

# **Proposed risk treatment strategies for Information and Communication Technology projects**

**Keneilwe Nicollette Magwede**  
**13168649**

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Magister Scientiae in Computer Science at the Vaal Triangle Campus of  
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Supervisor: Dr Sonja Gilliland

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## DECLARATION

**I, Keneilwe Nicollette Magwede** declare that **Proposed risk treatment strategies for Information and Communication Technology projects** is my own work and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Signature: \_\_\_\_\_

May 2017

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## Erratum

This document lists errors and corrections for the submitted dissertation of Keneilwe Nicollette Magwede, titled "Proposed risk treatment strategies for Information and Communication Technology projects".

| <i>Location</i>               | <i>Error</i>               | <i>Correction</i>                                                                                                      |
|-------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------|
| Page iii, paragraph 1, line 3 | "thought"                  | "through"<br>The sentence should read as:<br>"Indeed, I can do all things<br>through Christ who gives me<br>strength." |
| Page 123, Table 5.14          | The numbering start at 11. | The numbering should start<br>at 1 and not from 11.                                                                    |

## **DEDICATION**

This dissertation is lovingly dedicated to my late mother, Adeline Keaitse Tolo and my late grandfather, Aubaas Tolo. Although they are no longer physically present in my life, I still feel their impact every day.

I also dedicate this study and give special thanks to my daughter, Londani Kgolagano Magwede and my son, Unamaanda Kgothatso Magwede for their understanding and patience. I pray that this study be a source of inspiration to you, that you can achieve whatever you set your mind to.

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## SUMMARY

The high failure rate of Information and Communication Technology (ICT) projects has been documented in the literature. Most ICT project failures can be avoided if risks are identified and managed before they negatively impact the project. The challenge for ICT project managers is to identify critical risk factors that they consider to be commonly affecting ICT projects in their organisation and define appropriate strategies that can be used to minimise the probability and impact of the project risks.

Various researchers have tried to address this problem by investigating common ICT project risk factors and proposing lists of top ICT project risks. There are now many of these lists in the literature, but project managers do not know which list to use as the lists were compiled at different periods of time, by people from different backgrounds using different research methods. This study aims to compile a list of top ten ICT project risk factors affecting one South African organisation and to propose risk treatment strategies that can be used to manage the top ten ICT project risk factors.

To achieve the objectives of this research, a literature review was done to formulate the research questions and to broaden the researcher's knowledge of ICT project management and ICT project risk management. Semi-structured interviews were conducted to gather rich qualitative data on the participants' experiences and perceptions regarding common ICT projects risk factors. During the interviews, participants were asked to define the term 'risk' and to identify risk factors that they consider to be commonly affecting ICT projects in the organisation.

Due to the subjective nature of this study, interpretative phenomenological analysis (IPA) was employed as a data analysis approach. This approach is founded in phenomenology design and was a feasible option to choose because it seeks the opinions and subjective accounts and interpretations of participants. Interview transcripts were qualitatively analysed through a process of familiarisation with the text, identification and clustering of themes. Ten main themes emerged which resembled the top ten ICT project risk factors that participants considered to be commonly affecting ICT projects in their organisation. Based on the literature review and the researcher's experience, risk treatment strategies that can be used to manage the top ten ICT projects risk factors were proposed.

**Keywords:** ICT project management, ICT project risk management, top ten ICT project risk factors, ICT project risk treatment strategies.

## TABLE OF CONTENTS

|                                                   |            |
|---------------------------------------------------|------------|
| <b>DEDICATION.....</b>                            | <b>i</b>   |
| <b>ACKNOWLEDGEMENTS .....</b>                     | <b>ii</b>  |
| <b>SUMMARY .....</b>                              | <b>iv</b>  |
| <b>TABLE OF CONTENTS .....</b>                    | <b>vi</b>  |
| <b>LIST OF TABLES .....</b>                       | <b>xii</b> |
| <b>LIST OF FIGURES .....</b>                      | <b>xiv</b> |
| <b>LIST OF ABBREVIATIONS .....</b>                | <b>xvi</b> |
| <b>1 INTRODUCTION AND PROBLEM STATEMENT .....</b> | <b>1</b>   |
| 1.1 INTRODUCTION .....                            | 2          |
| 1.2 PROBLEM STATEMENT.....                        | 4          |
| 1.3 RESEARCH OBJECTIVES .....                     | 5          |
| 1.4 RESEARCH QUESTIONS .....                      | 5          |
| 1.5 RESEARCH METHODOLOGY.....                     | 6          |
| 1.5.1 Literature review .....                     | 6          |
| 1.5.2 Empirical study .....                       | 7          |
| 1.6 ETHICAL CONSIDERATIONS .....                  | 8          |
| 1.7 CHAPTER CLASSIFICATION .....                  | 8          |
| 1.8 SUMMARY .....                                 | 9          |
| <b>2 PROJECT MANAGEMENT .....</b>                 | <b>11</b>  |

|            |                                                 |           |
|------------|-------------------------------------------------|-----------|
| <b>2.1</b> | <b>INTRODUCTION .....</b>                       | <b>12</b> |
| <b>2.2</b> | <b>PROJECTS .....</b>                           | <b>12</b> |
| 2.2.1      | Defining projects .....                         | 13        |
| 2.2.2      | Defining project management .....               | 14        |
| 2.2.3      | Project management knowledge areas .....        | 17        |
| 2.2.4      | Project management process groups .....         | 18        |
| <b>2.3</b> | <b>PROJECTS IN ORGANISATIONS.....</b>           | <b>20</b> |
| 2.3.1      | Functional organisational structure .....       | 22        |
| 2.3.2      | Matrix organisational structure .....           | 22        |
| 2.3.3      | Project-based organisational structure .....    | 23        |
| <b>2.4</b> | <b>ICT PROJECT LIFECYCLE .....</b>              | <b>25</b> |
| 2.4.1      | Waterfall lifecycle model .....                 | 25        |
| 2.4.2      | Evolutionary prototyping lifecycle model.....   | 26        |
| 2.4.3      | Spiral lifecycle model.....                     | 27        |
| <b>2.5</b> | <b>COMPLEXITY IN MANAGING ICT PROJECTS.....</b> | <b>27</b> |
| <b>2.6</b> | <b>SUMMARY .....</b>                            | <b>28</b> |
| <b>3</b>   | <b>PROJECT RISK MANAGEMENT .....</b>            | <b>29</b> |
| <b>3.1</b> | <b>INTRODUCTION .....</b>                       | <b>30</b> |
| <b>3.2</b> | <b>PROJECT RISKS .....</b>                      | <b>32</b> |
| 3.2.1      | Project risks .....                             | 32        |
| 3.2.2      | Project risk management .....                   | 35        |

|            |                                                         |           |
|------------|---------------------------------------------------------|-----------|
| <b>3.3</b> | <b>ICT PROJECT RISK MANAGEMENT PROCESSES.....</b>       | <b>41</b> |
| 3.3.1      | Plan risk management .....                              | 42        |
| 3.3.2      | Identify risks.....                                     | 44        |
| 3.3.3      | Analyse and evaluate risks .....                        | 45        |
| 3.3.4      | Respond to risks .....                                  | 45        |
| 3.3.5      | Monitor and control.....                                | 47        |
| 3.3.6      | Communicate and consult .....                           | 48        |
| <b>3.4</b> | <b>COMPLEXITY IN MANAGING ICT PROJECT RISKS .....</b>   | <b>48</b> |
| <b>3.5</b> | <b>TOP ICT PROJECT RISKS .....</b>                      | <b>50</b> |
| 3.5.1      | The 1970s .....                                         | 52        |
| 3.5.2      | The 1980s .....                                         | 52        |
| 3.5.3      | The 1990s .....                                         | 52        |
| 3.5.4      | The 2000s .....                                         | 53        |
| 3.5.5      | 2010 to present .....                                   | 58        |
| 3.5.6      | Analysis of top ten ICT project risk factors lists..... | 62        |
| <b>3.6</b> | <b>SUMMARY .....</b>                                    | <b>64</b> |
| <b>4</b>   | <b>RESEARCH DESIGN AND METHODOLOGY .....</b>            | <b>65</b> |
| <b>4.1</b> | <b>INTRODUCTION .....</b>                               | <b>66</b> |
| <b>4.2</b> | <b>RESEARCH METHODOLOGY.....</b>                        | <b>66</b> |
| 4.2.1      | Research philosophies .....                             | 68        |
| 4.2.2      | Research Design .....                                   | 74        |

|            |                                                      |            |
|------------|------------------------------------------------------|------------|
| 4.2.3      | Research Methods .....                               | 76         |
| 4.2.4      | Participant selection .....                          | 80         |
| 4.2.5      | Data Collection.....                                 | 81         |
| 4.2.6      | Data Analysis .....                                  | 83         |
| 4.2.7      | Rigour and evaluation of method .....                | 85         |
| 4.2.8      | Ethical considerations .....                         | 85         |
| <b>4.3</b> | <b>RESEARCH PLAN AND EXECUTION .....</b>             | <b>86</b>  |
| 4.3.1      | Background .....                                     | 87         |
| 4.3.2      | Philosophical stance .....                           | 89         |
| 4.3.3      | Research method .....                                | 92         |
| 4.3.4      | Participant selection .....                          | 93         |
| 4.3.5      | Data collection.....                                 | 93         |
| 4.3.6      | Rigour and evaluation of method .....                | 96         |
| 4.3.7      | Ethical considerations .....                         | 96         |
| <b>4.4</b> | <b>SUMMARY.....</b>                                  | <b>98</b>  |
| <b>5</b>   | <b>DATA ANALYSIS AND DISCUSSION .....</b>            | <b>99</b>  |
| <b>5.1</b> | <b>INTRODUCTION .....</b>                            | <b>100</b> |
| <b>5.2</b> | <b>DATA ANALYSIS PROCEDURE .....</b>                 | <b>100</b> |
| <b>5.3</b> | <b>DISCUSSION OF THE MAIN THEMES .....</b>           | <b>103</b> |
| 5.3.1      | Section 1: Participants background information ..... | 103        |
| 5.3.2      | Section 2: Understanding of ‘risks’ .....            | 105        |

|            |                                                              |            |
|------------|--------------------------------------------------------------|------------|
| 5.3.3      | Section 3: Most common ICT project risk factors .....        | 106        |
| <b>5.4</b> | <b>ANALYSIS OF THE COMMON ICT PROJECT RISK FACTORS .....</b> | <b>118</b> |
| 5.4.1      | Combined list .....                                          | 118        |
| 5.4.2      | Top ten ICT project risk factors .....                       | 118        |
| 5.4.3      | Comparing the top ten ICT project risk factors.....          | 120        |
| <b>5.5</b> | <b>SUMMARY .....</b>                                         | <b>124</b> |
| <b>6</b>   | <b>CONCLUSIONS AND RECOMMENDATIONS .....</b>                 | <b>126</b> |
| <b>6.1</b> | <b>INTRODUCTION .....</b>                                    | <b>127</b> |
| <b>6.2</b> | <b>SUMMARY OF THE DISSERTATION .....</b>                     | <b>127</b> |
| <b>6.3</b> | <b>RESEARCH PLAN REVISITED .....</b>                         | <b>129</b> |
| <b>6.4</b> | <b>TOP TEN RISK FACTOR TREATMENT STRATEGIES.....</b>         | <b>131</b> |
| <b>6.5</b> | <b>SUMMARY OF KEY FINDINGS.....</b>                          | <b>141</b> |
| 6.5.1      | Understanding of ‘risks’ .....                               | 141        |
| 6.5.2      | Identification of most common ICT project risk factors.....  | 142        |
| 6.5.3      | Risk treatment strategies .....                              | 143        |
| <b>6.6</b> | <b>RESEARCH LIMITATIONS .....</b>                            | <b>144</b> |
| <b>6.7</b> | <b>RECOMMENDATIONS FOR FUTURE RESEARCH.....</b>              | <b>144</b> |
| <b>6.8</b> | <b>CONTRIBUTION TO THE KNOWLEDGE BASE .....</b>              | <b>145</b> |
| 6.8.1      | Theoretical.....                                             | 145        |
| 6.8.2      | Practical .....                                              | 145        |
| <b>6.9</b> | <b>SUMMARY.....</b>                                          | <b>146</b> |

|    |                                                                                      |            |
|----|--------------------------------------------------------------------------------------|------------|
| 7  | <b>REFERENCES .....</b>                                                              | <b>147</b> |
| 8  | <b>APPENDIX A: INTERVIEW SCHEDULE .....</b>                                          | <b>162</b> |
| 9  | <b>APPENDIX B: SAMPLE PARTICIPANT CONSENT FORM</b><br><b>.....</b>                   | <b>163</b> |
| 10 | <b>APPENDIX C: SAMPLE CODING AND MARKING OF</b><br><b>INTERVIEW TRANSCRIPT .....</b> | <b>164</b> |

