fransson & Frendberg, 2008). According to Tijunaitiene (2009) motives are the basis of motivating. Motives are the most significant

motivational factors (Nov, *et al*, 2011). Since this research project is based on intrinsic motivation, Nov, et al. (2011) states that intrinsic motives are strongly related to particiation intentions. Therefore intrinsic motives can increase motivation in citizens and thus increase ctizen particiation. Citizens in a Public Safety Smart City Project participate because they have reasons such as to help in changing the environment, reducing Public Safety and providing relevant information to assist.

- **Reciprocity**

Falk and Fischbacher (2006) views reciprocity as the behavioral response to a perceived kindiness or unkindness. Therefore is it important to understand how people evaluate the kindness of a particular person. Gernsbacher (2006) defines reciprocity as a relation of mutual dependence or action or influence. A strong reciprocator is a person who is willing to sacrifice resources to be kind to those who are being kind (Fehr, Fischbacher, & Gachter, 2002). In a Public Safety Smart City Project citizens need to be kind to one another as one might be in an accident and cannot report to authorities and needs someone else to report the matter.

- **Self-efficacy**

Goncalves, et al. (2013) define self-efficacy as the degree to which an individual believes that he/she have the capabiities to achieve desired goals. Citizens with strong beliefs in their capabilities approach tasks with the assurance that they can exercise control over it and thus thi can further increase citizen participation. Lai (2011) views self-efficacy as an individual's confidence in her ability to organise and execute a given course or accomplish a task. Self-efficacy on perfomance has been well established in other disciplines such as management, psychology, education and sports. From these disciplines studies show that self-efficacy motivates individuals to produce successful outcomes (Iskandar, Sari, Mohd-Sanusi, & Anugerah, 2012).

Public Safety self-efficacy is the self-confidence in the ability to make an effort in successfully reducing Public Safety matters, this can include phone and computer use and observation skills. Self-efficacy can influence motivation in Public Safety from which citizens' feelings of living in an unsafe city will motivate citizens to particiate and thus increase citizen particiation. Sepasgozar, Hawken, Sargolzaei and Foroozanfa (2019) state that citizens who see themselves as efficacious may be more likely to get involved in improving conditions in their cities. Richter, Raban, and Rafaeli (2015) state that the more citizen's believe that they are able to

bring a certain task to a successful ending the better they will perform the task. Ohmer (2007) states that actively engaging citizens in efforts to improve their communities is associated with increased feeelings of self-efficacy and empowerment.

- **Rewards**

Rewards differ from incentives. Naranjo-Zolotov, Oliveira, Cruz-Jesus, Martins, Gonçalves, Branco and Xavier (2019) believe that monetary and tangible rewards are the most common motivation factors that can influence people to be motivated in doing something. These two factors are considered as the strongest factors to influence motivation. Rewards are given in recogniton of an achievement or when commanding a behaviour. According to Fransson and Frendberg (2008) rewards do not only motivate people to do what is considered but to do more and better. He clarifies that people are rewarded for the value they create, to motivate people and obtain their commitment and engagement. Malchenko and Smirnova (2019) supports that rewards promote motivation and task performance compared to no rewards. Rewards also enhance self-efficacy more than no incentives. Incentives are only benefits given to improve a particular behaiour. Rewards in a Public Safety Smart City Project are given to citizens for theirs positive behaviour in participating reporting Public Safety matters.

4.7. Conclusion

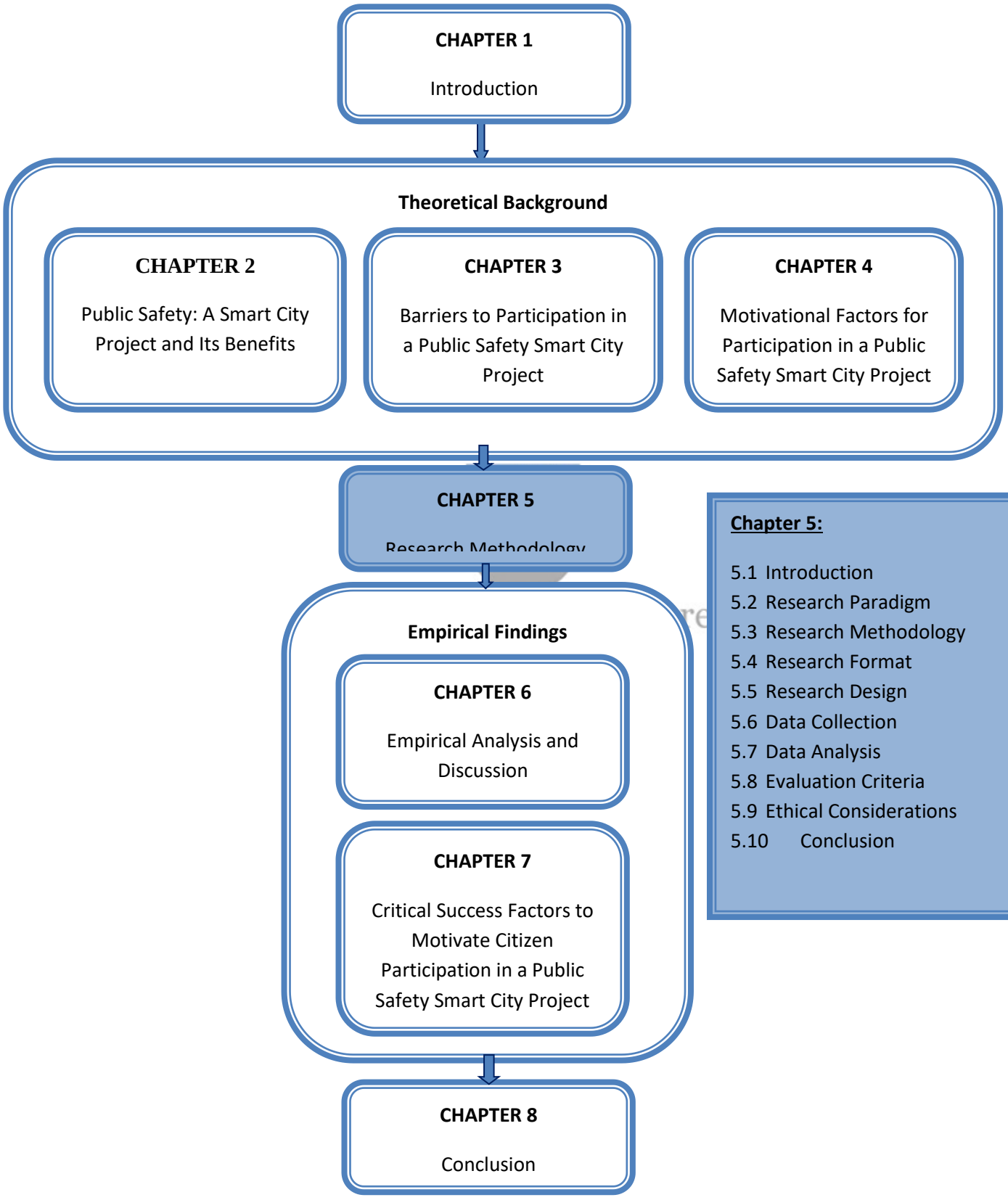
The research problem investigated requires motivation as participation has been lower. Motivation is a key factor in participation. People need to be motivated before they can participate and in some cases to improve participation there is a need for motivation.

This chapter presented the definition of motivation. Motivation can be either intrinsic or extrinsic. Intrinsic motivation refers to internal desires while extrinsic motivation refers to external factors. Intrinsic motivation is the focus in the study, which is believed to result in better participation outcomes. Motivation to participate was discussed. The chapter presented the need to participate in a Public Safety Smart City Project. Keller's ARCS theory of motivation was described and applied to the study, while interventions to motivate for citizen participation were identified.

Motivation to participate can be made with the use of incentives. Incentives attract citizen attention and form part of the motivational factors. There are also four dimensions of motivation that can help improve motivation. The Keller's ARCS theory of motivation helps identify the motivational factors and consists of four components namely (1) attention, (2)

relevance, (3) confidence, and (4) satisfaction. Each of these components consists of three elements. From Keller's ARCS theory of motivation five motivational factors were adopted: incentives, motives, reciprocity, self-efficacy and rewards. The methodology to be used in identifying motivational factors is discussed in the next chapter.

Chapter 5:
Research Methodology



Chapter 5:

5.1 Introduction
5.2 Research Paradigm
5.3 Research Methodology
5.4 Research Format
5.5 Research Design
5.6 Data Collection
5.7 Data Analysis
5.8 Evaluation Criteria
5.9 Ethical Considerations
5.10 Conclusion

5.1. Introduction

This chapter aims to explain the research design and methodology adopted for this study to investigate the critical success factors proposed as a solution for the research problem. In a Public Safety Smart City Project participation has not yet met the expectation and therefore leads to serious issues being left unattended or not resolved because citizens did not report them. Citizen participation needs to be improved as the Public Safety Smart City Project relies on citizens reporting for it to be successful. Critical Success Factors were investigated to motivate citizens to participate in a Public Safety Smart City Project as solution to the problem and address factors that motivate citizens to participate in a Public Safety Smart City Project.

This study is conducted within a interpretive paradigm and follows a mixed method approach that is consistent with this paradigm. Thus, both qualitative and quantitative data was collected and analysed. The Design Science Methodology is followed in this research study, which is aimed at creating and evaluating IT artefacts. In this case, the artefact is the Critical Success Factors. The methods used to collect empirical findings for this research study were a case study, web-based questionnaires (quantitative) and expert reviews (qualitative).

This chapter details the selected research paradigm followed in this study. The research paradigm is examined at the beginning of this chapter and is followed by an outline of the research methodology, which includes the Design Science Methodology and mixed methods. Next, the research format for the study is discussed followed by the research design of this study. The discussion of the data collection methods will follow. The data analysis methods are presented, followed by evaluation criteria and the discussion of ethical considerations. A summary of this chapter is provided in conclusion.

5.2. Research Paradigm

The success of a study depends on well-chosen and appropriate method for the study being conducted (Hofstee, 2006). Therefore, it is essential that a research study be conducted following a specific research paradigm. A research paradigm is a philosophical framework that guides how a research study should be conducted (Collis & Hussey, 2009). There are different research paradigms that exist and the sections that follow describe the various paradigms and the paradigm mostly appropriate for this study.

5.2.1. Positivism

The positivist research paradigm assumes that social reality is singular and objective (Collis & Hussey, 2009). Knowledge in positivism results from constructive information that is justifiable and scientifically verifiable. Therefore, to support the assumptions made by the researcher logical reasoning is used. When data is gathered in the positivist approach, it relies on experiments that are used also to prove the initial assumption (Oates, 2006). This is contrasted by the interpretive research paradigm, which is highly subjective and relies on the researchers' social context. This paradigm is described next.

5.2.2. Interpretivism

The interpretivist paradigm assumes that social reality is subjective and multiple. Therefore, it is affected by the act of investigating it because it is shaped by our perceptions (Collis & Hussey, 2009). The interpretivist approach tries to understand human behaviour in a specific context and explore the complexity of social phenomena to gain interpretive understanding. The phenomena are understood through meanings and values assigned to each individual. The interpretivist paradigm identify how factors are related and interdependent in a specific social setting rather than proving or disproving an assumption (Oates, 2006). In the next section critical theory is defined.

5.2.3. Critical theory

The critical theory research paradigm is focused on helping eliminate the causes of alienation and domination by identifying power relations, conflicts and contradictions and empowering people (Oates, 2006). Social reality in critical research is historically constituted and is produced and re-produced by people (Myers, 2009). Therefore, social reality has some objective properties that dominate our experiences and on the way, we see the world. Critical research is seen as a social critique to alienate the conditions of status quo. Having defined the most relevant research paradigms, the following section compares them and justifies the selection of the interpretive research paradigm for this study.

5.2.4. Collaborative Research Paradigm

Oates (2006) provides clear differences between the three paradigms considering separate characteristics of each paradigm.additionally, Collis and Hussey (2009) believe that conducting positivist or interpretive reseach under these harsh characteristic is extremely unlikely. However, in recent years interpretivism has been adopted more frequently. Critical research is less well-known and accepted than the other researh paradigms.

The differences between the two main paradigms (Interpretivism and Positivism) are considered under philosophical assumptions, namely: ontological, epistemological, axiological, rhetorical and methodological . Collis and Hussey (2009) describes the philosophical assumptions as follows:

- Ontological – This assumption is concerned with the nature of reality.
- Epistemological – this assumption is concerned with what constitutes valid knowledge.
- Axiological – This assumption is concerned with the role of values.
- Rhetorical – this assumption is concerned with the language of research.
- Methodological – This assumption is concerned with the process of research.

The five assumptions and the two paradigms are illustrated in Table 5.1 below.

Table 5. 1: Philosophical Assumptions of the Main Two Paradigms (Collis & Hussey, 2009)

Assumption	Positivism	Interpretivism
Ontological Assumption	• Social reality is objective and external to research. • There is one reality.	• Social reality is subjective and socially constructed. • There are multiple realities.
Epistemological Assumption	• Knowledge comes from objective evidence about observable and measurable phenomena. • The researcher is distanced from phenomena under study.	• Knowledge comes from subjective evidence from participants. • The researcher interacts with phenomena under study.
Axiological Assumption	• The researcher is independent from phenomena under study. • The results are unbiased and value-free.	• The researcher acknowledges that the research is subjective. • The findings are biased and value laden.
Rhetorical Assumption	• The researcher uses the passive voice, accepted	• The researcher uses personal voice, acceptedd qualitative

	quantitative words and set definitions.	terms and limited definitions.
Methodological Assumption	• The researcher takes a deductive approach. • The researcher studies cause and effect, and uses a static design where categories are identified in advance. • Generalisation leads to prediction, explanation and understanding. • Results are accurate and reliable through validity and reliability	• The researcher takes an inductive approach. • The researcher studies the topic within its context and uses an emerging design where categories are identified during the process. • Patterns and/or theories are developed for understanding. • Findings are accurate and reliable through verification.

Any research conducted is based on underlying assumptions, which are distinguished in Table 5.1 between the two main paradigms in philosophical assumptions that under pin the pure forms of the two main paradigms. Collis and Hussey (2009) consider ontology, epistemology and axiology as interrelated and need to be considered before one designs the research project.

Reality can be viewed in various ways and Collis and Hussey (2009) provide a continuum of paradigms that shows the different views of reality.

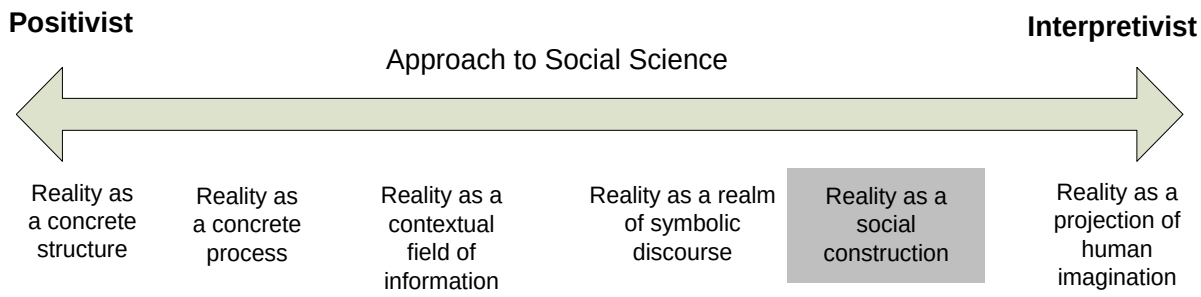


Figure 5. 1: Typology of Assumptions on a Continuum of Paradigms (Collis & Hussey, *2009*)

Figure 5.1 illustrates the positivist and interpretivist extremes in a continuum mentioned by Collis and Hussey (2009) and the research paradigm used for this study is highlighted. This

research study focuses on motivating citizens to participate in a Public Safety Smart City Project in East London. In the context of this study, the social setting is the motivation of citizen participation in a Public Safety Smart City Project. Therefore, significant motivational factors relating to the project are studied in this research

The study followed an interpretivist approach. Experts and theories were used to validate interpretations from collected data; hence, the study is in line with the fifth stage (reality as a social construction) of the continuums presented in figure 5.1.

5.3. Research Methodology

After identifying the research paradigm, it is important to choose a methodology that reflects the philosophical assumptions of your paradigm (Collis & Hussey, 2009). This study adopted the Design Science Methodology and mixed method approach.

5.3.1. Design Science

Design Science research focuses on the creation and evaluation of IT artefacts to solve identified organisational problems. The artefacts can be developed in the form of constructs, models, methods and instantiations (Hevner, March, Park, & Ram, 2004). Therefore, Design Science is an appropriate research methodology as this study aims to formulate critical success factors to motivate citizen participation in a Public Safety Smart City Project.

Hevner, *et al*. (2004) highlight that the development of an IT artefact relies on existing theories that are applied, modified and extended through the experience, creativity, intuition and the problem solving capabilities of the researcher. The formed artefact in this study are critical success factors that are achieved through the intergration of existing models and theories. The artefact assisted in understanding the problem addressed and the solution components (Hevner, *et al.*, 2004). Figure 5.2 below presents a conceptual model for understanding, executing and evaluating research in the discipline of information systems (Hevner, *et al*., 2004). It combines the the elements of Behavioural Science and Design Science.

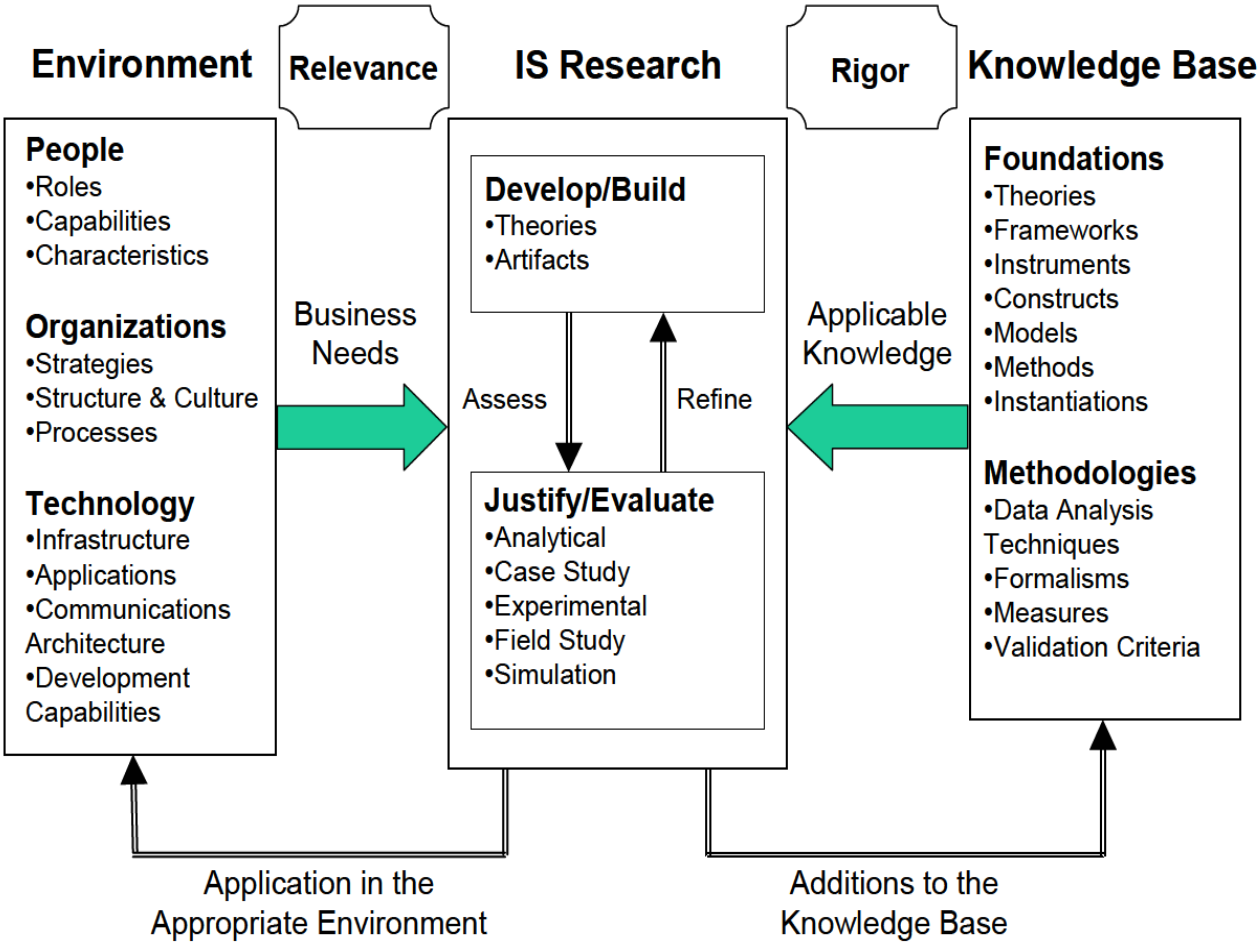


Figure 5. 2: Information Systems Research Framework (Hevner, March, Park, & Ram, 2004)

Hevner, *et al*. (2004) recognise the impact of environment and the existing knowledge base on information sytems (IS) in their framework. The environment refers to the context of the research, in this case, the Public Safety Smart City Project. The environment includes people (East London citizens), organisations (BCMM) and technology (the Public Safety Smart City system). All groups of the environment combined together allow the reseacher to define the research problem. However, the environment must ensure research relevance (Hevner, *et al*.,2004). The knowledge base includes existing theories and methodologies that are used in the development of the artefact. The knowledge base ensures trustworthiness of the researcher as it uses previous information system research revelant to the researcher's study and the research process is guided by the methodology used (Hevner, *et al*., 2004). All research conducted in the information systems disciplines conducted in two phases: the development or critism of an artefact or theory and the assessment of the discovery through appropriate

evaluation methods. In this research study expert reviews were used to evaluate the proposed critical success factors in order to refine them.

The seven guidelines established by Hevner, *et al*. (2004) were adopted in this study. The guidelines, description and their application to this research study are presented in Table 5.2.

Table 5. 2: Design Science Guidelines (Hevner, March, Park, & Ram, 2004)

Guideline	Description	Application
1. Design as an Artefact	Design Science research must produce a viable artefact in the form of a construct, a model, a method, or an instantiation.	The artefact designed for this study is in the form of Critical Success Factors. The critical success factors produced are essential for motivating citizens to participate in a Public Safety Smart City Project.
2. Problem Relevance	The objective of Design Science research is to develop technology-based solutions for important and relevant business problems.	The problem identified in this study refers to citizen participation that is lower than expected for a Public Safety Smart City Project. This is due to telephone cost, intimidating experience, lack of knowledge and lack of information. For this reason, some citizens do not report Public Safety matters they observe, thus leading to serious issues being left unattended or unresolved because people did not report them.
3. Design Evaluation	The utility, quality and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.	The formulated critical success factors will be evaluated using expert reviews. The experts were selected based on their educational background and experience relevant to Smart Cities and Public Safety.
4. Research Contributions	Effective Design Science research must provide clear and verifiable contributions in the areas of the design artefact, design foundation, and/or design methodologies.	The design artefact for this study was in the form of Critical Success Factors that ensure citizen participation is enhanced in a Public Safety Smart City Project through motivation and therefore addresses the issue of low citizen participation in the project. This is discussed in detail in Chapter 6.
5. Research Rigor	Design Science research relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.	Valid data gathering and analysis techniques were used to study the research problem and proposed critical success factors. The methods used are described in this chapter.
6. Design as a Search Process	The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment.	This guideline entails the description of the research process which is followed, and which leads to the development of an effective solution to a problem. The closed-ended questionnaires and proposed artefact were constructed from the assessment of related primary data and secondary data to ensure applicability to the problem domain. An assessment by an expert group was used to evaluate the development of the proposed artefact. Comments and recommended modifications relevant to the proposed artefact were considered.
7. Communication of Research	Design Science research must be presented effectively both to technology-oriented as well	This guideline is concerned with the manner in which the researcher communicates the research findings to other entities. This research project ensured effective communication in following ways: the findings will be

	as management-oriented audiences.	published in academic journals (submitted article attached as Appendix A), the findings of this research will be presented to IBM for future research purposes and the completed dissertation will be sent to the library at the Fort Hare University and made available to all students and staff members

The Design Science Methodology has assisted in conducting the research process, thus, in the following section the mixed methods are discussed for their use in the evaluation of the research artefact (CSFs).

5.3.2. Mixed Methods

Hofstee (2006) highlights that for a study to be a success depends on a carefully thought out and appropriate chosen research method for the study. There are three types of research methods namely; qualitative, quantitative and mixed methods (which is a combination of both qualitative and quantitative). This research project adopted a mixed method approach.

Cameron (2011) describes mixed methods as a research in which the researcher collects, analyses, mixes and draws inferences from both qualitative and quantitative data in a single study. Creswell and Clark (2007) highlight that using qualitative and quantitative approaches in combination provide the researcher with a better understing of the research problem. The goal of mixed methods reseach is to not to replace either of these approaches but rather draw from the strengths and minimise the weaknesses of both qualitative and quantitative approaches in a single study (Johnson & Onwuegbuzie, 2004). Mixed methods are often adopted to help researchers answer research questions through multiple appoaches. The data is collected and analysed concurently or sequentially to collectively solve the research problem. Thus, it is essential to select an appropriate qualitative and quantitative research method where the findings can be combined together in a viable manner.

Adopting a mixed method aprroach for this study, was found to be the most appropriate approach when considering the process required when developing the Critical Success Factors for motivating citizens to participate in a Public Safety Smart City Project. The qualitative approach used in this study included the case study of What are the factors that motivate East London citizens to participate in a Public Safety Smart City Project and why they should be motivated in a Public Safety Smart City Project, theories on motivation and expert reviews to assess the proposed critical success factors. The quantitative research appoach involved the assessment of responses collected from closed-ended the questionnaires sent to citizens. The

questionnaire was developed from relevant literature and theories on citizen participation and motivation.

5.4. Research Format

5.4.1 Types of Research

A researcher's choice of methodology is informed by the research objective and resources to achieve the set objectives and the philosophical paradigm for the study (Saunders, Lewis, & Thornhill, 2007). The authors describe research formats into these broad categories:

1. **Evaluation Research:** A systematic assessment conducted to provide accountability for the changes that are made to an object.
2. **Theoretical and pure research**: This category comprises of the expansion of knowledge in a field for solving existing problems.
3. **Applied and Policy research:** The aim of this research is to identify motivation factors that motivate citizens participate in a Public Safety Smart City Project.
4. **Critical and feminist research:** Critical research aims to analyse and interrogate the validity of basic hypothesis and conventional research approaches; it also seeks to investigate such approaches that have been ignored in business or management sciences. On the other hand, feminist research, as the name implies, seeks to promote research, which contributes to the advancement of women, and the causes related to them.

All research projects involve the development of theory in order to validate knowledge building. The two important research approaches are deductive and inductive research methods (Saunders *et al*, 2007). Usually, the research design of a study indicates whether the research approach is deductive or inductive. However, the research approach becomes explicit at the conclusion of the study. An academic work should show unequivocally which of these two approaches was used to reach the conclusions at the end of the study (Crowther & Lancaster, 2008). The significant differences in the two research approaches are outlined below.

5.4.1.1 Deductive Research

Deductive research involves the development of a theory, which is thereafter subjected to a rigorous test (Saunders *et al*, 2009). The deductive approach is mostly regarded as scientific research because it concentrates on using a positivist, quantitative paradigm to predict, prove and control phenomena (Collis & Hussey, 2009). Deductive research seeks an explanation for

causal relationships between variables. It involves the development of a hypothesis, which is thereafter tested by empirical data. The deductive researcher remains neutral about the phenomena under investigation and collects data that can be measured and analysed quantitatively.

An important characteristic of deductive research is generalisability, an attribute that dictates that deductive research usually investigates a large sample size (Olivier, 2009). Saunders *et al* (2009) asserts that deductive research emphasises scientific principles, moving from theory to data in order to explain causal relationships between variables. Furthermore, deductive research is highly structured, applies controls to ensure the validity of data and selects large sample of the phenomena under investigation to facilitate the generalisation of conclusions.

5.4.1.2 Inductive Research

Inductive research, on the other hand works from data to theory. The advent of the social sciences in the 20th century fostered a critique of the deductive approach to all research, thus giving birth to inductive research (Saunders, Lewis, & Thornhill, 2012). Social scientists justified this development by making a case for the validity of a social context as interpreted by humans before cause and effect relationships could be established. Inductive research places a premium on the context of the phenomena and mostly works with qualitative data in order to find rich explanations for the phenomena (Lancaster, 2005).

Inductive research emphasises a close understanding of the research context and an understanding of the meaning's humans attach to events (Saunders *et al*, 2012). Due to its interpretive nature, the data collection methods consist of a more flexible structure in line with the social dynamics of the phenomena being investigated.