## LIST OF TABLES

|                                                                                                                                                 |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Table 1.1: Research objective and sub-objectives. ....                                                                                          | 8   |
| Table 3.1: Maturity rating levels of different knowledge areas in South African ICT projects (Schwalbe, 2015:426). ....                         | 31  |
| Table 3.2: The difference between the evaluation approach and management approach to project risk management (Bakker et al., 2010:495). ....    | 40  |
| Table 3.3: Summary of ICT project risk factor lists .....                                                                                       | 51  |
| Table 3.4: ICT project risk factor lists compiled in the 1980s.....                                                                             | 53  |
| Table 3.5: ICT project risk factor lists compiled in the 1990s.....                                                                             | 54  |
| Table 3.6: Top ICT project risk factor lists compiled in the 2000s. ....                                                                        | 55  |
| Table 3.7: Top ten ICT project risk factor lists compiled from 2010 to present. ....                                                            | 60  |
| Table 3.8: ICT project risks frequency by dimension (Arnuphaptrairong, 2011:4). ....                                                            | 62  |
| Table 3.9: Top ICT project risk factors frequency (Arnuphaptrairong, 2011:4). ....                                                              | 63  |
| Table 4.1: Summary of four main research philosophies ICT research (Saunders et al., 2009:119). ....                                            | 70  |
| Table 4.2: Summary of seven principles for conducting and evaluating interpretive research (Klein & Myers, 1999:72). ....                       | 72  |
| Table 4.3: Comparison of quantitative and qualitative research approaches (Mack et al., 2005:3). ....                                           | 79  |
| Table 4.4: Application of the seven principles for conducting and evaluating interpretive research (Klein & Myers, 1999:72) in this study. .... | 90  |
| Table 5.1: Example of how main themes were generated. ....                                                                                      | 102 |
| Table 5.2: Participants' background information. ....                                                                                           | 104 |

|                                                                                                                                                             |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Table 5.3: Participants’ understanding of ‘risks’ .....                                                                                                     | 105 |
| Table 5.4: ICT project risk factors identified by participant 1. ....                                                                                       | 107 |
| Table 5.5: ICT project risk factors identified by participant 2. ....                                                                                       | 108 |
| Table 5.6: ICT project risk factors identified by participant 3. ....                                                                                       | 111 |
| Table 5.7: ICT project risk factors identified by participant 4. ....                                                                                       | 114 |
| Table 5.8: ICT project risk factors identified by participant 5. ....                                                                                       | 115 |
| Table 5.9: ICT project risk factors identified by participant 6. ....                                                                                       | 116 |
| Table 5.10: Combined list of the most common ICT project risk factors identified<br>in this study. ....                                                     | 119 |
| Table 5.11: Top ten ICT project risk factors identified in this study.....                                                                                  | 120 |
| Table 5.12: Comparison between the top ten ICT project risk factors identified in<br>this study and the findings of the Arnuphaptrairong (2011) study. .... | 121 |
| Table 5.13: Comparison between the top ten ICT project risk factors identified in<br>this study and the findings of the (Smith et al., 2006) study. ....    | 122 |
| Table 5.14: Comparison between the top ten ICT project risk factors identified in<br>this study and the findings of the Hughes et al. (2017) study.....     | 123 |
| Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk<br>factors.....                                                              | 132 |

## LIST OF FIGURES

|                                                                                                                                           |    |
|-------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1.1: Summary of the research methodology adopted in this study.....                                                                | 6  |
| Figure 2.1: Cyclical approach to business/project alignment (Fink, 2013:31)....                                                           | 21 |
| Figure 2.2: Functional organisational structure (Schwalbe, 2015:49). ....                                                                 | 22 |
| Figure 2.3: Matrix organisation structure (Schwalbe, 2011:49). ....                                                                       | 23 |
| Figure 2.4: Internal project structure of a PBO (Passenheim, 2009:17). ....                                                               | 24 |
| Figure 2.5: Integrated structure of a PBO (Fink, 2013:18).....                                                                            | 25 |
| Figure 3.1: Project risks across project management knowledge areas (Fink, 2013:161).....                                                 | 30 |
| Figure 3.2: Uncertainty spectrum of project risk management (Fink, 2013:143) .....                                                        | 37 |
| Figure 3.3: The evaluation approach to project risk management (Bakker et al., 2010:494). ....                                            | 38 |
| Figure 3.4: The management approach to project risk management (Bakker et al., 2010:495). ....                                            | 39 |
| Figure 3.5: Combination of the evaluation approach and the management approach to project risk management (Bakker et al., 2010:496) ..... | 41 |
| Figure 3.6: Project risk management process .....                                                                                         | 42 |
| Figure 3.7: Dataflow for the plan risk management phase (Alberts & Dorofee, 2010). ....                                                   | 43 |
| Figure 3.8: Dataflow for the identify risks phase (Alberts & Dorofee, 2010)....                                                           | 44 |
| Figure 3.9: Dataflow for the analyse-and-evaluate risks phase (Alberts & Dorofee, 2010). ....                                             | 45 |
| Figure 3.10: Dataflow for the respond to risks phase (Alberts & Dorofee, 2010). ....                                                      | 47 |

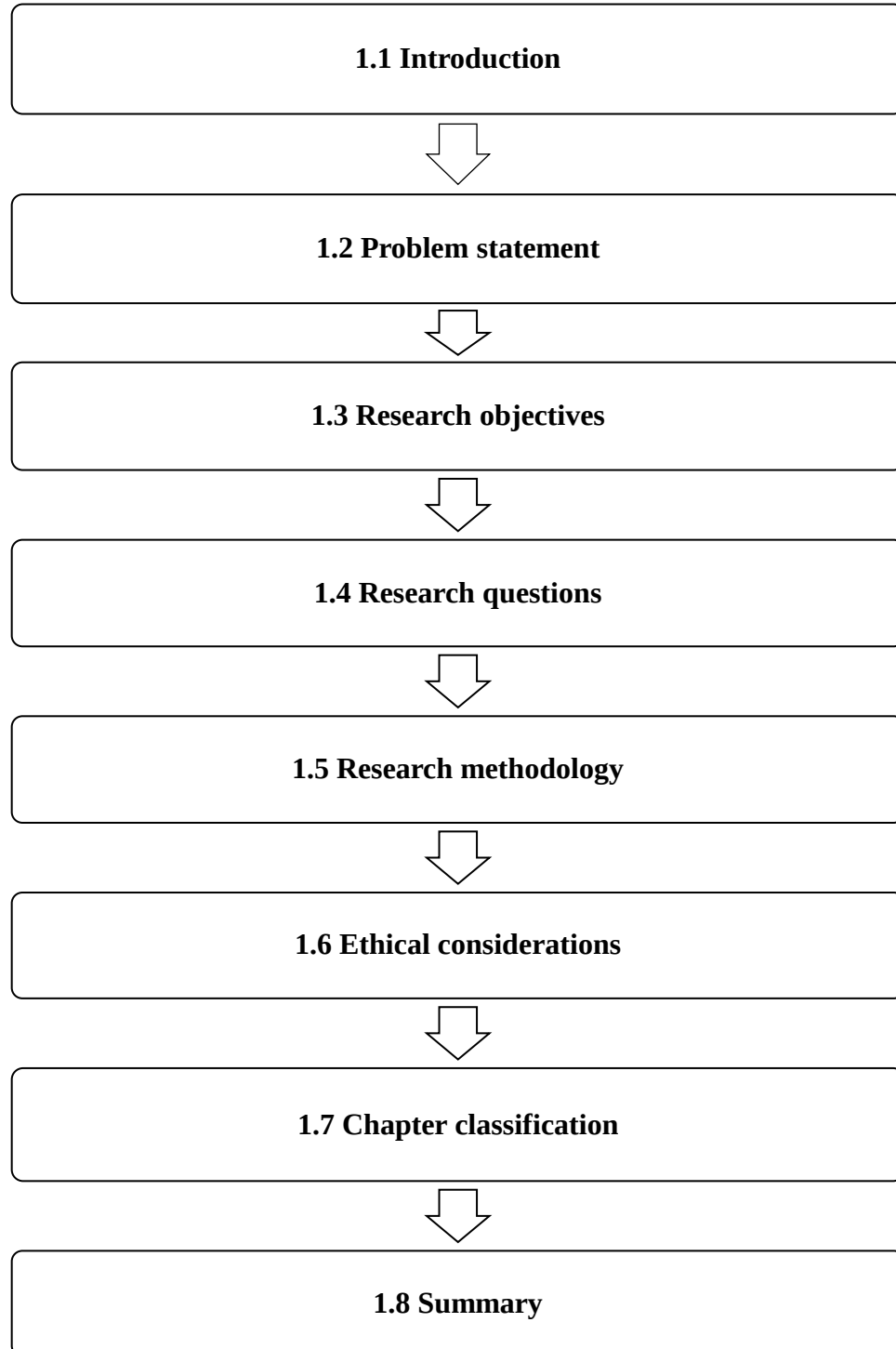
|                                                                                                |    |
|------------------------------------------------------------------------------------------------|----|
| Figure 3.11: Dataflow for the monitor-and-control risks phase (Alberts & Dorofee, 2010). ..... | 48 |
| Figure 4.1: Summary of the research methodology adopted in this study.....                     | 87 |
| Figure 4.2: Summary of activities prior to, during and after interviews.....                   | 97 |

## LIST OF ABBREVIATIONS

|        |                                                   |
|--------|---------------------------------------------------|
| CASE   | Computer-aided Software Engineering               |
| ICT    | Information and Communication Technology          |
| IPA    | Interpretative Phenomenological Analysis          |
| ISO    | International Organisation for Standardisation    |
| PMI    | Project Management Institute                      |
| PMBOK  | Project Management Body of Knowledge              |
| SEI    | Software Engineering Institute                    |
| SLA    | Service-Level Agreement                           |
| CAQDAS | Computer-aided Qualitative Data Analysis Software |

# CHAPTER 1

## INTRODUCTION AND PROBLEM STATEMENT



## 1.1 INTRODUCTION

As globalisation and international competition continue to intensify, there is increasing pressure on organisations to only invest in projects that are critical to the business performance (Raymond & Bergeron, 2008:213). Information and Communication Technology (ICT) offer services, applications and technologies that provide information to support the operation, management, analysis and decision making functions within organisations (Raymond & Bergeron, 2008). As most business operations have become increasingly automated and computerised, ICT has become mission critical to business operations and subsequently organisations are unable to operate without innovative ICT systems (Gingnell *et al.*, 2014; Tajari *et al.*, 2014). Most of ICT projects are strategic and provide a source of competitive advantage (Schwalbe, 2015).