5.4.1.3 Research Approach for this Study

The research approach for this study is deductive. The research aims to propose Critical Success Factors to motivate citizens to participate in a Public Safety Smart City Project, thus the approach of moving from theory to data in offering a solution to the research problem. In light of this, chapters 2, 3 and 4 of the study consisted of the literature review on the citizen participation barriers in Public Safety affect that citizen participation from which motivational factors are identified to enhance citizen participation in a Public Safety Smart City Project.

5.5. Research Design

Figure 5.3 below illustrates how the study was conducted and the relationship between the problem, the Public Safety Smart City Project and this study. This study was in alignment with the project undertaken by the University of Fort Hare in East London. The Public Safety Smart City Project seeks to contribute to Smart City Initiatives by exploring ways that can enhance Public Safety in cities. The importance of this project can be identified by the research problem, which relates to citizens that are reluctant to participate. Citizens' attention need to be attracted and motivated in order for citizens to participate in the project. Citizens participate in the project by providing information to the city relating to Public Safety issues.

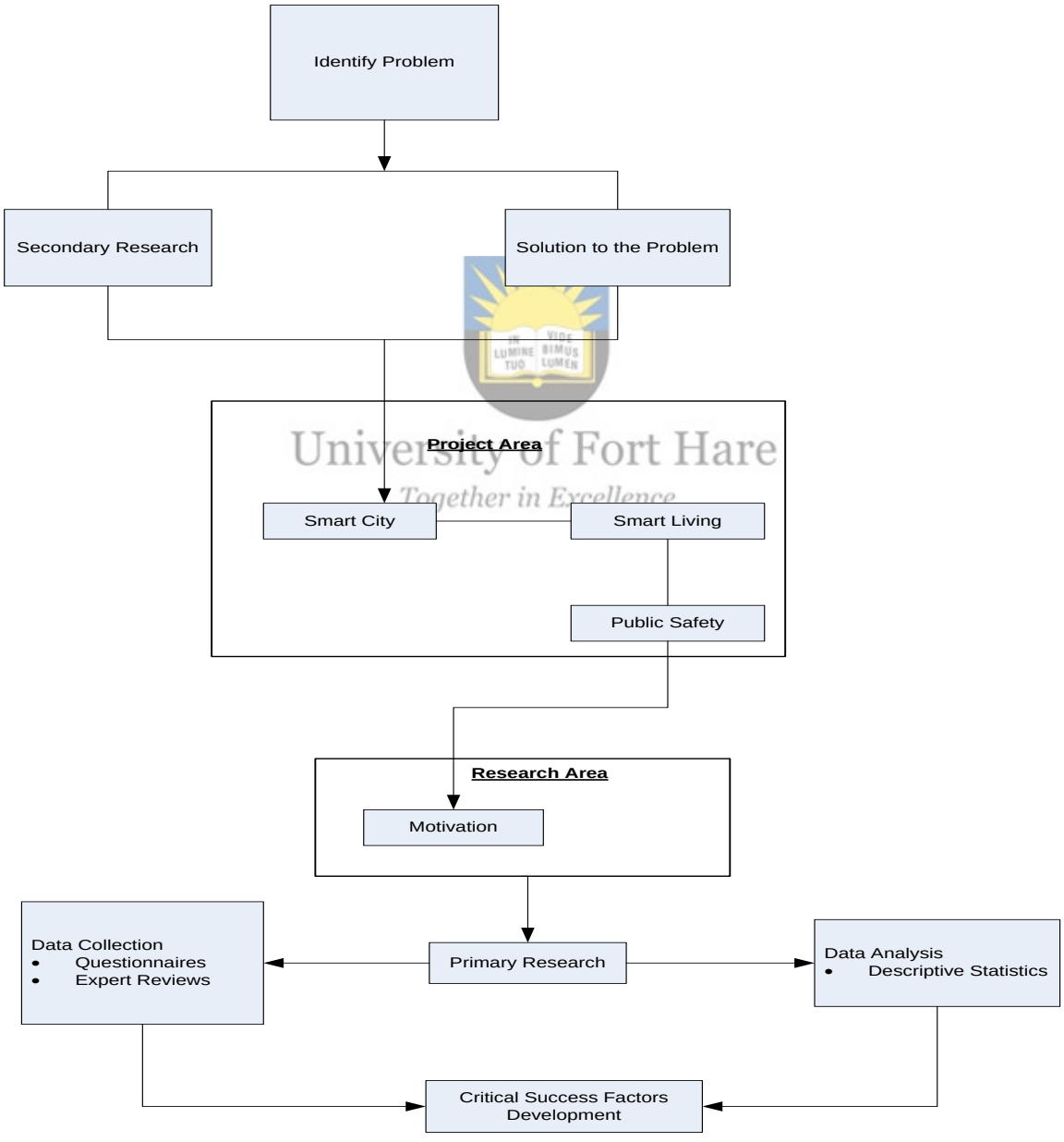


Figure 5.3: Research Design

As shown in figure 5.3, a problem was identified for this research study. Secondary data include theoretical findings from literature review. The data collected from questionnaires and expert reviews influenced the development of Critical Success Factors. To motivate citizens, participate.

The information will help the city to manage its resources better and thus be more effective and efficient in preventing and solving Public Safety matters. The project aims to use East London citizens to solve Public Safety matters and thus enhance the lives of people living in the city.

The concept of Smart City is a means of enhancing the life quality of citizens in a city. Smart City consists of six recognised components that are categorized as follows: Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment and Smart Living. This project forms part of one of the Smart Living characteristics namely Public Safety. Smart Living aims to improve the lifestyle of citizens. The project plans to use citizens to improve Public Safety initiatives and provide citizens the opportunity to live in a better environment.

Public Safety matters include crime, natural disasters, motor vehicle crashes, terrorism, public health threats and cyber threats. There are Public Safety initiatives that are introduced to detect and assess Public Safety issues. Public Safety focuses on providing improved services to citizens of the city, preventing, resolving and responding effectively to all the Public Safety matters. Therefore, this will provide better management of city resources.

This study focused on ensuring that citizens are motivated to participate in a Public Safety Smart City project. Citizen participation was lower than expected; therefore, citizens needed be to motivate to participate to the project. Citizens are important in the project as they play an essential role in providing information about the Public Safety issues they observe in their daily lives. Thus, there is a need for citizens to be motivated as they have an impact in improving their daily lives. This will enhance and provide better Public Safety in the city.

The primary research for this study was conducted by collecting and analysing data. The data collection tools included a case study, web-based closed-ended questionnaires distributed to citizens to discover barriers that may influence citizens not to participate as well as motivational factors that may influence them to continue participating and attract others to participate too. Additional data was obtained from expert's responses in motivation to find out about the issues related to citizen participation and possible motivation factors. The data

analysis instrument used to analyse and interpret the collected data was descriptive statistics with the use of an Excel spreadsheet. The interpreted data assisted in formulating the critical success factors to motivate citizens to participate in a Public Safety Smart City Project. This research design is followed by the research paradigm.

5.6. Data collection

This study made use of primary and secondary data. The primary data included a case study, questionnaires, recommendations and comments from the expert reviews. The secondary data collection was in the form of literature relating to this study was collected from journals, conference proceedings, books and websites, theories, methodologies and previous studies.

5.6.1. Case Study Quality Criteria

A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context especially when the boundaries between phenomenon and context are not evident (Yin, 2009). There are four necessary tests that Yin (2009) acknowledges to judge the quality of a case study these test elements include construct validity, internal validity, external validity and reliability. The case study quality criterion for this research study is presented on Table 5.3 below.

Table 5.3: Case Study Quality Criteria

Tests	Case Study Tactics	Phase in Research in Which Tactic Occurs
Construct Validity	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft case study	• Data collection • Data collection • Composition
Internal Validity	• Do pattern matching • Do explaination – building • Address rival explanations • Use logic models	• Data analysis • Data analysis • Data analysis • Data analysis
External Validity	• Use theory in a single-case studies • Use replication logic in multiple-case studies	• Research design • Researc design
Reliability	• Use case study protocol	• Data collection

	• Develop case study database	• Data collection

Yin (2009) summarises the four tests as follows:

- **Construct Validity**: is about identifying correct operational measures for the concepts being studied. In order to enhance construct validity in this research study, data was collected from multiple sources such as, questionnaires, document analysis and observations. The data collection methods employed aimed to obtain how citizens can be motivated to participate in a Public Safety Smart City Project. Efforts were made to follow the same logical order through out the enquiry of the dissertation which started from the description of the problem to the presentation of data and subsequent analytical considerations to establish chain of evidence.
- **Internal Validity**: seeking to establish a casual relationship whereby certain conditions are believed to lead to other conditions. This research study use descriptive statistics and pattern matching for analysis of the findings from different data sources of this research.
- **External Validity**: defining the domain to which the study's findings can be generalised. The aim of this research is to determine the factors that motivate citizens participate in a Public Safety Smart City Project to increase citizen participation in the project, as discussed in Chapter Four. Therefore, to establish the different views about the phenomena of interest questionnaires and multiple data sources were used to establish the motivational factors for citizen participation in a Public Safety project.
- **Reliability**: demonstrating that the operations of a study can be repeated with the same results. In the context of this research study, attempts have been made through a description of data collection methods. Also, to increase the validity and reliability of the research instruments used for data collection, an experienced supervisor was engaged to evaluate the questions on the questionnaire and any suggestions from the supervisor were discussed and applied to the research instrument.

5.6.1. Questionnaires

Questionnaires are described as a data collection instrument that is completed by the respondents themselves and as a result are referred to as self-administrated questionnaires. Questionnaires are relatively easy to use, inexpensive and usually the most reasonable alternative for measuring unobservable constructs such as attitudes, values, preferences,

intentions and personalities (Tharenou, Donohue, & Cooper, 2007). Questionnaires can either be administered by hand or conducted online. Questionnaires can be open-ended or close-ended.

This study found closed-ended questionnaires (web-based) the most appropriate for this study. Closed-ended questionnaires allow the respondent to select optional answers provided to the question and the respondent does not provide views of their own but only limited to researchers' responses. The closed – ended questionnaires are appropriate in this research study to find which factors motivate citizens to participate from those found by literature.

The questionnaire consisted of 27 multiple-choice questions (Appendix B). All questions were closed-ended. The design of the questionnaire assisted in answering the research questions to achieve the objective of this study. The aim of this questionnaire was to identify the barriers to participation in a Public Safety Smart City Project and motivational factors that can enhance participation in the project. The categories and questions used in the questionnaire were constructed from the literature reviewed.

5.6.2. Expert Review

The expert review was used to assess the Critical Success Factors by collecting recommendations from 2 experts based on their sufficient and relevant educational background and experience. The expert's knowledge and background was on smart cities and citizen participation. The experts used in this research study met the four criteria identified by Skulmoski, Hartman, and Krahn (2007) for an expert review process namely: knowledge and experience relevant to the research, capacity and willingness to participate, sufficient time to participate, and effective communication skills.

An expert review method was employed to validate the Critical Success Factors, as discussed in Chapter One of this study. An expert reviews is a process used to collect and survey opinions of experts on a particular subject (Yousuf, 2007). The proposed Critical Success Factors were evaluated by two experts. They were required to comment on the Critical Success Factors and their descriptions. The feedback from the experts was taken into consideration and recommendations were used to refine the Critical Success Factors.

5.6.3. Sample Selection and Design

Mixed method sampling involves combining well-established qualitative and quantitative techniques in creative ways to answer the research questions (Teddie, 2007). Mixed method

refers to the combination of data collection and analysis techniques for both quantitative and qualitative procedures combined in a single study (Saunders, Lewis & Thornhill, 2009). The quantitative research approach involve the analysis of the questionnaire collected from participants and the qualitative research approach will be used in this study include expert reviews to evaluate the proposed critical success factors. The failure of a sample size to effectively represent the population being investigated will result in research findings and conclusions having questionable credibility and integrity (Marshall & Rossman, 2010).There are different types of non-probability sampling.

The various types of non-probability sampling methods are discussed below:

1. **Convenience sampling:** This refers to the selection of respondents based on the convenience of accessing the subjects. Convenience sampling may be employed if the whole population is well defined and the issue of accessibility is addressed within the context of relevance to the research. However, convenience sampling purely based on accessibility to respondents can result in poor quality of data and may lack academic integrity.
2. **Quota sampling:** This involves the selection of pre-determined characteristics of units of the sample to be used for the research. This is to ensure an even distribution of the same characteristics across the whole population under investigation
3. **Snowball sampling:** The method is a chain referral style. This implies that respondents are encouraged to forward the data collection tools employed to members of their social network, thereby creating a chain of participants.
4. **Purposive sampling:** In this method, the researcher uses her experience of the context, previous research that may be relevant to the current research question or skills to select a sample, which she believes, would be the most prolific in solving the research question (Marshall & Rossman, 2010).
5. **Random sampling:** This is a probability-based method of data collection, which ensures that anyone in the relevant population for the study has an equal chance of being selected. The focus of random sampling is to ensure that the most accurate data is gathered from every subset of the relevant population under investigation (Marshall and Rossman, 2010; Babbie, 2008; Creswell, 2009).

The sampling method for this study was convenient sampling. The sample size for the study is ninety-one respondents who registered on the Public Safety Smart City Project website.

According to Creswell (2009), a 10% sample size is acceptable for empirical findings in a study of this nature.

5.6.4. Selection of Respondents for Questionnaires

For the purpose of this study, it was important that respondents are selected from the city of East London as the research problem being investigated is directly related to the daily experiences of Public Safety they come across with. Ninety-one respondents were selected from East London. The method selected was to ensure that the distribution of the questionnaire to citizens identify the motivational factors. The respondents only included East London citizens who only participated in a Public Safety Smart City Project. A sample of two experts selected from the Smart City field was also used for the expert review process.

5.6.5. Selection of Respondents for the Expert Review

A sample of two experts selected from the Smart City was employed for the expert review process. The justification choice of these experts is that Smart City is a specialised field of Public Safety and motivation. The two experts were selected based on the knowledge and experience of Smart Cities. The expert's contribution was considered valuable to the study based on the vast experiences they have about Smart Cities in South Africa.

5.7. Data Analysis

All relevant data collected was analysed appropriately.

- **Primary Data Analysis**

The data collected from web-based questionnaires was analysed through descriptive statistics, which included mean, median, and frequency with the use of Microsoft Excel spreadsheet and pattern matching. The researcher found Excel easy to use and sufficient for the task. The information obtained from the questionnaires was used to inform the development of the research artefact, namely the Critical Success Factors to motivate citizens participate in a Public Safety Smart City Project.

The data collected from expert reviews, which either supported or opposed the Critical Success Factors was taken into consideration and was analysed appropriately. The recommendations made were used in the refinement of the Critical Success Factors.