Over the years, ICT has played a critical role in many business organisations around the world (Safa'a, 2012). The role of ICT in organisations has, over the past decades, evolved from just automation of business processes to the automation of data exchange and connection of intelligence devices (Internet of Things, Cloud computing, 3D printing etc.) (Pearlson *et al.*, 2016). This technological trend provides cheaper, flexible and scalable computing resources to organisations and has been termed as 'digital economy' (Zhang *et al.*, 2010; Wang *et al.*, 2016).

Organisations embark on ICT projects with an expectation that ICT systems will improve the effectiveness of business processes and to develop innovative solutions that offer competitive advantages (Chaffey & Wood, 2005:37; Xue & Xu, 2017). According to the Global Information Technology Report's Networked Readiness Index (Baller *et al.*, 2016), which assesses countries' ability to fully leverage ICT for increased competitiveness, South Africa's digital transformation has improved from 75th place (out of 139 countries) in 2015 to 65th place in 2016. The Global Information Technology Report credits this improvement to the best usage of ICT systems in South African business organisations.

Investments in ICT are also growing significantly; according to Gartner 2016 IT Spending Forecast report (Lovelock & Worldwide, 2016), ICT investment

worldwide for the year 2017 has been estimated to be around \$3.5 trillion, which is a 2.9 percent increase from 2016 costs.

However, the failure of ICT projects to realise the expected benefits has led to a growing number of senior executives questioning the value of ICT investments (Owusu *et al.*, 2013; Mysore *et al.*, 2016). Most ICT investments are made in good faith, with the hope that they will accidentally succeed (Grindley, 1995). Reported statistics on the failure of ICT projects paint a very dull picture that cannot be overlooked:

- 18–36% of ICT projects in South Africa fail, 27–57% are completed late, and only 37% are successful (Labuschagne & Marnewick, 2009; De Wet & Visser, 2013).
- 19–29% of ICT projects in the United States of America fail, 43–52% are late or over budget, and only 19–39% are successful (Standish, 2015).
- 30–40% of ICT projects are implemented without any traceable benefits (Willcocks & Margetts, 1994).
- Lost opportunity costs due to ICT project failures are estimated to be trillions of dollars (Standish, 2012) .

These statistics highlight that there is still an area for continued development with regards to improving the success rate of ICT projects around the world, particularly in South Africa (De Wet & Visser, 2013:23). Given the high failure rates of ICT projects, managing factors that contribute to the projects' failure has become a critical area of concern (Wallace *et al.*, 2004:115). Information and communication technology projects should be managed in such a way that quality projects are delivered on time, within budget, and as per agreed scope (Raymond & Bergeron, 2008).

According to Nelson (2007:72), 45% of ICT project failures are due to project management process mistakes, 43% are due to people mistakes, 8% are due to product mistakes and only 4% of project failures are related to the technology used. One of the process mistakes is the inadequacy of existing ICT project risk management strategies to effectively manage ICT project risks (Vrhovec *et al.*,

2015). Although there are various techniques and methodologies developed to manage ICT project risks, somehow the risks still persist (Hanseth, 2007:3).

The identification and management of ICT project risks throughout the project life-cycle can contribute to the successful delivery of ICT projects (Baccarini *et al.*, 2004; Remenyi, 2010). Many organisations are therefore seeking ways to identify and proactively manage ICT project risk factors and to formally introduce risk management as part of their ICT project management processes (Tesh *et al.*, 2007).

## **1.2 PROBLEM STATEMENT**

As part of its deliverables, ICT projects often introduce new and unknown technologies in the form of hardware, software, product developments or proof-of-concept tasks (Dekkers & Forselius, 2007b:2; Safa'a, 2012). Due to the increasing market competition, new, faster, better and more complex technologies are now used to develop ICT systems (Zhang & Fan, 2014). However, the introduction of these technologies aggravates ICT project risks (Roberts, 2001). High levels of risks are brought into the organisation with these new technology introductions (Dekkers & Forselius, 2007b). Typical risks include technical, financial, planning, organisational, and integration risks (Jaafari, 2001).

Information and Communication Technology project managers must identify critical ICT project risk factors in their organisations and define strategies to manage those risks (Baccarini *et al.*, 2004). However, it is not easy to identify ICT project risks factors because ICT projects are diverse and complex (Lehtinen *et al.*, 2014). Researchers have tried to address this problem by investigating common risk factors and proposing lists of top ICT project risks (Boehm, 1988a; Baccarini *et al.*, 2004; Arnuphaptrairong, 2011). There are now many of these top ICT project risk lists in the literature but project managers end up not knowing which list to use as the lists were compiled at different periods of time, by people from different backgrounds using different research methods (Arnuphaptrairong, 2011). Also, the proposed ICT project risk factor lists do not provide practical recommendations on how the top risk factors should be managed (Irvine & Hall, 2015). This study aims to address this gap by identifying top ten risk factors affecting ICT projects in one South African organisation and proposing risk management strategies that can be used to

manage the top ten ICT projects risk factors. The problem statement for this study is defined as:

*It is difficult for ICT project team members to identify top ten risk factors affecting ICT projects and define strategies to manage them.*

### **1.3 RESEARCH OBJECTIVES**

Considering the limitations pointed out in the literature and the subsequent problem statement of this research, the main objective of this study is to identify top ten ICT project risk factors in one South African organisation and to propose risk treatment strategies that can be used to manage these risks.

The main objective of the research is divided into two objectives with related sub-objectives.

- Research objective 1: To identify the top ten ICT project risk factors in one South African organisation.
  - Sub-objective 1.1: To perform a literature review to understand theoretical concepts integral to this study (ICT project management and ICT project risk management).
  - Sub-objective 1.2: To perform an exploratory study with the aim of understanding the most common ICT project risk factors from participants' perspective.
- Research objective 2: To propose risk treatment strategies that can be used to manage the top ten ICT project risk factors.

### **1.4 RESEARCH QUESTIONS**

To reach the above research objectives, the following research questions have been formulated:

- What are the top ten ICT project risk factors in one South African organisation?
- What are the most appropriate risk treatment strategies for managing the top ten ICT project risk factors?

## 1.5 RESEARCH METHODOLOGY

Since one of the objective of this research is to explore and understand the common risk factors that participants consider to be commonly affecting ICT projects in their organisation, this study adopted the interpretive research approach. Interpretive research allows researchers to adopt empirical methods that focus on understanding the phenomena through human interpretations and shared meaning (Myers, 1997). Chapter 4 explains the research methodology and the research plan for this study in detail. Figure 1.1 illustrates a summary of the research methodology adopted in this study.

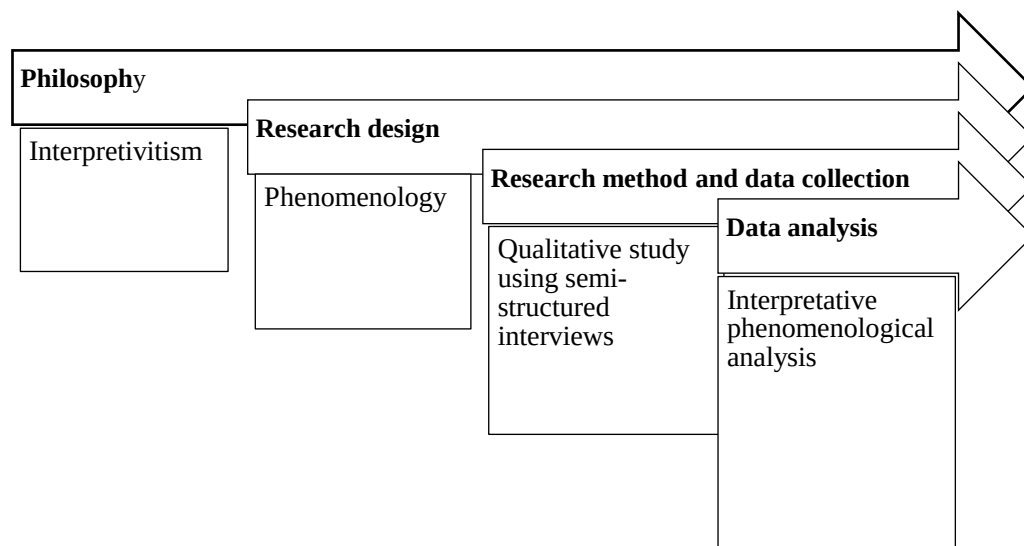


Figure 1.1: Summary of the research methodology adopted in this study.

To achieve the research objectives, a literature review and empirical study were performed.

### 1.5.1 Literature review

Available literature on ICT project management and ICT project risk management was reviewed to get a background understanding of the research problem and to get acquainted with the body of knowledge regarding the common ICT project risk factors. The literature was sourced from academic journals, articles, relevant books, dissertations, theses and the Internet. Section 4.3.5.2 explains how literature was used in this study.

## **1.5.2 Empirical study**

To address the first research question, an exploratory study was conducted. This exploratory study allowed the researcher to explore and understand the risk factors that participants consider to be commonly affecting ICT projects in the organisation. The study comprised the following methodology dimensions.

### **1.5.2.1 Research method**

A qualitative research method was selected for this study. The qualitative research method allowed the researcher to understand participants' different views regarding risk factors that are commonly affecting ICT projects in the organisation. The research method used in this study is discussed in more detail in Section 4.3.3.

### **1.5.2.2 Participant selection**

A combination of purposive and snowball sampling techniques was used to select participants for this study. The participant selection method used in this study is discussed in more detail in Section 4.3.4.

### **1.5.2.3 Data collection methods**

Data was collected by conducting semi-structured, one-on-one interviews at participants' offices. The data collection approach used in this study is discussed in more detail in Section 4.3.5.

### **1.5.2.4 Data analysis method**

The data gathered during interviews was analysed using the interpretative phenomenological analysis approach. The data analysis approach used in this study is discussed in more detail in Section 5.2.

### **1.5.2.5 Rigour and evaluation of method**

The strategies used to ensure that the findings of this study are valid and reliable are discussed in Section 4.3.6.

## 1.6 ETHICAL CONSIDERATIONS

This research study conformed to the general accepted ethical principles of academic research as prescribed by the university. The ethical aspects that have been taken into consideration for this study are discussed in Section 4.3.7.

## 1.7 CHAPTER CLASSIFICATION

Table 1.1 provides an indication of where in the dissertation the research objectives were addressed. Table 1.1 is followed by a brief description of the chapter layout and content.

Table 1.1: Research objective and sub-objectives.

| Research Objectives                                                                    | Sub-objectives                                                                                                                   | Dissertation section    |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| <i>To identify the top ten ICT project risks in one South African organisation.</i>    | 1.1: To perform a literature review to understand theoretical concepts integral to this study.                                   | Chapter 2 and Chapter 3 |
|                                                                                        | 1.2: To perform an exploratory study with the aim of understanding the most common ICT project risk factors in one organisation. | Chapter 4 and Chapter 5 |
| <i>To propose risk management strategies that can be used to manage the top risks.</i> |                                                                                                                                  | Section 6.4             |

This dissertation comprises the following chapters.

### Chapter 1. Introduction and Problem Statement

Chapter 1 provides the background and need for this study by identifying the problem statement, research objectives and questions of this study. A brief description of the research methodology and ethical considerations are also

presented in this chapter.