5.8. Evaluation Criteria

It is important to evaluate the quality of data interpretation in a research study of this nature. This is done by examining the reliability and validity of research findings. Saunders et al (2009) assert that tests of validity and reliability also reduce the possibility of obtaining the wrong answer. Results of a research study are considered reliable if they are consistent with that of other researchers testing the same hypotheses in similar circumstances.

The validity of the data collection instrument was tested in this study. The questions were structured after Keller's Attention Relevance Confidence Satisfaction (ARCS) theory of motivation and data collection instrument in an investigation of motivation factors. Further testing for validity was also conducted by means of a pilot study.

In addition, Oates (2006) outlines a set of measurement parameters for assessing the quality of findings in positivistic and interpretive research. These are illustrated in the table below:

Table 5.4: Quality in Positivist and Interpretivist Research (Source: Oates, 2006)

Positivism	Interpretivism
Validity	Trustworthiness
Objectivity	Confirmability
Reliability	Dependability
Internal Validity	Credibility
External validity	Transferability

Due to the positivist nature of this study, the tests of quality applicable to this study according to the table shown above are validity, objectivity, reliability, internal validity and external validity. The parameters are defined below.

1. **Validity**: The information provided by the respondents is honest, thereby contributing to the attributes of the study.
2. **Objectivity**: The use of secondary literature from recognised authors establishes the objectivity of a study. The use of established theories and models, which have been employed in several other research projects, also confirms the objectivity of a study.
3. **Reliability**: The use of a questionnaire as the research instrument to confirm theoretical findings of the research. The development of a research artefact is derived from this procedure.

4. **Internal Validity**: This attribute is achieved through the collection of data from sources, which are directly involved in the context of a study.
5. **External Validity**: Generalisability has been achieved as the critical success factors can be applied to other Public Safety projects with similar characteristics.

5.9. Ethical Considerations

Punch (2006) state that it is the researcher's responsibility to comply with academic integrity and honesty, as well as to respect other people. The following measures were taken into account in order to ensure that ethical principles were fully observed and to guarantee the confidentiality of the study participants who have been recruited to participate in the study:

- The Research Ethics Committee of the University of Fort Hare approved the study (Certificate Reference Number: FLO04SPID01) (see Appendix A).
- There was one ethics certificate for the whole project; hence, the certificate has the supervisor as the principal investigator.
- Informed consent was obtained by sharing all necessary information about the research project with all participants. The terms and conditions of the research project were displayed on the website. It was a legal requirement for participants to agree to the terms and conditions of the research project before they could report Public Safety matters.
- Participants were guaranteed anonymity by constructing the questionnaires in a manner that ensures no personal information was captured.
- Information gathered from participants was only used for the intended and expressed purpose of the research.
- Participants could refuse participation in the project.
- Participants were fully aware about the purpose of the study and what they commit to regarding any issues, benefits and risks that may arise.
- The confidentiality of the participants was assured.
- The raw data was securely stored, and proper access control measures were put in place.

The researcher was aware of the above ethical considerations and has taken these into consideration. The research undertaken complied with these considerations.

5.10. Conclusion

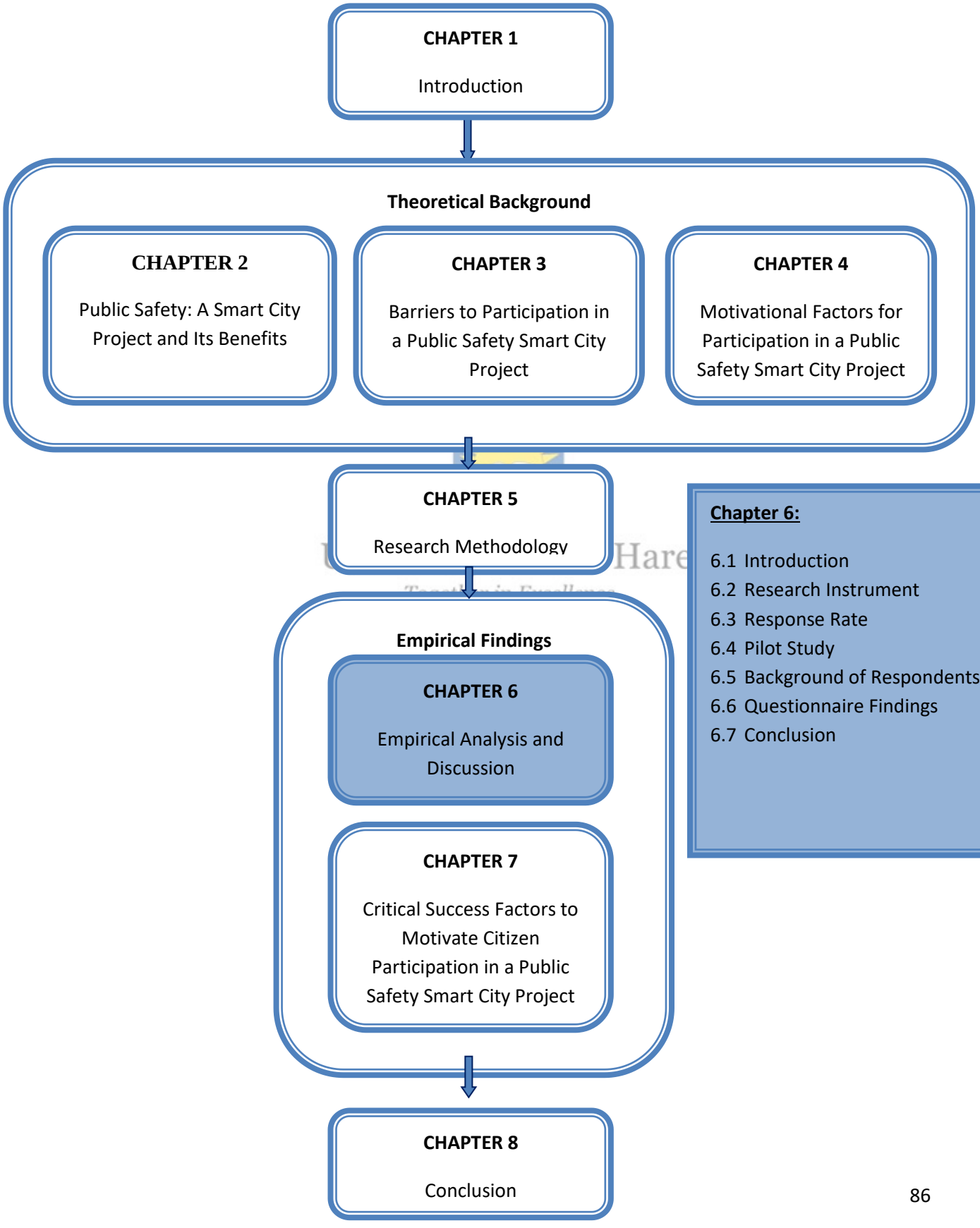
The way this study was conducted is discussed in this chapter. This chapter begin by providing a discussion of the key research paradigms, positivistic, interpretive and critical theory. This study was conducted under the interpretive paradigm that was considered the most appropriate paradigm for the research project. The study was conducted under Design Science Methodology and followed a mixed method approach. The Design Science Methodology was described and evaluated as applicable to the study.

A detailed description of the research format was provided.

Followed by the research design. The data collection methods used to collect empirical data for this research study were web-based questionnaires and expert reviews. Secondary data came from literature reviewed while primary date came from the expert reviews and questionnaires. Data analysis and the evaluation criteria are outlined.

This chapter concluded with the ethical considerations applied in this study. All discussions above allowed this study to result in the construction of possible Critical Success Factors for motivating citizens to participate in a Public Safety Smart City Project. The next chapter focuses on the findings and discussion of this study.

Chapter 6:
Empirical Analysis and Discussion



Chapter 6:

6.1 Introduction
6.2 Research Instrument
6.3 Response Rate
6.4 Pilot Study
6.5 Background of Respondents
6.6 Questionnaire Findings
6.7 Conclusion

6.1. Introduction

The previous chapter has outlined the research methodology and design used for this study, in which the data collection and analysis techniques were presented. To obtain primary data different data collection instruments were used that aided in achieving the objective of this research study. These include expert reviews and questionnaire data. Secondary data was collected from reviewing existing literature. This research project aims to investigate factors that can motivate citizens to participate in a Public Safety Smart City Project. Participation in the project has been lower than expected and thus leading to serious Public Safety issues being left unresolved or unattended. Therefore, this chapter presents a discussion of the results obtained from web-based questionnaires discussed in the previous chapter.

This chapter focuses on the analysis of the primary data to evaluate the findings of this study with relevance to the research problem. The primary data was obtained from the results of the web-based questionnaire and analysed using descriptive statistics with the use of an excel spreadsheet. The data from the questionnaire findings was used to formulate the critical success factors described in the following chapter.

6.2. Research Instrument

In this study a web-based questionnaire was used as a research instrument for data collection. The questionnaires were distributed electronically to citizens who registered in the project's website and participated in the project by reporting Public Safety issues. The research instrument was derived from extensive literature reviewed and Keller's ARCS theory of motivation factors. The web-based questionnaire (see Appendix B) comprised of closed-ended questions about the use of the system to report Public Safety matters, the perceived benefits of participating in reporting matters and the potential barriers for participating. The most important questions in the questionnaire focused on finding the motivational factors that can motivate citizens to participate in reporting Public Safety matters. Questions about the usefulness and effectiveness of the system to report matters were also in the questionnaire. The questionnaire was divided into the following three sections namely usability, motivation and incentives.

6.3. Response Rate

A total of 91 citizens registered on the Public Safety Smart City website. The East London citizens were considered appropriate, as they were the potential users to participate in a Public

Safety Smart City Project and report matters. The questionnaires were sent to these citizens and asked them to complete the online questionnaire after they have reported a Public Safety matter whether via the Public Safety Smart City system or the website. A total of 74 questionnaires were completed, representing a response rate of 81%. According to Oates (2006) a response rate of 30% or more is usually acceptable in a research study. Therefore, the response rate of 81% is deemed satisfactory.

6.4. Pilot Study

A pilot study was conducted to further refine the data collection instrument. A total of fifteen respondents were asked to comment on the understandability, structure and practicality of the questionnaire. Eight of the respondents were from potential users of a Smart City Public Safety system and the remaining seven were colleagues and fellow students.

Responses from the pilot study revealed that the list of potential incentives for participation was not complete. This list was then refined and improved for the final instrument. The pilot study significantly improved the quality of the questionnaire. Oates (2006) and Creswell (2009) assert that the quality of the data collection instrument is a contributory factor to a high response rate. This is applicable to this study as the questionnaire achieved an 81% response rate.

6.5. Background of Respondents

This section discusses the background and demographics of the questionnaire respondents. The study sample consisted of 43 (58.10%) females and 31 (41.90%) males. The respondents were asked to indicate which age group they fall into. Table 6.1 below presents the reported ages of the respondents. The age groups were grouped into two categories (under 30 years and over 30 years). Most respondents (73.00%) were younger than 30 years, while 27.00% were older than 30 years.

Table 6. 1: Age of Respondents

Age Group	Number of Respondents	Percentage %
Under 30 years	54	73.00%
Over 30 years	20	27.00%

Total	**74**	**100.00%**

As discussed in Chapter 2, citizens participate in a Public Safety Smart City Project by reporting Public Safety matters they observe or experience on a daily basis. Therefore, it is important to establish on how many times in a week citizens reported Public Safety matters. Table 6.2 and Figure 6.1 indicate that most of the respondents reported none to two Public Safety matters per week. This was lower than the expected reporting rate, and therefore highlights the significance of this study.

Table 6. 2: Summary of How Many Times Respondents Reported Public Safety Matters Weekly

	Number of Respondents	Percentage %
0-2	56	75.68%
3-5	16	21.62%
5+	2	2.70%
Total	**74**	**100.00%**

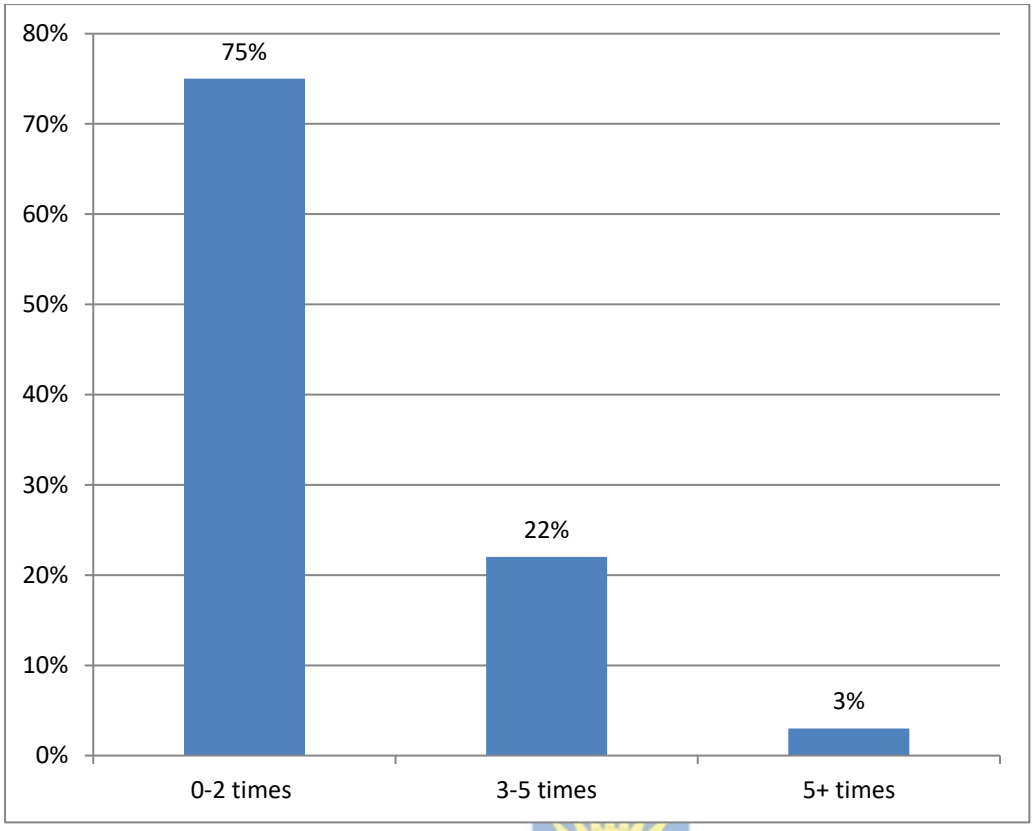


Figure 6. 1: Frequency of Reporting Public Safety Matters

Results from the questionnaire reveal that 56 (75.68%) of the 74 respondents did not report Public Safety matters more than 2 times a week. Only 18 (24.32%) of the respondents indicated that they report 3-5 time to more than 5 times a week. A majority of the respondents report Public Safety matters not more than 2 times a week, this could be that some citizens got demotivated to participate due to certain barriers that prevented them to take part in the project and that is more likely to result in serious Public Safety matters not being reported.