## **Chapter 2. Literature review: Project Management**

Chapter 2 explores the literature on project management and ICT project management. The aim of this chapter is to provide the researcher with an understanding of theoretical concepts relating to ICT project management.

## **Chapter 3: Literature review: Project Risk Management**

In this chapter, the literature on project risk management and ICT project risk management is reviewed. The aim of this chapter is to provide the researcher with an understanding of theoretical concepts relating to ICT project risk management, especially the body of knowledge relating to the common ICT project risk factors.

## **Chapter 4: Research Design and Methodology**

In Chapter 4, the research methodology is discussed, followed by an explanation of the research plan proposed and executed in this study. The chapter further explains the ethical aspects that were considered for this study.

## **Chapter 5: Data Analysis and Discussion**

The data analysis approach used in this study is explained in Chapter 5. Study findings are presented, analysed and discussed in this chapter.

## **Chapter 6: Conclusions and Recommendations**

This chapter presents the risk treatment strategies that are proposed to manage the top ten ICT project risk factors for the selected organisation. The summary of the research is provided, the research plan is revisited, the key findings are summarised and the success of the study is determined in this chapter. Finally, contributions to the knowledge base and recommendations for future studies are indicated.

## **1.8 SUMMARY**

This chapter has provided a background and motivated the need for this study. A discussion of the high failure rate of ICT projects led to the identification of the problem statement, research objectives and research questions. A brief description

of the research methodology and ethical considerations employed in this study were provided. Finally, the chapters of this dissertation were outlined.

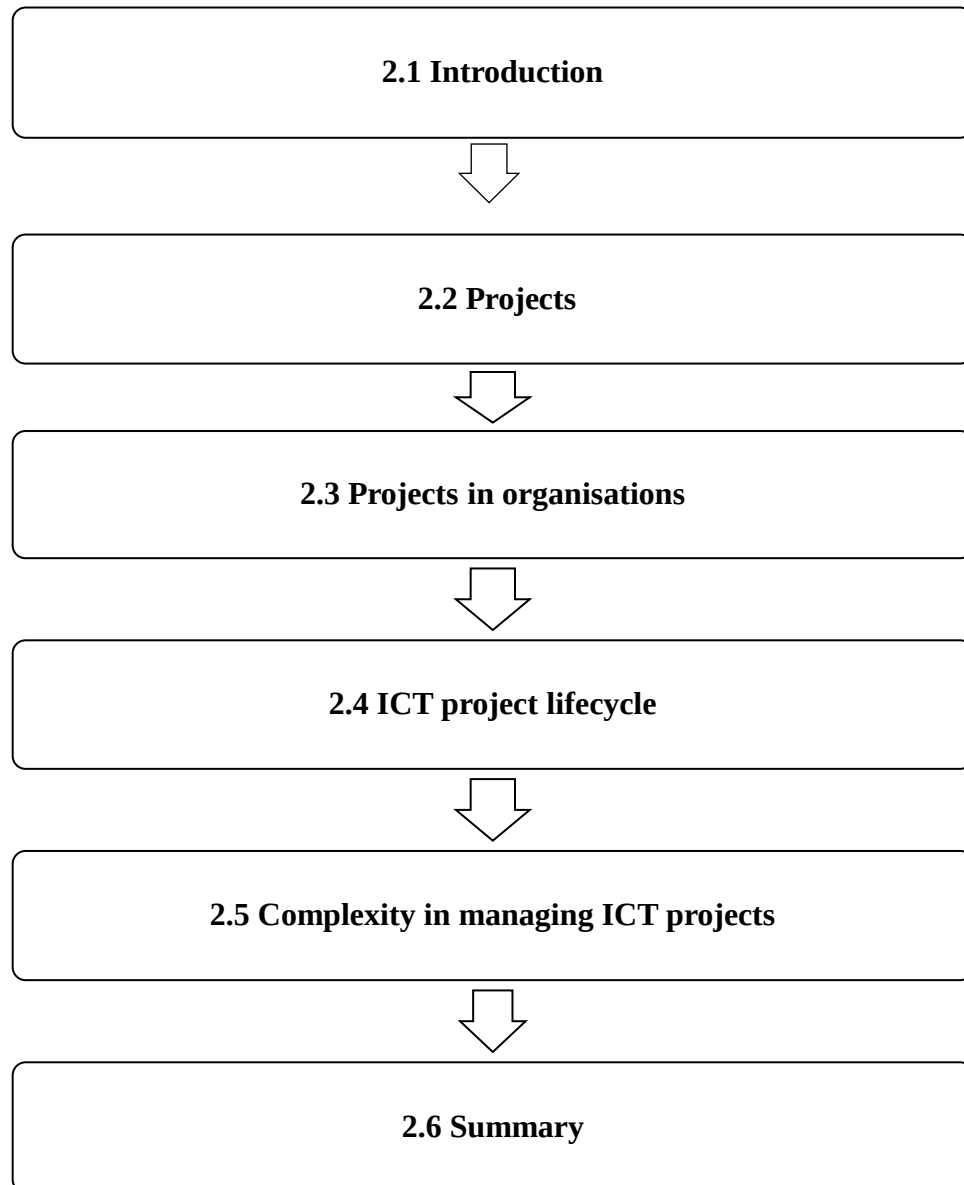
Chapter 1, therefore is a summary of this research project and provides a foundation of the research project by identifying and justifying the research problem. Based on this foundation, the report proceeds with an exploration of the literature.

The main objective of this study is to propose risk treatment strategies that can be used to manage one South African organisation's top ten ICT project risk factors. To accomplish this, it is essential that the existing literature on ICT project management and ICT project risk management be reviewed as the two concepts are integral to this study.

Chapter 2 presents the literature review on project management and ICT project management.

## **CHAPTER 2**

### **PROJECT MANAGEMENT**



## 2.1 INTRODUCTION

Reviewing the literature is a very important part of research (Saunders *et al.*, 2009). A literature review is a way of gathering information or evidence to support a research claim, to demonstrate that a topic is relevant and worthwhile, that other work in the field of research has been acknowledged, that there is a reason for doing the research, and that the work fits into an existing context (Oates, 2006). According to Gill and Johnson (2002), by conducting a literature review, researchers are able to demonstrate awareness of the current state of knowledge with relation to their subject, its limitations, and how their research fits in this wider context.

According to Baccarini *et al.* (2004), understanding the critical role of project management in managing ICT project risks is a necessity for project success. Therefore, this chapter presents a review of available and relevant literature in project management and ICT project management from the current body of knowledge and provides the context within which this research is performed.

The definitions and characteristics of projects, project management and project success are presented in Section 2.2. This section also describes the ten project management knowledge areas and five project management process groups. In Section 2.3, project management is further discussed to highlight how projects are implemented and embedded in organisations. Section 2.4 gives an overview of different ICT project lifecycle models. Section 2.5 explains the nature and complexity of managing ICT projects.

## 2.2 PROJECTS

According to Passenheim (2009), there is always confusion and misunderstanding of what constitutes a project, project management, project success and the specific project management knowledge areas and tools required to run a project successfully. To set the context of the study, the definitions and key concepts of projects are generally clarified and then described in terms of its applicability to ICT projects.

### 2.2.1 Defining projects

Projects are authorised as a result of one or more strategic consideration, like market demands, customer requests, strategic opportunities, technology advancements, social needs, environmental or legal requirements (Passenheim, 2009:13; PMI, 2013:10). Organisations undertake different projects as a means to put their strategic objectives and goals into action and to positively contribute to the company profits (Raymond & Bergeron, 2008; Fink, 2013:2).

The Project Management Institute (PMI) is an international professional society for project managers. The Project Management Body of Knowledge (PMBOK) was developed by PMI to serve as a general guide for the fundamental principles, processes, knowledge areas and terminologies that are accepted as best practices for the project management profession world-wide (PMI, 2013). PMBOK states that a project is “a temporary endeavour undertaken to create a unique product, service, or result” (PMI, 2013:5). PMI (2013) cautions that not all work can be classified as a project. Kerzner (2009:2) agrees that a project is any activity that has a well-defined objective; must be completed within certain specifications; has a defined start and end date; and consumes resources (money, people, equipment). ICT projects may entail developing new software, installing off-the-shelf hardware and associated systems or improving the business processes.

In this dissertation, the term ‘ICT project’ is used to refer to projects that aim to develop new products and services such as new software, networks, installing new hardware and associated systems, or improving ICT related business processes.

All kinds of projects (including ICT projects) must have the following attributes:

- Unique purpose. Each project must have a clear objective (Clements & Gido, 2012:4).
- Temporary. Each project must have a finite start and a finite end; it must be carried out over a specific time frame (Heagney, 2012:13).
- Interdependent tasks. Projects consist of a number of non-repetitive tasks that should be concluded in sequence (Clements & Gido, 2012:4).
- Benefits. Projects are undertaken to create a lasting outcome (PMI, 2013:3).

- Resources. Projects require resources (Schwalbe, 2011:7).
- Uncertainty. Projects involve a certain degree of uncertainty and it is important to identify and manage the uncertainties (Clements & Gido, 2012:5).

Section 2.2.2 provides clarification on the definition and objectives of project management, criteria for measuring project success and identifies factors that contribute to project success.

## **2.2.2 Defining project management**

The concept of project management has been around for years (Kerzner, 2009:47). However, it has gained more acceptance and has been more formalised in the past few years, in parallel to the general trends in worldwide economics (Passenheim, 2009:11). Kerzner (2009:47) notes that the economic recession that happened between 1989 and 1993 contributed to the regular use of projects to complete specific organisational tasks and to the growth of project management. It was during this period that organisations started to realise that project management could help them operate more effectively and efficiently.

Project management is a discipline that involves planning, organising and managing resources in order to ensure that a project is completed successfully (Vanhoucke, 2013:1). According to Chapman and Ward (2011), project management includes designing, creating or enhancing specific organisational changes. In ICT, project management practices are used to organise tasks and resources to develop and implement new products and services for internal and external clients (Jiang & Klein, 2014). The key objective of project management is to accomplish a balance between project scope, schedule and costs whilst ensuring that customers are satisfied with the project outcome (Clements & Gido, 2012:22; Parker *et al.*, 2015:553). In addition to these, project management entails ensuring that the following is done:

- Organisational structures are customised to fit the operational style of project teams.
- Resources are allocated to projects.
- Project risks are identified and managed.

- Critical tasks are met.
- Stakeholders are regularly informed about the project status (Passenheim, 2009:11).

### **2.2.2.1 Project success**

Project managers are expected to ensure that projects are delivered successfully (Passenheim, 2009:18; Heagney, 2016:25). There are many varying definitions and criteria for measuring if an ICT project was a success or a failure (Young, 2005; Hughes *et al.*, 2017). The common traditional measures (also known as triple constraints) for project success are time, budget and scope (Grindley, 1995; Raymond & Bergeron, 2008:213; Schwalbe, 2015). However, the current view on measuring project success is shifting towards providing value to the business (Hughes *et al.*, 2017). Therefore, ICT projects are considered successful if they directly or indirectly deliver improved financial benefits, and those benefits are persistent over time (Standish, 2012; Lientz, 2013).