6.6. Questionnaire Findings

The objective of this research study is to investigate factors that can motivate citizens to participate in a Public Safety Smart City Project in order to formulate critical success factors that will address motivational factors that affect citizen participation in the project. The following sections discuss the findings from the questionnaire relevant to the research questions, which were stated in Chapter 1. The questionnaire was constructed based on the three summarised concepts identified from the research questions namely, perceived benefits, potential barriers and motivational factors. The findings for each concept are discussed in the section that follows.

6.6.1. Perceived Benefits

This section describes responses related to the first research sub-question, namely: *What perceived benefits of a Public Safety Smart City Project could motivate citizens to participate?* For this reason, respondents were asked three questions concerning the perceived benefits of the Public Safety Smart City project.

The perceived benefits of the Public Safety Smart City Project includes benefits such as reduction of crime, increased wellness of the environment, growth opportunities in the city and quicker emergency responses from Public Safety initiatives . Keller's ARCS theory of motivation identifies factors that can enhance motivation in Public Safety for citizens to participate in improving Public Safety as the citizens will benefit.

In order to investigate the benefits of the Public Safety Smart City project, respondents were asked to indicate the benefits to participation concerning using Public Safety Smart City System. The citizens report Public Safety issues through telephonic calls or a website. The telephonic reports are saved as voice files from and are then transcribed from the Interactive Voice Response (IVR) system, while the reports from the website are text reports from which are received as an email (Bhana, *et al*, 2013). All the information from the reports is distributed to the relevant authorities to resolve the Public Safety matters reported by the citizens.

The outcome of the benefits was measured on a Likert Scale, which ranged from 1 (Strongly Agree) to 5 (Strongly Disagree). The findings are shown in Table 6.3. It is important to note that the responses in Table 6.3 are grouped into Agree (Strongly Agree and Agree responses) and Disagree (Strongly Disagree and Disagree responses). The neutral responses are not provided in Table 6.3.

Table 6. 3: Perceived Benefits of the Public Safety Smart City System

	Mean	Median	Agree	Disagree
I found this system useful as a means to report Public Safety issues.	1.3 (Strongly Agree)	1 (Strongly Agree)	99.00%	0%
The system did everything I would expect it to do to allow me to report Public Safety issues (i.e. it is effective).	1.5 (Agree)	2 (Agree)	97.00%	0%

I would be willing to use such a system in the future as I perceive it to be useful to me.	1.6 (Agree)	2 (Agree)	99.00%	0%

The respondents were first asked to indicate how the find the system useful as means of reporting Public Safety matters. The question provides perception on the ease of use of the system. The results obtained from the questionnaire about the usability of the system had a mean of 1.3 (Strongly Agree) and median of 1 (Strongly Agree). The majority of respondents (99%) indicated that they find the system useful for reporting Public Safety matters. This indicates that the usability of a platform is important as a perceived benefit.

The second question asked if the system did everything expected for reporting of Public Safety issues. The results from the questionnaire about the effectiveness of the system were positive with 97.00%, indicating that citizens find the system effective to use and did everything that was expected to do when reporting Public Safety matter. The responses for system effectiveness had a mean of 1.5 (Agree) and the median 2 (Agree). An effective approach to reporting Public Safety issues is therefore an important benefit.

The future use of the system refers to the usefulness of the services provided by the Public Safety Smart City system to citizens when reporting Public Safety matters. The services include the ability to make phone calls and reporting on the website considering time, cost and other benefits. The respondents were asked to indicate how they perceive the usefulness of the system and their willingness to use it in the future. The results obtained show that, most of the respondents (99.00%) indicated that the Public Safety Smart City system when reporting Public Safety matters can save time and costs. Hence, they are willing to use it in the future to report Public Safety matters. The mean for the responses of the future of the system was 1.6 (Strongly Agree) and the median 2 (Agree).

6.6.2. Potential Barriers

As this study seeks to investigate the motivational factors that can motivate citizens participate in a Public Safety Smart City Project, is it important to identify and verify the barriers, which prevent citizens from participating in the project. This section describes the responses to questions relevant to the second research question, which is: *What are the barriers to participation in a Public Safety Smart City project?*

For this reason, respondents were asked to indicate barriers that hinder them to participate concerning the Public Safety Smart City system. The effect of the barriers was measured on a Likert Scale that ranged from 1 (Agree) to 5 (Strongly Disagree). Table 6.4 show the responses to the potential barriers identified. The benefits in terms of time and cost are important.

Table 6. 4: Potential Barriers to participation in a Public Safety Smart City Project

	Mean	Median	Agree	Disagree
The number of steps (or amount of effort) needed to successfully report an issue was acceptable (whether via a telephone call or via the mobi site).	1.6 (Agree)	2 (Agree)	94.00%	4.00%
I have the necessary resources (e.g. phone, airtime) to report future Public Safety matters.	1.8 (Agree)	2 (Agree)	87.00%	0.00%
The reporting process was too time consuming for me.	3.9 (Disagree)	4 (Disagree)	8.00%	81.00%
I felt uncomfortable to report Public Safety matters due to a lack of experience.	4.1 (Disagree)	4 (Disagree)	5.00%	88.00%
I hesitate to participate for fear I will make a mistake.	4.0 (Disagree)	4 (Disagree)	8.00%	84.00%
Reporting an incident is an intimidating experience.	3.8 (Disagree)	4 (Disagree)	16.00%	73.00%

Results from the questionnaire concerning barriers to participation show that 94.00% of the respondents indicated that the amount of effort (the number of steps) required reporting a Public Safety matter was satisfactory. Therefore, the results from the questionnaire indicate that respondents find the instructions followed clear when reporting a Public Safety matter and do not cause any misunderstanding. The mean for the number of steps needed to successfully report to an issue was acceptable was 1.6 (Agree) and the median was 2 (Agree)

In terms of resources, responses show that 87.00% of the respondents indicated that they have the necessary resources to participate in reporting the future Public Safety matters. The

resources include phone and airtime. The responses had a mean of 1.8 (Agree) and the median 2 (Agree).

The questionnaire results show that 81.00% of the respondents did not find the process of reporting a Public Safety matter time consuming. The responses for this barrier had a mean of 3.9 (Disagree) and a median of 4 (Disagree).

In terms of lack of experience as barrier, the responses had a mean of 4.1 (Disagree) and a media of 4 (Disagree). A majority of 88% of respondents indicated that they due to the experience they have, they did not feel uncomfortable to report Public Safety matters. Therefore, this means that most respondents have the required skills or knowledge to participate in reporting Public Safety matters.

Respondents indicated that fear of making a mistake when reporting a Public Safety matter did not stop them from participating. 84.00% of the respondents felt encouraged and confident and therefore did not fear making mistakes when reporting Public Safety matters through encouragement. The responses for this barrier had a mean of 4.4 (Disagree) and a median of 4 (Disagree).

From the responses, 73.00% of the respondents indicated that they did not find reporting Public Safety matters to be intimidating. The responses for this barrier had a mean of 3.8 (Disagree) and a median of 4 (Disagree).

While none of the perceived barriers were confirmed through the questionnaire findings, it is important to note that none was rated as Strongly Agree or Disagree. This indicates that these barriers are not entirely overcome and do still affect at least some of the respondents.

6.6.3. Motivational Factors

The central theme of this research project is focused on identifying motivational factors that can help motivate citizens to participate in a Public Safety Smart City Project. For this reason, it was important to ask respondents to indicate what motivates them to participate in a Public Safety Smart City Project. This is in line with the third research question, name: *Which motivational factors are relevant for enhancing citizen participation in a Public Safety Smart City Project?*

Motivation is a stimulation of any behaviour caused by various motives. Motivation strengthens the involvement of citizen to participate. Keller's ARCS theory of motivation can

create motivation in a Public Safety Smart City Project. The theory assisted in investigating the motivational factors necessary to enhance citizen participation in a Public Safety Smart City Project through the use of the four factors namely: attention, relevance, confidence and satisfaction.

Table 6.5 show the respondent's choices on the factors that they consider motivational and can enhance participation in the project. These results are reported in percentages of participants who considered the listed factors to be relevant.

Table 6. 5: Summary of Responses for Motivational Factors

	Mean	Median	Number of respondents on Motivational Factors	Percentage of Respondents
Overall, I was satisfied with this automated system for reporting Public Safety issues. I would be comfortable using it again to report such issues.	1.42 (Strongly Agree)	1 (Strongly Agree)	69	98.00%
I feel that calling a Public Safety help line is a useful way to act on Public Safety issues that may pose a personal risk to me.	1.45 (Strongly Agree)	1 (Strongly Agree)	61	95.00%
I feel that calling a Public Safety help line makes me feel better, because I am trying to do something about a Public Safety issue that may place me at personal risk.	1.56 (Agree)	1.5 (Agree)	61	95.00%

Results from the questionnaire concerning the factors that motivated citizens to participate in a Public Safety Smart City Project reveal that 98.00% of the respondents felt motivated and comfortable in reporting Public Safety matters with the automated system and that is what kept them participating in reporting matters. The responses for this motivational factor had a mean of 1.42 (Strongly Agree) and a median of 1 (Strongly Agree).

The results from the questionnaire show that usefulness of a Public Safety helpline as a factor of motivation 95.00% of the respondents indicating that they feel that using a Public Safety help line is a useful system for reporting Public Safety matters that may pose personal risk to

them. It is safer to use and makes them feel better using it as they are trying to do something about a matter they observe. The Public Safety helpline usefulness as a motivational factor had a mean had a mean of 1.45(Strongly Agree) and median of 1 (Strongly Agree).

Residents feel strongly that the automated system is appropriate for reporting future Public Safety issues and thus would motivate continued participation. Concern about personal risk and being involved in solving Public Safety issues also motivate further participation.

Further to these motivational factors, respondents were asked to indicate their choices from a list of given options as to factors that will motivate them to participate in a Public Safety Smart City Project. The responses are presented in Table 6.6. Respondents were given the option to choose multiple options that were relevant to them.

Table 6. 6: Summary of Responses on Factors that Motivate Citizen to Participate

	Number of respondents	Percentage of Respondents
Airtime Incentives	25	40.00%
Toll-free number	28	44.00%
Response from Municipality	35	56.00%
Making a difference	51	81.00%

The results in Table 6.6 reveal that the most important factor that can enhance motivation for citizens' to participate in a Public Safety Smart City Project are the practices related to making a difference in communities. According to the results, 81% of the respondents indicated that making a difference to their communities is one of the factors that would motivate them to participate in a Public Safety Smart City Project. These results are consistent with the literature reviewed in this study.

Additionally, 56.00% of the respondents indicated that response from the municipality on Public Safety matters reported could motivate them to participate in a Public Safety Smart City Project. This indicates that it is important that municipality and relevant authorities respond and solve matters reported quickly. Public Safety matters reported that affect the living

conditions of citizens need to be considered as they may pose risks to the life of citizens, thus the municipality needs to respond on time.

From the responses it can be seen that providing a Toll-free number (44.00%) and Airtime incentives (40.00%) were the least considered motivational factors. This means that citizens were not as motivated by reducing costs of participation, but were rather motivated by the possibility of improving their lives and the lives of their community.

In a Public Safety Smart City Project airtime incentive were used as motivation to participate. Respondents were therefore asked to indicate if they were encouraged by the airtime incentive to participate or if they participated in order to get airtime. Table 6.7 and shows the results respondents gave concerning airtime incentive as an encouragement to participate.

Table 6. 7: Summary of Responses on Airtime Incentive as Encouragement

	Number of respondents	Percentage of Respondents
Yes	21	34.00%
No	14	23.00%
Maybe	26	43.00%

The results show that 43.00% of the respondents were indifferent about receiving the airtime incentive and 34.00% of the respondents were encouraged by the airtime incentive to participate. This indicates that airtime incentives are not necessarily the most appropriate means of encouraging or motivating to participate. While 23.00% of the respondents do not consider the airtime incentive as what encouraged them to participate in the project. Therefore, this suggests that there are other incentives that can encourage citizens to participate other than airtime incentives.

Incentives have been previously noted as encouragement to participate. For this reason, respondents were asked to indicate the incentives they prefer they would to get as an encouragement to participate. The results are shown in Table 6.8 and Figure 6.6.

Table 6. 8: Summary of Responses on Incentives Preferred

	Number of respondents	Percentage of Respondents
Money	12	20.00%
Airtime	15	25.00%
Feeling of Accomplishment	14	23.00%
Feedback	20	32.00%

Results from the questionnaire concerning the incentives participants would have prefer to receive as an encouragement to participate in a Public Safety Smart City Project show that 32.00% of the respondents indicated that they prefer to get feedback as an incentive. These results are consistent with the literature reviewed in this study. Thus, municipality and relevant authorities would need to provide feedback to citizens when they have participated in reporting Public Safety matters to enhance citizen participation. This can be done through resolving reported issues or providing updates on progress of resolving the issues.

Fewer respondents preferred the remaining incentives. These are airtime (25.00%), feeling of accomplishment (23.00%) and money (20.00%). In this regard, citizens did acknowledge airtime as an incentive as the second most appropriate. This might indicate that money is a factor inhibiting participation. Therefore, project managers need to consider the cost of reporting Public Safety matters. In terms of a feeling of accomplishment, citizens participate to accomplish the goal of solving Public Safety matters. Therefore, to encourage them to keep participating project managers should consider rewarding them as it would increase their engagement and commitment, as outlined in the literature reviewed in this research project.

There seem to be other reasons that exist in the project that may encourage citizens to participate. For this reason, respondents were asked to indicate if the concern of safety for others encouraged them to participate in a Public Safety Smart City Project. The results from respondents are shown in Table 6.9.

Table 6. 9: Summary of Responses on Concern of safety for others

	Number of respondents	Percentage of Respondents
Yes	56	92.00%
No	4	7.00%
Maybe	1	2.00%

The results from Table 6.9 reveal that citizen participation in the project was encouraged by the concern of safety for others. According to the results for most of the respondents (92.00%) concern of safety for others encourages them to participate in the project. This indicates that participants give all their time and energy to reporting Public Safety matters not only to benefit their own situation but also to help others when their personal lives are at risk and that encourages them to participate in making their communities better places to live in.