Vargas (2011:3) notes that ICT projects are troubled if the difference between what the client is expecting and what has been accomplished exceeds the acceptable tolerance limits. Each organisation has a definition of the tolerance limits and use different aspects to indicate whether the project is in trouble or not. According to Vargas (2011:3), it is important that troubled ICT projects be identified early in the project lifecycle so that they can be recovered and the impact of the negative effects be reduced. Smith (2001:8) defines and explains the characteristics of a troubled project as follows:

- It exceeds the planned time-scale by more than 50%, excluding the time-scale impact of agreed changes in scope.
- It exceeds the build cost by more than 35%, excluding the cost of agreed changes in scope.
- It is the cause of major client dissatisfaction to the extent that the future of the project is called into question.
- Project stakeholders are not committed to the success of the project.
- It substantially fails to support the intended business processes.
- It substantially fails to deliver the anticipated benefits.

ICT projects are considered to have failed if they are completed later than the planned date, if the development costs exceeds the budget or if the implemented system does not meet the technical specifications (Dijk, 2009:237; Passenheim, 2009). According to Remenyi (2010:4), ICT projects are considered to have failed when the following occurs:

- System development commences but is abandoned before completion.
- The system has been fully developed but never used.
- The system is fully developed, commissioned but abandoned within a short period of time.
- The system functionality is downscaled to a point that it no longer provides the originally envisaged functionality.

#### **2.2.2.2 Improving the chances of ICT project success**

Wateridge (1995:171) notes that there seems to be no consensus amongst researchers on identifying factors that influence the success of a project. Thomas and Fernandez (2008:737) suggest that having a formal definition of success criteria, consistently measuring project success, and using the results can improve the chances of ICT project success. According to Cooke-Davies (2002:189), the following aspects can improve the chances of ICT project success:

- Educating the entire organisation on risk management.
- Maintaining a risk register for each project.
- Defining and keeping an up-to-date risk management plan and risk register.
- Defining and communicating roles and responsibilities on the project.
- Tracking and management of benefits.
- Mature portfolio and programme management processes.
- Established change control process.
- Formal processes of documenting lessons learnt from previous projects.

PMI (2013) identified ten project management knowledge areas. Each knowledge area describes key competencies that project managers should develop in order to ensure project success. The knowledge areas are discussed in Section 2.2.3.

### 2.2.3 Project management knowledge areas

Project management knowledge areas represent “a complete set of concepts, terms and activities that make up a professional field, project management field or area of specialisation” (PMI, 2013:60). The knowledge areas form basis of project planning and connect major professional fields that project managers should master in order to deliver successful projects (PMI, 2013:60). Project management knowledge areas can be applied throughout the project lifecycle to detect and rescue troubled ICT projects before they fail (Jaafari, 2001:90; Vargas, 2011:2)

- Integration management

Project-integration management includes the processes and activities to identify, define, combine, unify and coordinate the various processes and project management activities within the project management process groups.

- Scope management

Project-scope management includes processes required to ensure that the project includes all (and only) the work required to complete the project successfully.

- Time management

Project-time management includes processes required to ensure that the project is completed on time.

- Cost management

Project-cost management includes processes involved in planning, estimating, budgeting and managing project costs.

- Quality management

Project-quality management includes processes required to ensure that the project deliverables satisfy the needs for which it was undertaken.

- Human-resource management

Project-human-resource management includes processes that acquire, develop, organise and manage project teams.

- Communication management

Project-communication management includes processes that are required to ensure timely and appropriate planning, collection, creation, storage, and distribution of project information.

- Risk management

Project-risk management includes processes of planning, identifying and controlling project risks.

- Procurement management

Project-procurement management includes processes that are necessary to acquire products and services needed for the project.

- Stakeholder management

Project-stakeholder management includes processes required to identify people, groups or organisations that could be impacted by the project, to analyse and manage their expectations.

Decisions and actions taken in one project management knowledge area usually affect other knowledge areas. Therefore, in order to ensure that projects are successful, project managers may be required to make trade-offs between different project management knowledge areas and to modify the project management process groups to suits their individual project needs (Schwalbe, 2011:78). The project management process groups are the focus for the next section.

#### **2.2.4 Project management process groups**

A process is a way of doing something with the aim of achieving a particular outcome (Heagney, 2012:22). Related project management processes are grouped together to form process groups that can be repeatedly applied throughout different project phases, namely: initiation, planning, execution, monitoring and controlling, and closure (Schwalbe, 2015).

Although project management process groups are grouped according to related activities, it is possible for all process groups to be conducted within one phase.

Unlike the project phases, process groups are not industry specific and can be applied in any project (PMI, 2013:52). Different tasks that should be completed during each process group are discussed from Section 2.2.4.1 to Section 2.2.4.5.

#### **2.2.4.1 Initiating process group**

The main purpose of initiating process group is to ensure that all stakeholders' requirements are considered and that the requirements are aligned to the project objectives. The initiating process group consist of processes to identify, select and start new projects or project phases. The following tasks are performed during project initiation (PMI, 2013:54):

- Identifying key stakeholders.
- Gathering project requirements.
- Compiling the business case document (the business case document is used to justify investing in the project).
- Drafting a project charter.
- Holding a project kick-off meeting for all stakeholders to meet and agree on the project objective and milestones.

#### **2.2.4.2 Planning process group**

Planning is the most difficult process in project management and it is often taken for granted. The main purpose of planning processes is to guide project execution by defining the project scope, defining a risk response plan, and developing a project plan (Schwalbe, 2015:81). The project plan is used to ensure that projects are completed on time (PMI, 2013:55). According to Lientz (2013:4), all project activities, resource allocation, project costs, possible risks and expected completion date for each activity should be included in the project plan.

#### **2.2.4.3 Executing process group**

Executing a project involves coordinating people and other resources to perform all necessary activities as set out in the project plan. The activities of the executing process group require most of the project resources, and as such, a large portion of the project budget is spent on performing activities in this process group (PMI, 2013:56).

#### **2.2.4.4 Monitoring and controlling process group**

The monitoring and controlling process group consist of processes to regularly measure progress on project, monitor deviations from the plan and take corrective action. The monitoring and controlling process group are applied at the same time as other process groups and can be done throughout different phases of a project (Schwalbe, 2015:81).

#### **2.2.4.5 Closing process group**

The closing process group consist of processes to formally close a project or project phase (PMI, 2013:57). According to Clements and Gido (2012:284), closing processes include completing administrative tasks such as closing out contracts, archiving project documents, documenting lessons learnt, evaluating work done by project team members and conducting a post-project or phase-end reviews.

### **2.3 PROJECTS IN ORGANISATIONS**

As depicted in Figure 2.1, organisations embark on projects to implement their business strategies (Fink, 2013:31). The business strategy defines what should be done in the organisation. A business strategy plan is a document that organisations use to communicate their desired objectives, goals and other critical elements that provide the organisation with a competitive advantage (Govender & Pretorius, 2015). The business strategy is then interpreted to identify strategies that can be implemented through projects (Fink, 2013:31). Projects are chosen and prioritised based on the organisation's project strategic plan (Schwalbe, 2011:87). Project governance processes are used to manage projects and to ensure consistency in the use of project management principles (Fink, 2013:31).

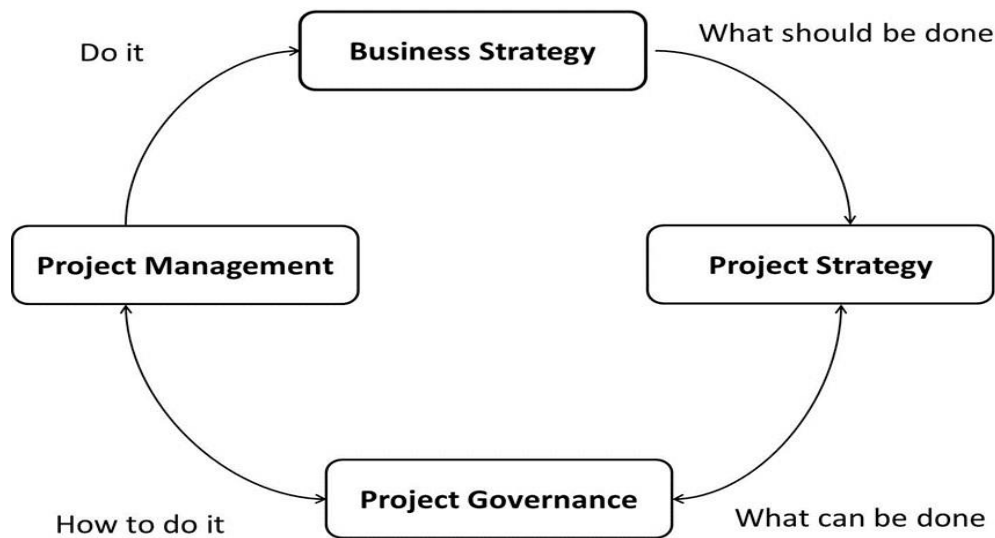


Figure 2.1: Cyclical approach to business/project alignment (Fink, 2013:31).

The alignment between business and projects (as depicted in Figure 2.1), requires high interaction and cooperation between different corporate functions. Information and Communication Technology projects might not be able to address the organisational needs stipulated in the business strategy if they are managed in isolation (Passenheim, 2009:16). Information and Communication Technology project managers need to ensure that the businesses, technological, and organisational issues related to ICT projects are addressed (Schwalbe, 2011). In ICT project management, organisational structures fulfil the role of defining how project management is embedded within the organisation and to define internal structures of project teams. (Passenheim, 2009:17). A flexible organisational structure must be designed in order to ensure that there is a horizontal and vertical flow of work between functional (line) managers and ICT project managers (Fink, 2013:31).

Three common types of organisational structures are functional organisational structure, matrix organisational structure and project-based organisational structure (Schwalbe, 2015). The three types of project management organisational structures are discussed next to emphasise where ICT project management fits in the organisational structure.

### 2.3.1 Functional organisational structure

Functional organisational structure represents the structure whereby teams are organised according to different functions, with all personnel reporting to the applicable functional managers. The functional managers, also known as vice presidents (VPs), report directly to the CEO of the organisation. Typical primary functions may be engineering, human resources (HR), ICT, and planning. Figure 2.2 portrays a functional organisational structure.

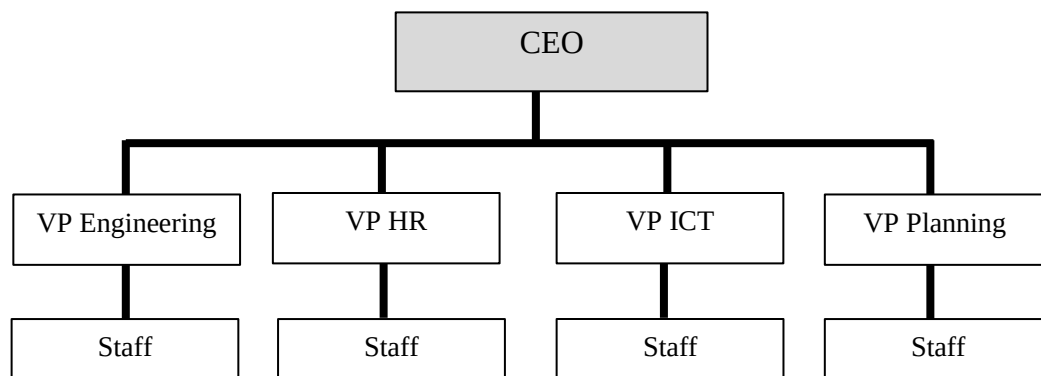


Figure 2.2: Functional organisational structure (Schwalbe, 2015:49).

### 2.3.2 Matrix organisational structure

A matrix organisational structure is similar to the functional organisational structure, with the only difference being that in matrix organisational structure control is shared between the functional and project managers. Personnel in matrix organisations report to their respective functional manager, as well as to the project manager of the project they are allocated to (Schwalbe, 2015:49). In South Africa, the number of ICT projects per person is too high due to a shortage of skills (Steyn & Schnetler, 2015). They recommend that functional managers in matrix organisations should prioritise projects, ensure that project resources are allocated optimally and that each resource's workload is manageable. Figure 2.3 portrays a matrix organisation structure.