6.7. Conclusion

This chapter presented the data collected for this research project by means of web-based questionnaires. The research findings and results were dealt with in this chapter by analysing the findings according to the three sub-questions identified in this research project and stated in Chapter One. These findings were described in terms of perceived benefits of the Public Safety Smart City Project, potential barriers related to citizen participation in the project and motivational factors that can enhance participation in the project.

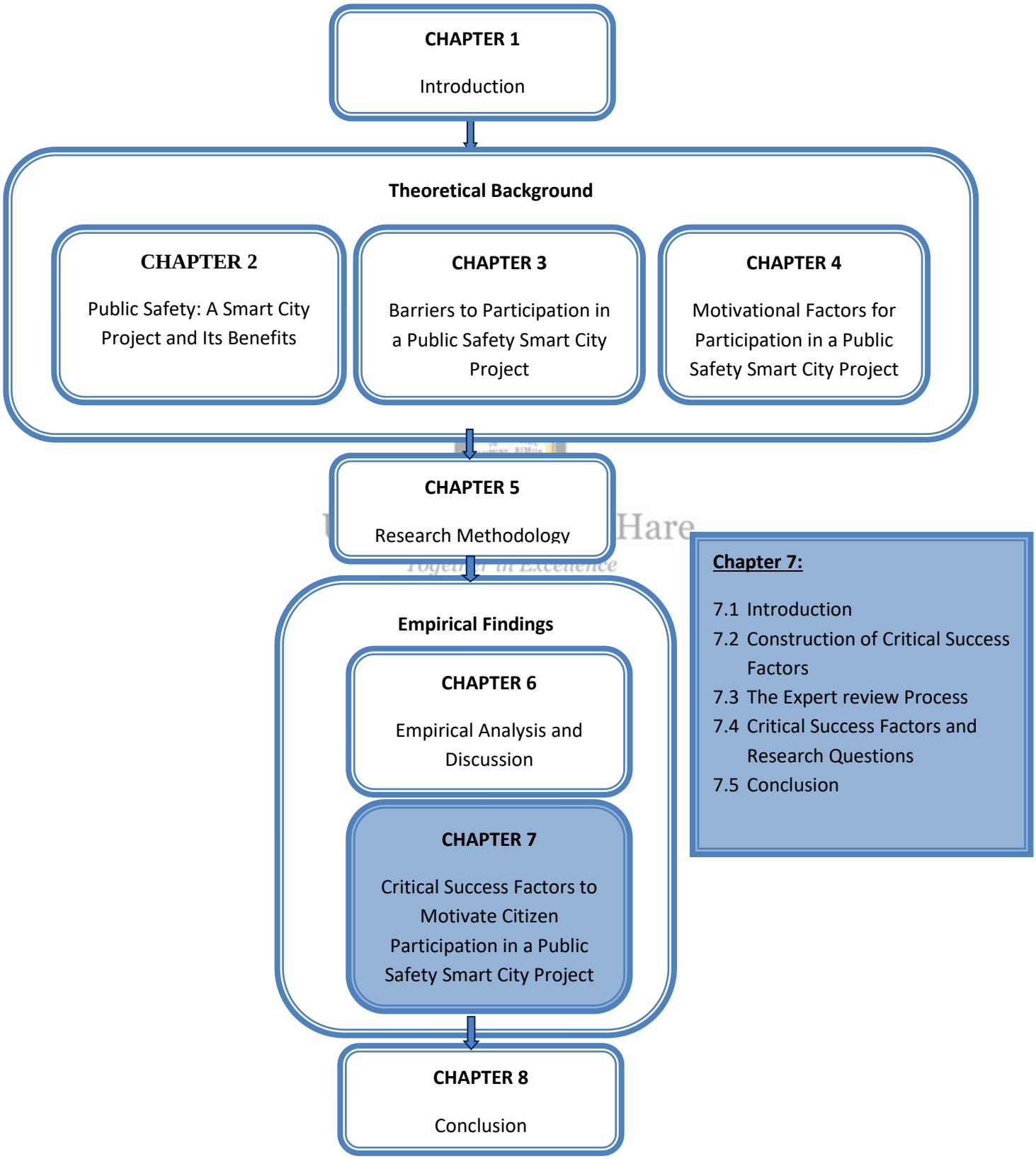
From the questionnaire findings it was revealed that respondents considered system usability, system effectiveness and future of the system can facilitate reporting ad can be barriers to motivation and participation if they are not effective in the project. In terms of potential barriers the questionnaire findings revealed that, according to the respondents, the time taken to report, fear of the unknown and an intimidating experience were barriers that still hinder some of the participants from participating in the project, while amount of effort, lack of resources and lack of experience did not seem to be barriers that prevent citizens from participating.

From the questionnaire findings it was found that satisfaction with the system, usefulness of the Public Safety helpline, making a difference and response from the municipality were the key motivational factors that can enhance participation in a Public Safety Smart City Project. The questionnaire also found that respondents found the airtime incentive to be an

encouragement to participate in the project but not the most appropriate. Some respondents preferred feedback as an important incentive to receive when they have participated in reporting Public Safety matters. The concern of safety for others was another factor that encouraged citizens to participate in the project. Therefore there is a need to formulate critical success factors to motivate citizens participate in the project.

The next chapter provides a detailed discussion of the development of the proposed critical success factors that will motivate citizens in a Public Safety Smart City Project to enhance participation, which are the primary objective of this research project. The proposed critical success factors were based on the literature reviewed and the questionnaire findings that were discussed in this chapter. The remaining primary data collected, in the form of expert reviews used to refine the critical success factors, is also provided in the next chapter.

Chapter 7:
Critical Success Factors to Motivate Citizen Participation in a Public Safety Smart City Project



Chapter 7:

7.1 Introduction
7.2 Construction of Critical Success Factors
7.3 The Expert review Process
7.4 Critical Success Factors and Research Questions
7.5 Conclusion

7.1. Introduction

The previous chapters discussed the research design and methodology as well as the empirical findings. This research study was conducted within the interpretive paradigm, following a Design Science methodology. Design Science allows for the development of an artefact (in this research this is critical success factors) through an iterative research process. Expert reviews were used to refine the proposed critical success factors from the research findings concerning this. This chapter discusses the critical success factors that motivate citizens participate in a Public Safety Smart City Project, as well as the refinement of these factors using expert reviews.

In this research study, it was found that there are Public Safety matters that do not get resolved due to citizens who are reluctant to participate in reporting Public Safety matters in a Public Safety Smart City Project. This, cause problems with the Public Safety initiatives as they will not be aware of such Public Safety matters because citizens did not report them.

Based on literature review and theory (as discussed in Chapters Two to Four) and empirical findings discussed in Chapter Six the critical success factors were formulated. The literature chapters covered the benefits of participating in a Public Safety Smart City Project, the barriers to participation in the project, and the motivational factors that can enhance participation in the project. This research project aims to formulate critical success factors that can be used to enhance participation in a Public Safety Smart City Project through motivation.

This chapter begins by introducing the construction of the proposed critical success factors, which include the relationship of critical success factors with ARCS model, other literature findings, empirical findings and the discussion of the proposed Critical Success Factors. Relationship of the Critical Success Factors and the research questions is provided. This is followed by an outline of the refinement of the critical success factors using expert reviews. The conclusion of this chapter is then provided.

7.2. Construction of Critical Success Factors

In this section the proposed Critical Success Factors are presented. Critical success factors are the essential areas of activity that must be performed well to achieve the mission, objectives and goals for a project. In identifying your critical success factors can create a common point of reference to direct and measure the success of the project (Manktelow, Jackson, Edwards, Eyre, Cook & Khan, 2011).

The Critical Success Factors identified in this study aim to address the underlying research problem and the primary objective of this research project in terms of enhancing participation in a Public Safety Smart City Project through motivation. The identified Critical Success Factors for this study will assist the Public Safety Smart City Project in East London to attract and attain more citizens to participate in reporting Public Safety matters through motivation.

This section illustrates how the proposed critical success factors for this research study were developed. Six proposed critical success factors were found from secondary data and primary data, these are provided in Table 7.1. After feedback from the expert reviews the suggestion on the naming conversion of the critical success factors were made more descriptive. The critical success factors are presented in Table 7.1 as it was suggested to show the changes between the proposed and final critical success factors.

Table 7. 1: Critical Success Factors for this Study

Proposed Critical Success Factors	Refined Critical Success Factors
Ensure System Satisfaction	Ensure user satisfaction by ensuring ease of use
Making a Difference	Citizens should be given the opportunity to make a difference in their community
Response from Municipality	Public Safety initiatives must provide adequate response to citizens
Concern of safety for others	Citizens should be able to participate due to their concerns of safety for others
Provide adequate feedback to citizens	Citizens should be given incentives after participating
Provide a Toll-free Number to report Public Safety matters	

The proposed critical success factors listed in Table 7.1 show, which factors need to be considered for motivation to increase citizen participation in a Public Safety Smart City Project. The next section will discuss the expert review process from which feedback was received from experts to explain the refined critical success factors.

7.3. The Expert Review Process

To analyse and receive feedback on the Critical Success Factors an expert group was used. Two experts on Smart City and citizen participation participated over two rounds of review. After each round the feedback was used to modify the Critical Success Factors. This satisfies the Design Science requirement for cyclical review of the artefact.

7.3.1. Expert Review Round One

In the first round of expert review, two NRF-rated researchers with the knowledge and relevant experience were approached to assess the Critical Success Factors for this study, which focused on motivating citizens to participate in a Public Safety Smart City Project. The comments and recommendations collected from the expert review related to the suggestion of the use intrinsic motivation factors. Feedback on the Critical Success Factors about making a difference and concerns for safety need more relevance. In addition, the feedback to citizens needs to be explained in terms of how this can be achieved.

The comments and recommendations collected from the first expert review were taken into consideration, adjustments were made in the Critical Success Factors by adding intrinsic motivation factors to show the prominence of intrinsic motivation factors, and the explanation of feedback was improved. Below are the Critical Success Factors before they were edited.

- Ensure System Satisfaction
- Making a Difference
- Response from Municipality
- Provide a Toll-free Number to report Public Safety matters
- Concern of safety for others
- Provide adequate feedback to citizens

7.3.2. Expert Review Round Two

The second round of expert review provided suggestions to the proposed Critical Success Factors with their descriptions. The following recommendations and suggestions were made:

- Experts suggested that the Critical Success Factors need to be re-structured in a form of factors and be linked to the ARCS theory.
- It was unclear if the first Critical Success Factor was referring to only the IVR or the Mobi site
- Provide a clear distinction between the feedback and municipality response

- Explain in detail how feedback would be provided to the citizens
- Suggested that incentive CSF be phrased as: correct incentive chosen for the population (intrinsic motivation added)

The comments were considered for the expert review. The refined Critical Success Factors are shown in Table 7.2. All the factors were restructured in a form of factors and linked to the theory as well as the theory was cleared. The feedback CSF was not considered because the CSF was removed and the municipality response was explained.

7.3.3. Refined Critical Success Factors

This section discusses the final (refined) Critical Success Factors for this study. Five proposed Critical Success Factors were established from the questionnaire findings and literature reviewed. The following CSFs were formulated based on the literature: CSF 1 is articulated based on the literature that suggested that self-efficacy motivates citizens to participate through their skills on observation, phone and computer use; CSF 2 formulated based on they have to provide their knowledge and experiences that will contribute to the community; CSF 3 was supported by the findings from the questionnaires; CFS 4 concerns of safety is based on motives that citizens get motivated to participate through them; and CSF 5 incentives that was formulated based on literature discussed in Chapter 4. These factors are provided in Table 7.2. The proposed Critical Success Factors need to be considered to ensure motivation in a Public Safety Smart City Project focusing on participation.

Table 7. 2: Refined Critical Success Factors

Critical Success Factor	Description
Ensure user satisfaction by ensuring ease of use	The Public Safety Smart City system should be clear, easy to use, and effective and the number of steps to successfully report a Public Safety issue should be acceptable. Citizens should also be provided with a Toll-free number they can use to report a Public Safety matter. Thus minimizing costs of reporting and allowing citizens to report Public Safety matters in a satisfactory manner.
Citizens should be given the opportunity to make a difference in their community	The Public Safety Smart City Project should give citizens the opportunity to be involved in their community to make a difference. Citizens get engaged in their community to improve others health and safety. This satisfies citizens needs to develop the feeling of being needed and valued while building one's self-esteem and self-confidence and to make an effort to address the concerns of others and ensure safety of the public.

Public Safety initiatives must provide adequate response to citizens	The Public Safety Initiatives or relevant authorities for an incident reported should ensure that citizens get quick response to incidents reported. The emergency responders should be able to maintain their ability to communicate as necessary during critical incidents affecting the life, health and safety of the public. They should manage Public Safety issues in an attempt to increase citizen satisfaction. Citizens should also be given feedback on a Public Safety matter they have reported to keep them updated and thus will motivate citizens to keep reporting matters they observe as they know their reports are auctioned. Therefore, Public Safety issues will be managed better and citizens will be motivated to report again.
Citizens should be able to participate due to their concerns of safety for others	Citizens should be able to protect each other. The data they provide should be able to protect others by addressing any form of incident that may be potentially hazardous to the safety of others, which may have a great likelihood of physical harm, property loss or environmental impact.
Citizens should be given incentives after participating	After participating, citizens must be given incentives as a form of reward for taking part and to keep them encouraged to participate in a Public Safety Smart City Project. This will also help attract the attention of those who have not yet participated to take part and report Public Safety matters they observe.

In the following sub-sections each Critical Success Factor is described in more detail. The questionnaire findings, which confirm the necessity of Critical Success Factor, are also described.

7.3.3.1. CSF1: Ensure user satisfaction by ensuring ease of use

From Keller's theory of motivation, attention is the relevant component in this Critical Success Factor as attention involves the use of strategies to gain initial interest (Shellnut, 1996). If citizens are satisfied with using the system because it is safer and easy are mostly likely to keep participating. Ensuring user satisfaction may attract others who have not participated in reporting Public Safety matters, therefore to promote ease of use.

The reports on the Public Safety Smart City Project are made through telephonic calls or a mobi site. Reports on the website are text reports. The instructions for reporting Public Safety matters must be clear and concise, as lengthy instructions may result in citizens skipping them and thus cause reduction in participation as citizens will perceive the reporting process as too much of an effort (Bhana & Flowerday, 2013). Thus, it is important to ensure that citizens are satisfied with reporting process and it being organised in a simple manner.

Based on the questionnaire findings, 98% of the respondents indicated that they find the system for reporting Public Safety matters effective, efficient and safe to use. The system is aimed at receiving Public Safety reports and provides citizens the opportunity to make these reports

without experiencing any challenges or problems. Therefore, citizens feel motivated to participate using a convenient and safe system.