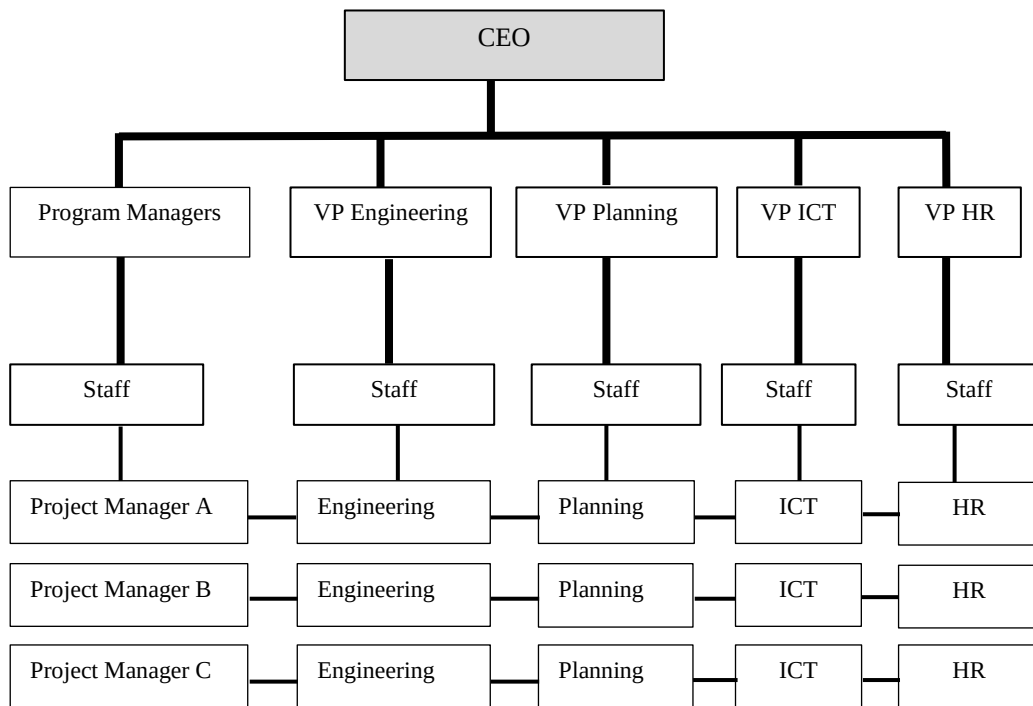


Figure 2.3: Matrix organisation structure (Schwalbe, 2011:49).

### 2.3.3 Project-based organisational structure

A project-based organisational structure (PBO) represents a structure whereby project managers have full control of project resources as all project team members report directly to the project managers (Jerbrant, 2014). In a PBO, most products are produced and main business functions coordinated and integrated through projects. Project management office (PMO) is established to act as an internal centre of excellence that maintains project governance by standardising project management practices and facilitating the sharing of project resources and tools (Pemsel & Wiewiora, 2013:32). The PMO is also responsible for ensuring that projects are implemented successfully, and that risk management processes and strategies are identified and implemented (Cooke-Davies *et al.*, 2009; Geraldi & Soderlund, 2014:65).

To ensure that ICT projects are successful, many organisations have replaced “old-style bureaucracies with flexible, project oriented structures” with a PBO structure that offers flexible service and production within a short turnaround time (Fink

2013:7). According to (Jeffery & Leliveld, 2004) 65% of ICT vice presidents from ICT organisations claim that PMO yields significant business value. The internal project structure of a PBO is depicted in Figure 2.4.

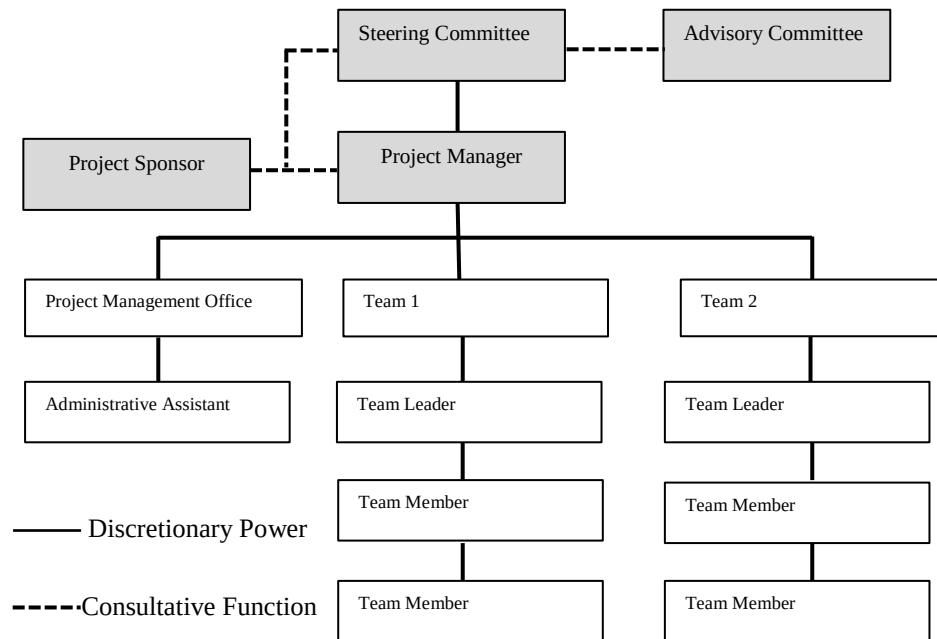


Figure 2.4: Internal project structure of a PBO (Passenheim, 2009:17).

Kerzner (2009:4) warns that ICT projects can only be executed efficiently once the activities are communicated and coordinated horizontally within the organisation. As depicted in Figure 2.5, the organisational structure of a PBO must be flexible, dynamic, and ensure that there is a link between projects and the business strategy (Fink, 2013:18).

Ensuring that each ICT project is linked to a strategic objective can contribute towards lowering capital expenditure (Kruger, 2012). According to Henderson and Venkatraman (1999) organisations may have different perspectives of ICT alignment. The four dominant alignment perspectives are:

- **Strategy execution.** The strategy execution perspective entails that a business strategy has been formulated and is used to determine which ICT projects can be implemented. ICT project strategy provides capabilities that will support the business strategy through the implementation of ICT projects.
- **Technology transformation.** The technology transformation perspective considers how ICT can be used to transform the business strategy. ICT projects

that introduce new technologies are implemented to increase business agility, so that the business can be more flexible and be able to quickly respond to changing business requirements.

- Competitive potential. The competitive potential alignment perspective allows for the adaptation of business strategy via emerging ICT capabilities.
- Service level perspective. The service level perspective focuses on building a world-class information system organisation.

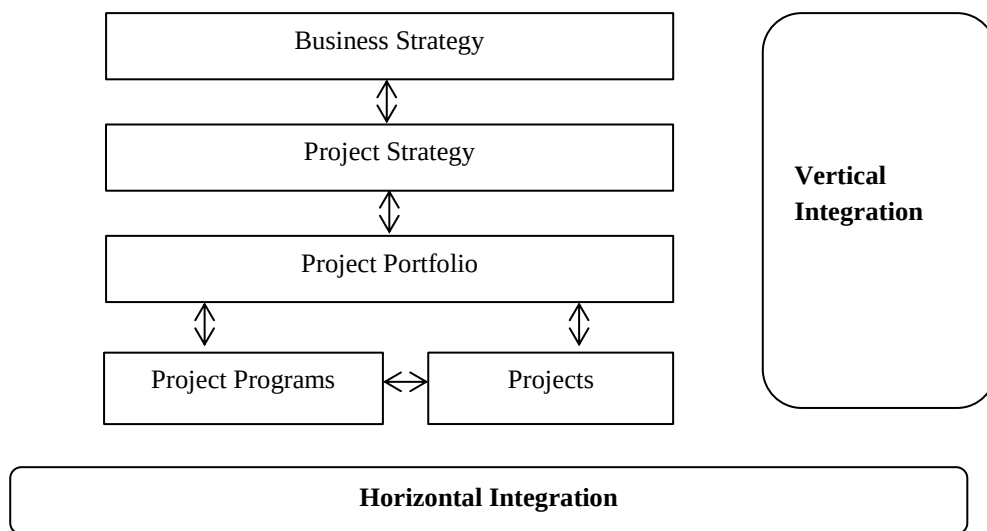


Figure 2.5: Integrated structure of a PBO (Fink, 2013:18)

## 2.4 ICT PROJECT LIFECYCLE

The primary functions of an ICT project lifecycle model are to describe the phases of an ICT project and to determine the consistent order in which those phases must be executed (Boehm, 1988b). There are different ICT life-cycle models that organisations can choose to adopt based on the organisational needs (Lientz, 2013). All the life-cycle models have different strengths and weaknesses (Scach, 2007). The most well-known ICT project lifecycle models are waterfall, evolutionary prototyping, and spiral lifecycles (Futrell *et al.*, 2002:115).

### 2.4.1 Waterfall lifecycle model

The waterfall lifecycle model has been used in ICT projects for many years and is often referred to as the classical model. The predictive nature of the waterfall model

is evident in the way the project phases are executed. All the phases are executed in sequence with each phase beginning once the activities in the current phase have been completed. Each phase is executed once and testing is not done as a separate phase but is inherent in each phase. The waterfall model assumes that the requirements are defined at the beginning of the project (Futrell *et al.*, 2002:115).

The waterfall model divides a project into phases, and although the naming of these phases may vary from one organisation to the next, the application remain the same. Medvedska and Berzisa (2015) describe the phases of the waterfall life-cycle as follows.

- Feasibility study. During the feasibility study, the project requirements are examined to determine whether they are feasible or not.
- Requirement analysis phase. The requirement analysis phase involves analysing requirements and determining the hardware/software requirements of a system and the ICT system interfaces.
- Implementation phase. The programming of a custom-developed system will be done during this phase. If the system is purchased (commercial off-the-shelf), then the major activity will be the system installation. The implementation phase ends with the system being installed and accepted by the client.
- Post-delivery maintenance. The deployment and maintenance phase is concerned with fixing errors, faults and failures.
- Retirement. The retirement phase involves removing the product from service.

### **2.4.2 Evolutionary prototyping lifecycle model**

Due to the increasing competitive pressure and the complexity of ICT systems, development processes are now usually performed in an incremental way (Pitangueiraa *et al.*, 2015). The evolutionary prototyping model is classified as an iterative and incremental lifecycle model whereby development teams work closely with clients, developing a working replica of the required ICT system (prototyping), installing the system on clients' machines and continuously making changes based on the clients' feedback. The evolutionary prototype model is more suitable for creating user interfaces or in instances where the development teams are uncertain of project requirements (Scach, 2007:53).

### 2.4.3 Spiral lifecycle model

The spiral lifecycle model evolved as a refinement of the waterfall model and is therefore, similar to the waterfall lifecycle (Boehm, 1988b:64). The only difference is that the spiral model puts more emphasis on risk management with each phase of the spiral life-cycle model being preceded by risk analysis (Munassar & Govardhan, 2010). The advantages of a spiral model are that it focuses on risk management, it focuses early attention on options involving the reuse of existing software, and that it can accommodate other ICT project lifecycle models (Boehm, 1988b:69). Spiral lifecycle is more suitable for large-scale mission-critical projects (Scach, 2007:60-61).

## 2.5 COMPLEXITY IN MANAGING ICT PROJECTS

ICT projects are unique, diverse, inherently complex and risky (Schwalbe, 2011:63; Whitney & Daniels, 2013; Liu & Wang, 2014). Like any type of project, ICT projects experience general project management challenges like schedule, budget and resource constraints (Wang *et al.*, 2016). However, ICT projects also experience unique technological challenges, which contribute to the high complexity and potential failure of ICT projects (Ahmed, 2011). An example of such unique technological challenges is the emergence of cloud computing (Section 1.1). The quick evolution of cloud computing is changing the way ICT projects are implemented and managed (Zhang *et al.*, 2010). In order to successfully implement cloud computing projects, ICT project managers augment their skills to include specific skills relating to the transition to cloud-based services, for example: data privacy management, service level management and managing ICT governance issues (Smith *et al.*, 2011; Wang *et al.*, 2016).

Dekkers and Forselius (2007b:2) explain that ICT projects differ from construction projects, and they provide the following reasons for this:

- There is a distinct absence of enforceable controls on ICT projects.
- ICT projects often introduce new technology in terms of hardware, software and/or new product development as part of the project.
- ICT projects usually commence without properly documenting requirements.

- There is a different success criterion for each ICT project.
- Original costs of the software development are a fraction of the overall life-cycle costs. Most of the costs are spent on maintenance, enhancements and technical upgrades.

The following factors also contribute to the high complexity in managing ICT projects:

- ICT projects are often outsourced (Ahmed, 2011:8).
- ICT projects are often implemented globally with users or the development team dispersed over multiple geographical locations involving various culturally diverse groups that use multiple standards and technologies (Lee, 2013).
- ICT project involves different stakeholders, with different skills and expectations from the project (Carlton, 2017).
- ICT projects have a substantial human and organisational interface (Love *et al.*, 2005).
- Managing different ICT projects require project managers and teams with different knowledge and skills (Schwalbe, 2011:63).
- ICT projects require some level of innovation and art – the developed system does not only have to meet stakeholders' requirements; the interface of the system should be user-friendly and appealing to the users (Ahmed, 2011:8).

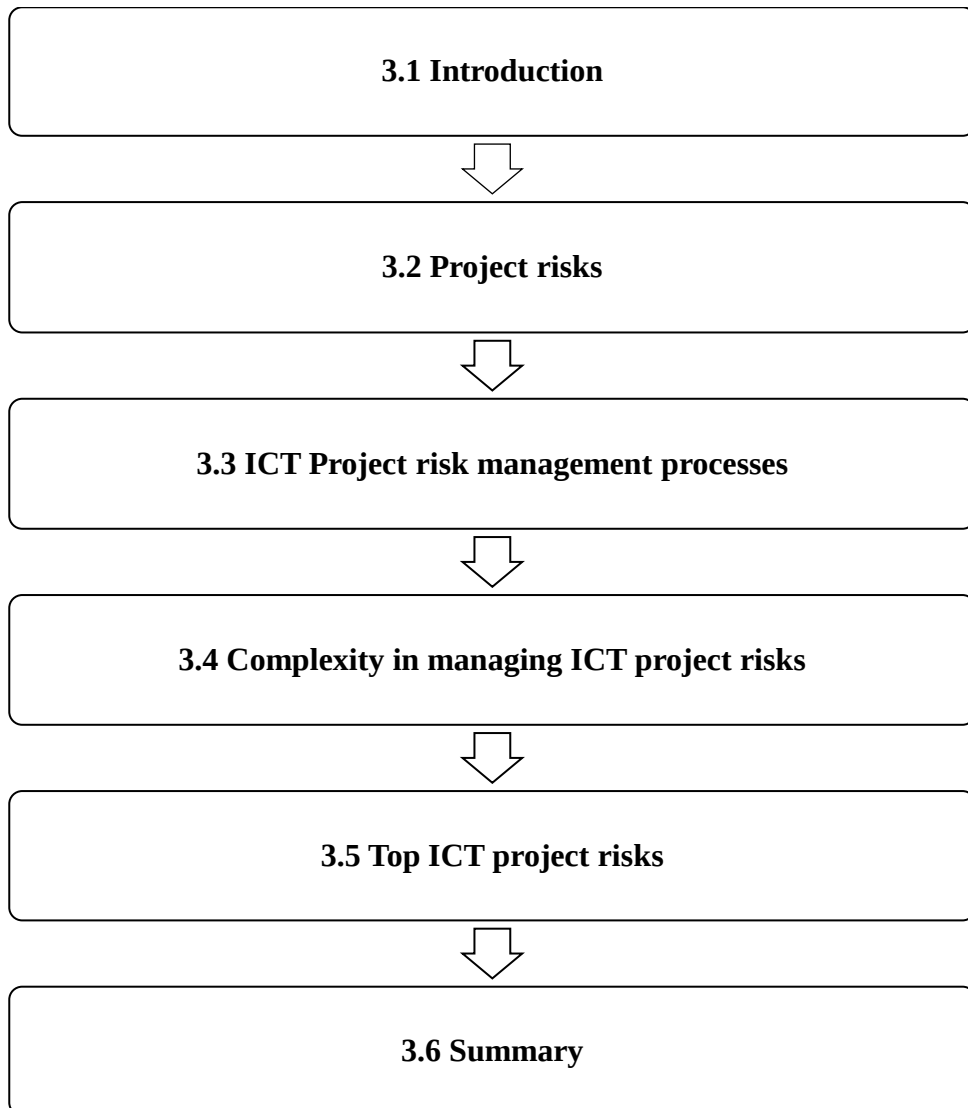
## 2.6 SUMMARY

In this chapter, definitions and characteristics of projects, project management and project success were provided. A brief overview of the project management knowledge areas, project management process groups, and project life-cycle models were discussed. Characteristics of ICT projects and how they contribute to the complexity in managing ICT projects were also discussed.

Chapter 3 presents the literature review on project risk management and ICT project risk management.

## **CHAPTER 3**

### **PROJECT RISK MANAGEMENT**



### 3.1 INTRODUCTION

In this chapter, the literature on project risk management and ICT project risk management application is reviewed. The aim of this chapter was to provide the researcher with an understanding of theoretical concepts relating to ICT project risk management, especially the body of knowledge relating to the common ICT project risk factors.

Risk management has been identified as one of the ten project management knowledge areas that contribute to project success (Section 2.2.3), and therefore an integral part of project execution (Raz & Michael, 2001). According to Fink (2013:161), risk management is the only knowledge area that has high interaction with other knowledge areas.

Figure 3.1 illustrates the integration of project risk management to other project management knowledge area and shows a possible risk in each project management knowledge area.

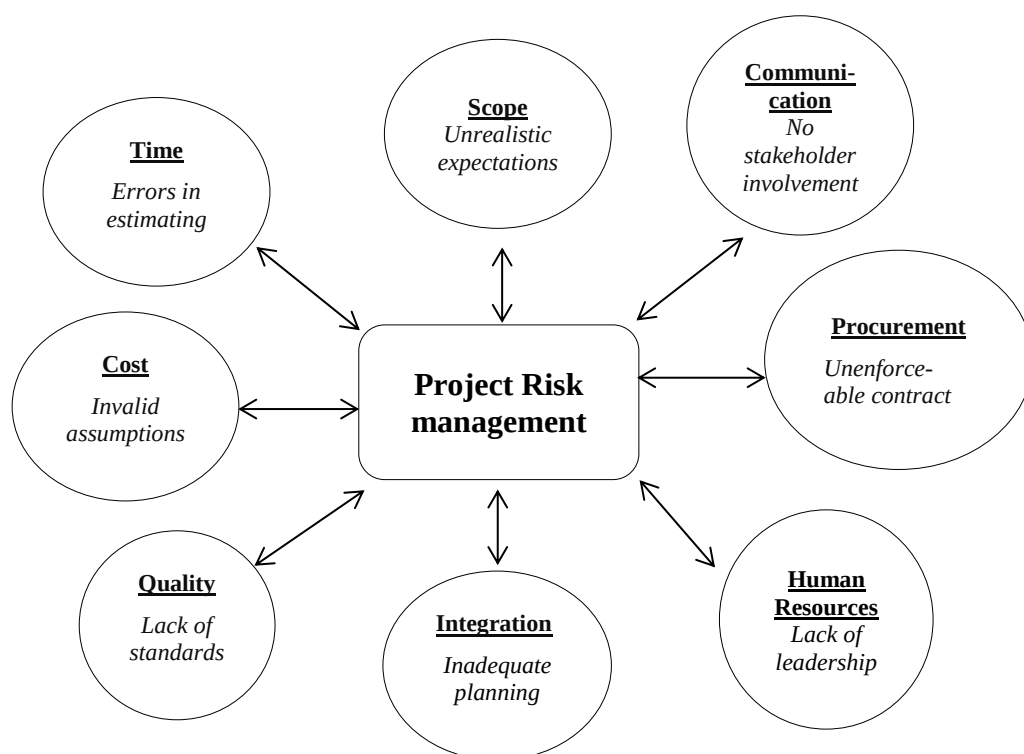


Figure 3.1: Project risks across project management knowledge areas (Fink, 2013:161)

Schwalbe (2015) notes that despite having a high interaction with other knowledge areas, risk management is still the least mature knowledge area, especially in ICT projects. The results of a study completed on the maturity rating levels of South African ICT projects per project management knowledge area are presented in Table 3.1.

Table 3.1: Maturity rating levels of different knowledge areas in South African ICT projects (Schwalbe, 2015:426).

| Knowledge areas           | Maturity levels |      |
|---------------------------|-----------------|------|
|                           | 2003            | 2007 |
| Scope management          | 3.12            | 3.71 |
| Integration management    | 3.02            | 3.75 |
| Time management           | 2.99            | 3.79 |
| Procurement management    | 2.99            | 3.59 |
| Cost management           | 2.94            | 3.61 |
| Communication management  | 2.93            | 3.65 |
| Human resource management | 2.87            | 3.61 |
| Quality management        | 2.82            | 3.44 |
| Risk management           | 2.65            | 3.38 |

The results in Table 3.1 show that ICT project risk management has the lowest maturity rating. Although there was an increase in the maturity rating from 2.65 to 3.38 over four years, risk management still had the lowest ranking. The reason for this is because unlike other knowledge areas, risk management is subjective and it is dependent on the project manager or organisation's tolerance for risks (PMI, 2013). Risk tolerance is the level of risk that the individual or organisation is willing to take (Schwalbe, 2011:427).

According to (Schwalbe, 2011:427), the organisational tolerance towards risk can be assessed based on the following categories.

- Risk takers. Risk-seeking project managers or organisations prefer to look for uncertain investments in exchange for anticipated pay-off.
- Risk avoiders. Risk-averse project managers or organisations are reluctant to take risks.
- Neutral. Risk-neutral project managers or organisations strive to reach a balance between the risk and pay-off.

Sixty seven percent of ICT project managers consider their organisations to be risk takers rather than risk avoiders (19%) or neutral to risks (14%) (Hwang & Chen, 2015).

The definitions and characteristics of ICT project risks and project risk management, as well as a discussion on the benefits and scope of ICT project risk management are presented in Section 3.2. Section 3.3 presents an overview of the ICT project risk management process. The complexity of ICT projects is discussed in section 3.4. Finally, previously published lists of top ICT project risk factors are discussed in Section 3.5.

## **3.2 PROJECT RISKS**

It is important that the meaning of ICT project risks and ICT project risk management be clarified to understand the context within which this research is performed. Definitions and characteristics of ICT project risks and ICT project risk management are discussed in Section 3.2.1 and Section 3.2.2. The two concepts are first clarified in a general context then described in terms of applicability to ICT projects.