A number of the respondents (44%) indicated that a toll-free number for reporting matters can motivate citizens participate in the project. Therefore, citizens can report Public Safety without paying for the call. This will allow authorities to receive information about an incident quickly, as some people do not always have airtime to make phone calls.

7.3.3.2. CSF2: Citizens should be given the opportunity to make a difference in their community

Confidence involves providing citizens with opportunities to participate through which they are provided with the performance requirements and project criteria. It is the relevant aspect of Keller's theory in this success factor. The Public Safety Smart City Project affords citizens the opportunity to participate in creating the city to be a better place. However, cost of phone calls was found a barrier earlier in the literature review and might prevent some participants from participating in a Public Safety Smart City Project

Citizens take part in programs in their environment that affects them whether on voluntary or obligation basis (André, 2012). Therefore, citizens should be given the opportunity to make change as their contributions will benefit them. Citizens will not only make a difference and provide the desired change in their communities but they will learn to understand and appreciate ones' and interests in the city (Wandersman, *et al*, 2000).

Making a difference in a community you reside in is therefore very significant. Citizens feel motivated to participate in the project as it creates a safe environment for every citizen and making a difference in the city of East London. Therefore, citizens are willing to devote their time and energy in helping to improve the living environment of the city. The feeling of involvement varies with the extent to which citizens are given the opportunity to participate and their desire to participate (Harms, 2007). Active participation in a Public Safety Smart City Project can create the feeling of involvement in the city.

The majority of the respondents (81%) indicated that making a difference in their communities is what motivates them to participate in a Public Safety Smart City Project to help improve health and safety. This can be further encouraged by feedback to participants as to how their reports assisted the community.

7.3.3.3. CSF3: Public Safety initiatives must provide adequate response to citizens

Satisfaction is the relevant aspect of Keller's theory of motivation as it provides citizens reinforcement that can either be encouraging them and supporting them enjoying the experience and providing them with motivational feedback (Poulsen, Lam, Cisneros, & Trust, 2008).

Public Safety were formed to provide quick response on emergency incidents. Public Safety initiatives are grouped into four categories that are responsible for fighting different Public Safety issues that occur, namely: law enforcement, fire management, emergency medical services and road traffic management (Moore, 2014). Therefore Public Safety initiatives should be able to provide adequate response to citizens as they are separated in different initiatives.
The Public Safety Smart City Project was introduced to collect Public Safety matters and thus relevant authorities should respond timeously on Public Safety matters reported. Respondents (56%) indicated that rapid response to incidents reported motivates citizens to participate. Thus, it is necessary for any relevant authority to respond quickly and solve the matter reported to increase participation and to keep citizens motivated.

According to Choy (2005) the use of rewards can be used to promote effort and progress. Nonetheless, 32% of the respondents indicated that they prefer feedback essential as incentive to keep them motivated in participating in the project. While others preferred, airtime (25%), feeling of accomplishment (23%) and money (20%) as incentives that motivate them to participate. Thus, the actual resolving of a Public Safety incident is key motivator to continued participation.

7.3.3.4. CSF4: Citizens should be able to participate due to their concerns of safety for others

Relevance is the relevant aspect to this success factor from Keller's theory of motivation as it is about linking citizen's needs, wants and motives (Poulsen, Lam, Cisneros, & Trust, 2008). Citizen participation motivation involves the motive to engage in certain behaviours (Cadwallader, Jarvis, Bitner, & Ostrom, 2010). Thus, in a Public Safety Smart Project citizens should be able to participate because they motive can be to participate as they are concerned about others safety.

People like to get involved in a project conducted not only to take part but because they have certain concerns. Therefore, it is important that people's concerns be considered. Thus, in this study the concerns of safety for others are significant as they will help in enhancing Public

Safety. Citizens are likely to report every incident that occurs because they want to protect others and they may address an incident that is likely to harm other citizens on time.

It was found that 92% of the respondents agreed that they felt motivated to participate in the project due to the concern of safety for others. Consequently, citizens protect each other from the harm of Public Safety threats. This will therefore improve safety of citizens.

7.3.3.5. CSF5: Citizens should be given incentives after participating

Satisfaction is the relevant aspect of Keller's theory of motivation in this success factor as it provides citizens with rewards to after they have participated. This is to encourage participation by recognising citizen's efforts in reporting Public Safety matters.

Incentives are the important determinant of willingness to participate (Klandermans & Oegema, 1987). Incentives attract the attention of citizens to participate. In a Public Safety Smart City Project it is important to give citizens incentives to improve citizen partipation and to keep citizen's involvement. Therefore, citizens should receive incentives after particing to improve motivation.

According to Fransson and Frendberg (2008) incentives play an important role in motivation for the following reasons: to recognise and reward better performance, to attract and attain high quality people, to motivate people, and to influence behavior. Thus it is important to give incentives to citizens after they have participated to keep them motivated and attract those who are hesitant to participate. People are rewarded for the value they create, to motivate people and obtain their commitment and engagement (Fransson & Frendberg, 2008).

Airtime incentive was used as motivation to participate in a Public Safety Smart City Project. 43% of the respondents indicated that the airtime incentive did not necessarily encourage them to participate in the project, while 34% of the respondents indicated that they were encouraged by the airtime incentive to participate. However, cost of reporting was a concern. Therefore, it is important to consider giving incentives to sustain participation. The next section will discuss the relationship between the critical success factors and the theory used in this research study.

7.3.4. Critical Success Factors and ARCS Model

It was stated above that Critical Success Factors are the most important areas that need to be considered to ensure the success of the project. Therefore, the problems that prevent citizens from participating in a Public Safety Smart City Project will be reduced if one considers its critical success factors. Table 7.3 recalls the four ARCS components for ensuring motivation.

These components are namely: attention, relevance, confidence and satisfaction. These components were considered when then questionnaire was designed and some questions were based on the theory. It is therefore important to show relation of the critical success factors with the theory used. Table 7.3 shows the relationship between the theory and the critical success factors.

Table 7. 3: Critical Success Factors & ARCS Model

ARCS Model Components	Critical Success Factor
Attention (Arousal)	Ensure user satisfaction by providing a toll- free number.
Relevance (Motive)	Citizens should be able to participate due to their concerns of safety for others.
Confidence (Opportunities)	Citizens should be given the opportunity to make a difference in their community.
Satisfaction (Rewards)	• Public Safety initiatives must provide adequate response to citizens. • Citizens should be given incentives after participating.

Table 7.3 provides a discussion of how Keller's ARCS theory of motivation (four components) relates to the proposed critical success factors. The relationship refers to the sub-elements of each component discussed in Chapter 4 together with the critical success factors, in which attention refers to the perpetual arousal (incentives), relevance refers to motive matching (motives), confidence refers to the success opportunities (feedback) and satisfaction refers to the intrinsic reinforcement (self-efficacy) of ensuring motivation for citizen participation in a Public Safety Smart City Project.

7.3.5. Other Literature Findings

The proposed Critical Success Factors were found from primary data and secondary data. Secondary data revealed that voluntary participation is an essential motivation factor. In addition, motives are motivational factors that cause a person to satisfy a specific need (Lamb, et al., 2010). Self-efficacy was found to be another motivational factor that citizens can actively participate to improve their community (Ohmer, 2007). In the theory adopted for this study it

was found that incentives and rewards motivate citizens to participate. Therefore, the Critical Sucess Factors were created under the factors identified from theory and literature review.

7.3.6. The Empirical Findings

From the empirical findings gathered it was acknowledged that respondents highlighted the factors that motivate them participate. The key factors indicated through the analysis of the questionnaire findings in Chapter 6 were:

1. User Satisfaction
2. Making a difference
3. Response from Public Safety initiatives
4. Concern of safety for others
5. Incentives

This suggests the importance of these motivational factors and thus this research project focuses on them in the development of the proposed Critical Success Factors.

7.4. Critical Success Factors and Research Questions

Three research questions needed to be answered in order to answer the main research question for this study. This section will discuss the questions that contributed towards the construction of the critical success factors. The questionnaire was constructed based on the three research questions to help investigate the critical success factors. The main research question asked: What are the factors that motivate East London citizens to participate in a Public Safety Smart City Project? Table 7.4 presents how the critical success factors address the three secondary research questions for this study.

Table 7.4: Critical Success Factor & Research Questions

Research Sub-Question	Critical Success Factors				
	CSF1	CSF2	CSF3	CSF4	CSF5
What perceived benefits of a Public Safety Smart City Project could motivate citizens to participate?	X		X		X
What are the barriers to participation in a Public Safety Smart City project?			X		
Which motivational factors are relevant for enhancing citizen participation in a Public Safety Smart City project?		X	X	X	X

Table 7.4 presents which critical success factors address the three sub-questions that assisted in answering the main research question. Thus, the Critical Success Factors are consistent with the guiding questions of the study.

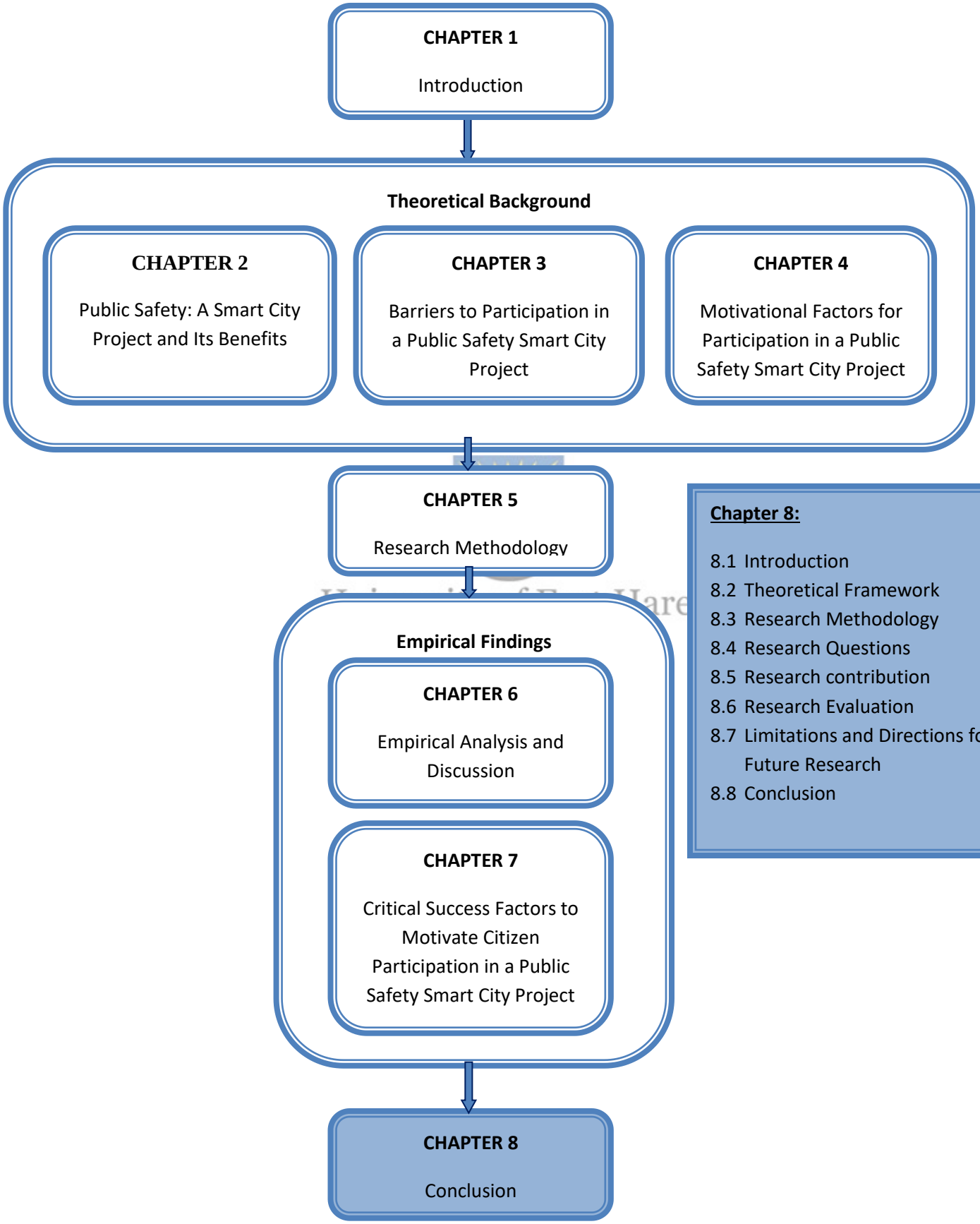
7.5. Conclusion

This study aimed to propose critical success factors that motivate citizens to participate in a Public Safety Smart City Project. These Critical Success Factors aim to address the underlying research problem of lower expected citizen participation in a Public Safety Smart City Project.

The chapter first provided details of how the critical success factors were constructed based on the empirical findings of this research study. The chapter then provided a detailed description of each critical success factor in a table format. The five identified critical success factors related to user satisfaction, making a difference, feedback, concerns of safety and incentives. The empirical findings and literature relating to each factor were discussed.

Following this section, the relationship between the critical success factors and the research questions for this study was presented to show the questions that contributed towards the construction of the critical success factors. The last section discussed the details of the expert reviews for this study. The next chapter will provide a conclusion summarising key aspects of this study.

Chapter 8:
Conclusion



Chapter 8:

8.1 Introduction
8.2 Theoretical Framework
8.3 Research Methodology
8.4 Research Questions
8.5 Research contribution
8.6 Research Evaluation
8.7 Limitations and Directions for Future Research
8.8 Conclusion

8.1. Introduction

The previous chapters consist of a comprehensive introduction of the study, literature reviewed, the research methodology, the empirical findings and discussion and the proposed critical success factors. The identified research problem and main objective of this study are explained in Chapter 1 of this dissertation. Following this, a theoretical background of the study was discussed in Chapters 2, 3, and 4. The research design and methodology applied for the study are presented in Chapter 5. Chapter 6 provides the empirical findings obtained from the primary data supported by the secondary data.

All these chapters have assisted in addressing the main objective of this study and in providing the solution to the research problem. The previous chapter discussed the findings and recommendations of the study and proposed critical success factors that motivate citizens to participate in a Public Safety Smart City Project in order to enhance citizen participation and improve Public Safety. The findings contributed in answering the research question and sub-questions investigated in this study. The critical success factors presented in this study were based on secondary data collected from a review of relevant literature and from primary data obtained through web-based questionnaire. The critical success factors were then refined using expert reviews, which satisfied the Design Science Methodology requirement that the research artefact be evaluated.

This chapter provides a summative conclusion of the entire study, beginning with the theoretical framework, the research methodology and thereafter, evaluates the research questions. The discussion about the contribution made by this study follows, followed by an evaluation of the research project. The limitations and directions for future research are then outlined.

8.2. Theoretical Framework

The problem identified in this study is that citizen participation in a Public Safety Smart City Project has been lower than expected. However, it was found that if citizens do not report Public Safety matters they observe, this can lead to serious issues being left unattended or unresolved because people did not report them. Thus, there is a need to motivate and attract the attention of citizens to participate in reporting matters they observe. The study proposed five critical success factors that motivate citizens to participate in a Public Safety Smart City Project. Keller's ARCS theory of motivation was proposed as a problem solving approach to create motivation in the learning environment (Keller, 2010). It is grounded in the expectancy–

value theory signifies that the drive for motivation of an individual to perform an activity is driven by perceived success (expectancy) and perceived satisfaction of personal needs (value) (Keller, 2010). Thus, this theory is appropriate for enhancing motivation to improve citizen participation in a Public Safety Smart City Project. The ARCS theory has therefore assisted in identifying factors that can help ensure motivation in a Public Safety Smart City Project, through its four components namely: attention, relevance, confidence and satisfaction. The four components should be taken into account to ensure motivation (Keller, 2008).

The four components assisted in the development of the critical success factors in the following manner:

1. **Attention**: Gaining citizen attention using interesting things, building curiosity, and sustaining active engagement in an activity. Providing incentives to citizens to gain their attention.
2. **Relevanc**e: Based on the citizen experience as being meaningfully related to end goals. Public Safety matters reported are matters that they experience and observe.
3. **Confidenc**e: Refers to a participant's belief that they can succeed in mastering the task. Citizens are given feedback through solving a Public Safety matter that was reported.
4. **Satisfaction**: Necessary to build positive feelings about the experiences, to develop, thereby providing further motivation. Citizens after participation are provided with a reward.

A brief discussion including primary data was used to formulate the critical success factors and is described in the research methodology in the next section.

8.3. Research Methodology

This study was conducted within a interpretive paradigm and employed a mixed method approach involving a combination of qualitative and quantitative research. The study has followed the Design Science Methodology, which focuses on the creation and innovation of an artefact to solve problems, and adopted the seven guidelines of Hevner, March, Park and Ram's (2004).

1. *Design as an Artefact*: This study produced critical success factors that motivate citizens to participate in a Public Safety Smart City project. These guidelines are the most appropriate set of guidelines for Design Science Methodology, and are thus relevant in this study. The seven guidelines were adopted as follows:

2. *Problem Relevance:* For this study, the problem under investigation is the issue of lower than expected participation of citizens in a Public Safety Smart City Project. A solution was proposed in the form of critical success factors for enhancing motivation.
3. *Design Evaluation*: The critical success factors are to be evaluated through applicable data gathering and analysis techniques that were discussed in detail in the previous chapters.
4. *Research Contributions*: The contribution of this study is in the proposed critical success factors, which are considered to ensure citizen participation is enhanced through motivation.
5. *Research Rigor*: In terms of rigor, the research project employed valid data gathering and analysis techniques and the critical success factors were evaluated using expert review.
6. *Design as a Search Process*: This guideline was satisfied through the collection of related primary data and secondary data.
7. *Communication of Research:* This guideline is satisfied by a journal article that will be published out lining the contribution of this research project.

This research project made used of a web-based questionnaire and expert reviews as primary data collection methods and the literature review for the secondary data. The literature survey was used to form theoretical base for this study. The theoretical base and the empirical findings from the web-based questionnaire led to the construction of the proposed critical success factors. The proposed critical success factors were then evaluated using expert reviews.

8.4. Research Questions

The main research question investigated in this study was: ***What are the factors that motivate East London citizens to participate in a Public Safety Smart City Project?*** The primary objective of this study was to determine the critical success factors that can help ensure motivation to improve citizen participation in a Public Safety Smart City project. Therefore, in order to achieve the primary objective and to answer the main research question, three sub-questions were identified and investigated:

What perceived benefits of a Public Safety Smart City Project could motivate citizens to participate?

This sub-question aimed at investigating the perceived benefits of a Public Safety Smart City Project to citizens and the city (East London), thus identifying and providing the benefits of participating in a Public Safety Smart City project. The literature survey in Chapter 2 was used to answer this secondary question.

From the literature reviewed, a clear overview of Smart Living was provided. In addition, a few components of Smart Living were outlined, namely: healthcare, education and Public Safety. It was found that Public Safety initiatives included law enforcement, road traffic management, fire management and emergency management services. These initiatives are responsible to prevent and fight different Public Safety issues that occur and help address Public Safety. Furthermore, it was found that the benefits of a Public Safety Smart City Project include citizen protection from danger of any physical harm, reduction of road accidents and traffic congestions in transportation, and good road user behaviour will be enhanced.

From empirical findings, the following benefits to the Public Safety Smart City Project were identified. It was revealed that system usability, system effectiveness and the future of the system were the important benefits the Public Safety Smart City Project can provide.

What are the barriers to participation in a Public Safety Smart City project?

The aim of this sub-question is to provide a better understanding of the cause of lower participation than expected in a Public Safety Smart City project. The participation barriers that hinder citizens from participating in a Public Safety Smart City Project were identified and discussed in Chapter Three.

They include time and cost constraints, trust, awareness, as well as security and privacy. The literature emphasised citizen participation, the benefits of citizen participation, the significance and its elements. In addition, the literature has shown that time and cost constraints, trust, awareness, security and privacy are participation barriers that hinder citizens from participating.

From the empirical findings, aspects relating to the barriers to participation were confirmed. From the questionnaire findings, factors relating to time and cost constraints were investigated. In particular, respondents agreed that the reporting process was too time consuming, some hesitated to participate as they fear they might make a mistake (fear of

the unknown) and some felt that the reporting process was an intimidating experience.

Which motivational factors are relevant for enhancing citizen participation in a Public Safety Smart City project?

The aim of this sub-question is to investigate motivational factors that encourage citizens to participate in a Public Safety Smart City Project. The motivational factors that are associated with citizen participation are identified and discussed in Chapter 4.

They include incentives, motives, reciprocity, self-efficacy and rewards. The theory for this research study was also addressed in Chapter 4. The motivational factors relate to the critical success factors as they form part in identifying them. From the findings of this study, four of the critical success factors were formulated based on self-efficacy (CSF 1), reciprocity (CSF 3), motives (CSF 4) and incentives (CSF 5). From the literature survey, several definitions of motivation were discussed. In addition, the literature has shown that the four components of Keller's theory of motivation: attention, relevance, confidence and satisfaction need to be considered to stimulate and sustain motivation.

From the empirical findings, motivational factors relating to citizen participation in a Public Safety Smart City Project were confirmed. These findings were obtained through the web-based questionnaire. In particular, respondents agreed that ensuring user satisfaction with the system and providing a toll-free number, making a difference and response from municipality were the key motivational factors that can enhance participation in a Public Safety Smart City Project.

Based on these theoretical and empirical findings, the critical success factors that help motivate citizens participate in a Public Safety Smart City Project were proposed. This was then refined through expert reviews.

8.5. Research Contribution

Literature on motivation in a Public Safety Smart City projects in cities is limited at present and thus this research project makes a valuable contribution to this field. This study set out to propose critical success factors to improve citizen participation in a Public Safety Smart City Project, thus to prevent and solve Public Safety issues effectively.

The critical success factors proposed and discussed in Chapter Seven is the primary contribution of this research project. The critical success factors were constructed considering the different motivational factors that can enhance citizen participation. The specific contribution made through the construction of these critical success factors was a proposal of addressing the problems with lower participation in a Public Safety Smart City Projects. This research project will add to the body of knowledge in Public Safety and motivation.

Previous studies have focused their contribution on the implementation of a Public Safety Smart City Project in a developing country and Public Safety data quality to identify problems that affect data quality and to ensure that collected data is of a high quality. Thus, considering these previous studies, this research project suggested critical success factors that aim to enhance citizen participation in a Public Safety Smart City Project by providing a means of evaluating motivation.

8.6. Research Evaluation

A positivist research differs from an interpretive research. Oates (2006) points out a set of criteria for interpretive research and positivist research. This criterion is mainly used to ensure the credibility and integrity of the research project. These are shown in Table 8.1.

Table 8. 1: Quality in Positivist and Interpretive Research (Oates, 2006)

Positivism	Interpretivism
Validity	Trustworthiness
Objectivity	Confirmability
Reliability	Dependability
Internal validity	Credibility
External validity	Transferability

As this study is a positivist study, the positivist criteria applied to this study as follows:

- *Validity:* The validity of the experts used to refine the proposed critical success factors was evaluated. The experts used in this process are respected in their respective fields and are NRF-rated researchers. Experts were selected from both motivation and Public Safety research. Thus, the recommendations made by these experts can be considered valid.
- *Objectivity:* The study is established through literature from recognised authors and contribution from experts in the field of study in the form of expert review. The

objectivity of the study was also ensured by using theories and models that are popular and have been evaluated.

- *Reliability:* The use of questionnaire findings confirmed the theoretical findings. This led to the construction of critical success factors, which were confirmed through expert review.
- *Internal Validity:* Internal validity has been achieved through the use of multiple data collection techniques and the use of expert review.
- *External Validity:* Generalisability has been achieved as the critical success factors can be applied to other Public Safety projects with similar characteristics.

Since these five criteria have been applied, this study can therefore be considered credible.

8.7. Limitations and Directions for Future Research

This study addresses lower citizen participation than expected in a Public Safety Smart City Project. A specific focus of this research project was on improving participation through motivation. The improvement of citizen participation in a Public Safety Smart City Project only focuses in the city of East London and does not include other cities. Another limitation: only those who had participated were sent questionnaires. Further responses could be obtained from citizens who had not expand on this.

The focus of the research project was to identify motivational factors to help enhance citizen participation in a Public Safety Smart City Project. Future research could investigate these factors through a qualitative study with the same population and the use of gamification in a Public Safety Smart City Project can be considered in the further research to assist in keeping citizen engagement and satisfactory. Gamification mentioned by an expert reviewer (a form of response to citizens after they have participated).

8.8. Conclusion

This research project presented a study of motivation in a Public Safety Smart City Project to improve citizen participation and keeping them involved. The outcome of this study was the construction of critical success factors to motivate citizens to participate in a Public Safety Smart City Project. The significance of this study will be the improvement in citizen participation in a Public Safety Smart City Project, which will be seen through motivation in

the project. The study has applied the five criteria namely: validity, objectivity, reliability, internal validity and external validity to ensure its credibility and integrity.

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Appendices

A Ethical Clearance

B Research Instrument: Web-based Questionnaire

Appendix A

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ETHICAL CLEARANCE

CERTIFICATE Certificate Reference Number:

FLO041SPIDO1

Project title:	**Enhancing participation and effectiveness of a Public Safety Smart City project for local government**
Nature of Project:	Masters
Principal Researcher:	Roxanne Piderit
Sub Investigator:	Elizabeth Bosha

	Amanda Gopeni Mbali Tuswa
Co-Investigator:	Liezel Cilliers
	Ntombovuyo Wayi
Supervisor:	Prof S Flowerday
Co-supervisor:	

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

Appendix B

Questionnaire

SECTION A - USABILITY

In these questions, "system" refers to the system as a whole (i.e. telephonic report line and mobi site).

1. I found this system useful as a means to report Public Safety issues by the general public.

   Strongly Agree Agree Neutral Disagree Strongly Disagree

2. The system did everything I would expect it to do to allow me to report Public Safety issues (i.e. it is effective).

   Strongly Agree Agree Neutral Disagree Strongly Disagree

3. I found this system easy to use.

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. The number of steps (or amount of effort) needed successfully report an issue was acceptable (whether via a *telephone call* or via *the mobi site*).

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. I learned to use this system quickly.

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. I will easily remember how to use this system.

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. Overall, I was satisfied with this automated system for reporting Public Safety issues. I would be comfortable using it again to report such issues.

Strongly Agree Agree Neutral Disagree Strongly Disagree

SECTION B - MOTIVATION

8. I feel that calling a Public Safety help line *is a useful way to act on Public Safety issues that may pose a personal risk to me*.

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. I feel that calling a Public Safety help line *makes me feel better, because I am trying to do something about a Public Safety issue that may place me at personal risk.*

Strongly Agree Agree Neutral Disagree Strongly Disagree

10. I have the necessary resources (e.g. phone, airtime) to report future Public Safety matters.

Strongly Agree Agree Neutral Disagree Strongly Disagree

11. The reporting process was too time consuming for me.

Strongly Agree Agree Neutral Disagree Strongly Disagree

12. I felt uncomfortable to report Public Safety matters due to a lack of experience.

Strongly Agree Agree Neutral Disagree Strongly Disagree

13. I would be willing to participate in this type of initiative in the future as I perceive it to be useful to me.

Strongly Agree Agree Neutral Disagree Strongly Disagree

14. Reporting Public Safety matters became part of my everyday activities.

Strongly Agree Agree Neutral Disagree Strongly Disagree

15. I hesitate to participate for fear I will make a mistake.

Strongly Agree Agree Neutral Disagree Strongly Disagree

16. Reporting an incident is an intimidating experience.

Strongly Agree Agree Neutral Disagree Strongly Disagree

17. What would motivate you to continue reporting Public Safety matters?

SECTION C – INCENTIVES

1. Did you report Public Safety issues in order for you to get the airtime incentive/ were you encouraged by the airtime incentive to participate?
   - Yes
   - Maybe
   - No

2. Was the incentive amount offered appropriate in terms of the effort you contributed to the project?
   - Yes
   - Maybe
   - No

3. Was airtime a fair incentive for this project?
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

4. Which of the following incentives would you have preferred? (*please choose 1*)
   - Money
   - Airtime
   - Feeling of accomplishment
   - Feedback

5. Do you think the incentives should be offered all the time whenever someone reports Public Safety issues?
   - Always
   - Most of the time
   - Half the time
   - Once in a while
   - Never

6. Would you have reported even if you were not being incentivised?

- Yes
- Maybe
- No

7. How willing are you to change the quality of lives for other citizens by continuously reporting Public Safety issues you witness - regardless of the incentive?
   - Always
   - Most of the time
   - Half the time
   - Once in a while
   - Never

8. Did the concern of safety for other citizens encourage you to participate?
   - Yes
   - Maybe
   - No I was encouraged by the incentive

9. How many times per week did you report?
   - 0-2
   - 3-5
   - 5+

10. How immediate did you want the incentive?
    - Just after the report
    - Sometime later
    - Anytime