### **3.2.1 Project risks**

PMBOK (PMI, 2013) defines a project risk as an uncertain event or condition that might have positive or negative effects on a project. Jaafari (2001) agrees that a risk is a probability of occurrence or an exposure to loss/gain. Hillson (2002) argues that in reality, the term 'risk' is commonly used to refer to the negative effects on

projects, and that positive effects on projects are commonly known as ‘opportunities’.

PMBOK (PMI, 2013) accepts that even though its definition of risk incorporates both the negative and positive effects on a project, project teams have a tendency to focus more on the negative effects. The findings of a study by March and Shapira (1987) show that more than 80% of the project team members consider risks as the negative effects on a project. Although Chapman and Ward (2003) are sympathetic to the PMBOK definition, they acknowledge that it will be difficult to convince project managers to consider risks as events or conditions that might have both positive and negative effects on projects.

In the ICT sector, project risks are generally referred to as events that may negatively impact the project. The definitions of ICT project risks are listed below:

- A “possibility of loss or any characteristic, object or action that is associated with that possibility” (Kontio, 2001:5).
- An event or condition that may pose a threat to the successful completion of an ICT project (Wallace *et al.*, 2004:116).
- A danger, hazard or threat of a poor outcome (Bannerman, 2008).
- The possibility of suffering loss (Alberts & Dorofee, 2010).
- The potential problems that may directly or indirectly lead to failure of an ICT project (Islam *et al.*, 2014).
- Any situation or event that may disrupt the project plan and jeopardise the timely delivery of ICT projects within the approved budget (Bakker *et al.*, 2010:496).

From the definitions above, it is evident that there are basic conditions that constitute an ICT project risk. For an ICT project risk to exist in any circumstance, the following three conditions must be satisfied:

- Uncertainty. The uncertainty of a potential event (loss) must exist.
- Probability. The likelihood of occurrence must be estimated.
- Severity. The impact or consequence of the potential event must be determined (ISO 31000:2009, 2009; Islam *et al.*, 2014:118).

In this dissertation, the term ‘risks’ is used to refer to *uncertain events or conditions that might have negative effects on ICT projects*.

The three primary sources of ICT project risks are external factors, shifting business objectives, and poor project management practices (Jaafari, 2001:90). Given that ICT projects involve different types of stakeholders (e.g. project managers, users, project teams and support teams), each with somewhat different but highly important satisfaction criteria, it is important that risks pertaining to each stakeholder be identified (Boehm, 1991). Wallace *et al.* (2004:117) advise that grouping ICT project risks into different dimensions can assist project managers in getting a broad view of the type of risk factors that might affect their projects. Several studies show that ICT projects share common sources of risks; the six dimensions of ICT project risks are listed and discussed below (Zmud, 1980; Beath, 1983; Jaafari, 2001; Wallace *et al.*, 2004:117; Schwalbe, 2011:431).

- Team risks. Team risks refer to risks associated with the project team members that can increase the uncertainty of a project outcome. An example would be the inability of a project team to successfully complete a project.
- Organisational environment risks. Organisational environment risks are risks or uncertainties surrounding the organisation in which an ICT project is implemented. A project manager may not have control over this category of risks. Examples of organisational risks factors include organisational politics or the lack of organisational support to a project.
- User risks. Lack of user involvement during system development can be classified as an example of user risks.
- Complexity risks. Information and Communication Technology projects are inherently complex and risky. The complexity of ICT projects may be due to the nature of the project itself or technology that is being used. The complexity risks category includes the use of new technology, technology being obsolete or failure of technology to meet user requirements. The introduction of new technologies like fabrication technologies, changes in the mix of applications, and emergence of new paradigms of computation increase the risk of hardware or software failure. Error detection and recovery mechanisms are now put in

place in order to address risks related to the new technologies and to increase the availability of ICT systems (Breuer *et al.*, 2008).

- Requirements risks. Requirements risks include uncertainty surrounding project requirements. An incorrect, unclear or inadequate requirement listing is an example of requirements risks.
- Planning and control risks. Planning and control risks refer to poor planning and control of project management processes. Poor planning often leads to unrealistic schedules and budgets.

### **3.2.2 Project risk management**

The objective of project risk management (PRM) is to minimise the probability and impact of negative effects while maximising the probability and impact of positive effects (PMI, 2013:309; Fukuda & Kuwano, 2017). Passenheim (2009) concludes that although projects managers tend to put the focus of risk management on managing the impact of negative effects on projects, risk management aims to manage the impact of both positive and negative effects on projects. It is for the same reason that Chapman and Ward (2003:98) advise against the use of the term ‘project risk management’. They argue that the term ‘project uncertainty management’ be used as it allows for desirability of a balanced approach to the management of both positive and negative effects on projects.

In ICT, PRM is described as a systematic process for identifying, analysing and controlling risks throughout the ICT project lifecycle with the aim of improving the chances of ICT project being successful (Schwalbe, 2011:422).

In this dissertation, the term ‘ICT project risk management’ refers to an effort to identify, analyse, and control risk factors that might negatively affect ICT projects.

The benefits and scope of ICT PRM are discussed in sections 3.2.2.1 and 3.2.2.2.

#### **3.2.2.1 Benefits of ICT project risk management**

The identification, analysis and management of risks allow for proper action to be taken in order to reduce the chances of projects failure (Wallace *et al.*, 2004:115). Most ICT project failures can be avoided if risks are identified and managed before

they negatively impact the project (Labuschagne & Marnewick, 2009; Tajari *et al.*, 2014). ICT project managers can take appropriate action if proper risk assessment leads to early identification of a troubled or failing project (Keil *et al.*, 2000).

According to (Schwalbe, 2011:427), PRM practices assisted project managers from 260 ICT organisations to achieve the following benefits:

- 80% of the ICT project managers said they could anticipate or avoid problems.
- 60% of the ICT project managers could prevent surprises.
- 47% of the ICT project managers could improve their ability to negotiate.
- 47% of the ICT project managers could meet customer commitments.
- 43% of ICT project managers could reduce schedule slips.
- 35% of ICT project managers could reduce cost overruns.
- Only 6% of the ICT project managers said that they did not derive any benefits from the PRM process.

In the South African context, the application of PRM processes has been shown to increase chances of executing ICT projects successfully. More than 60% of ICT project teams in South Africa agree that PRM practices increase the probability of ICT project success (De Wet & Visser, 2013).

### **3.2.2.2 Scope of ICT project risk management**

As discussed in Section 3.2.1, ICT project risks are uncertain. The level of uncertainty in ICT project risks depends on what is known about the project parameters such as time, cost, and quality of project deliverables (Fink, 2013). Therefore, it is important that the uncertainty around ICT projects be understood first, before attempts are made to identify possible risk factors that may affect ICT projects. As an example, project managers must first understand the fundamental relationships of people, business units, and organisations involved in a project before they can identify possible risks that may affect the project. Once the project managers understand the fundamental relationships, they will be able to identify possible risks and put mechanisms in place to manage the risks (Chapman & Ward, 2011:4).

Bannerman (2008:2120) notes that the uncertainty spectrum of project risk management can be distinguished by the following categories of awareness:

- Unknown-unknowns are “things we don’t know we don’t know” and unknown-knowns are “things we don’t know we know”. Risks in these categories are completely unforeseeable and cannot be easily managed as nothing is known about them, it is for this reason that they do not form part of the project risk management scope. Crisis management processes may be used to cater for these types of risks, should they occur.
- Known-unknowns are “things we know we don’t know”. Risks in this category are foreseeable and form part of the project risk management scope. Project risk management processes are used to identify and manage these risks.
- Known-knowns are “things we know we know”. Risks in this category are foreseeable and form part of the project risk management scope. This category of risks includes risks where all information about them is known; there is no uncertainty about them. These types of risks are normally referred to as issues and are managed through issue management processes. It is important that project issues are proactively managed so that they do not escalate into project risks. Figure 3.2 illustrates the uncertainty spectrum of project risk management.

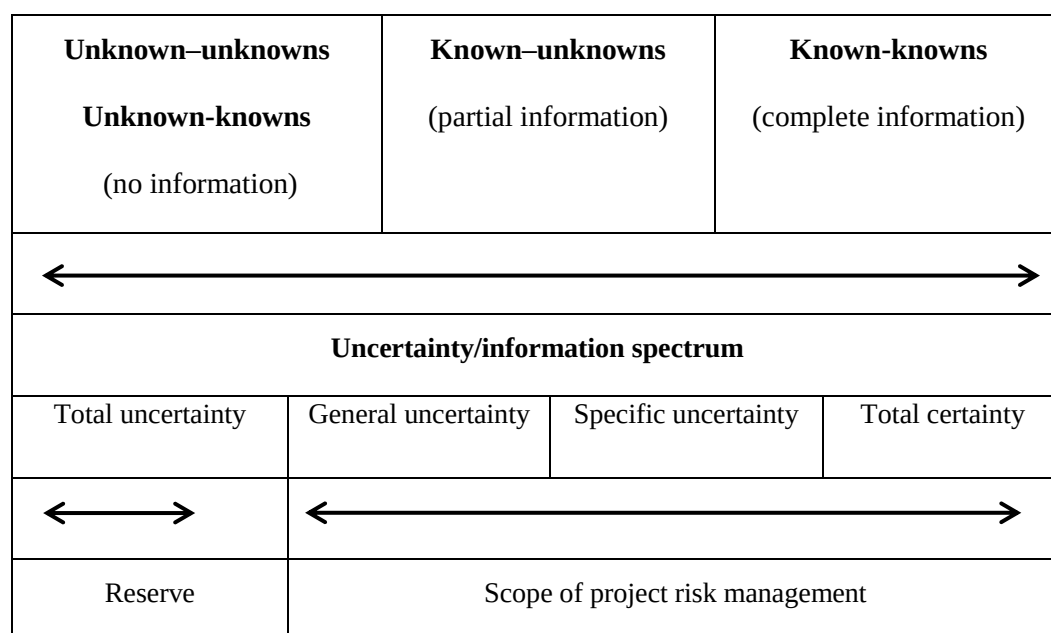


Figure 3.2: Uncertainty spectrum of project risk management (Fink, 2013:143)

### 3.2.2.3 Approaches to ICT project risk management

There are two approaches to ICT project risk management: the evaluation approach and the management approach (Bakker *et al.*, 2010:495). The evaluation approach is a dynamic process that aims to gather information regarding risk factors that affected previous ICT projects, and then use that information in the next projects (Bakker *et al.*, 2010). The aim of the evaluation approach is to list and quantify ICT project risk factors (Davis, 1982; Boehm, 1991; Charette, 1996). According to Bakker *et al.* (2010) the evaluation approach aims at identifying risk factors that cause ICT projects to fail. The evaluation approach has been dealt with in studies that aimed to identify and compile lists of risk factors that had an impact on ICT project success (Bakker *et al.*, 2010). Studies that focus on identifying common ICT project risk factors are discussed in Section 3.5. The strength of the evaluation approach is that the lessons learnt from previous projects are used to assist in managing recurring risks. The limitation of the evaluation approach is that new emerging risks are only managed in subsequent projects, leaving the current project exposed to those risks (Bakker *et al.*, 2010). Figure 3.3 illustrates the evaluation approach to project risk management and highlights the following:

- Known risk factors are used as input to the PRM process on new projects.
- New risk factors are identified through the application of ICT project risk management process.
- New risk factors are added to the list of known risk factors.
- The updated list of known risk factors will be used as input to the new projects.

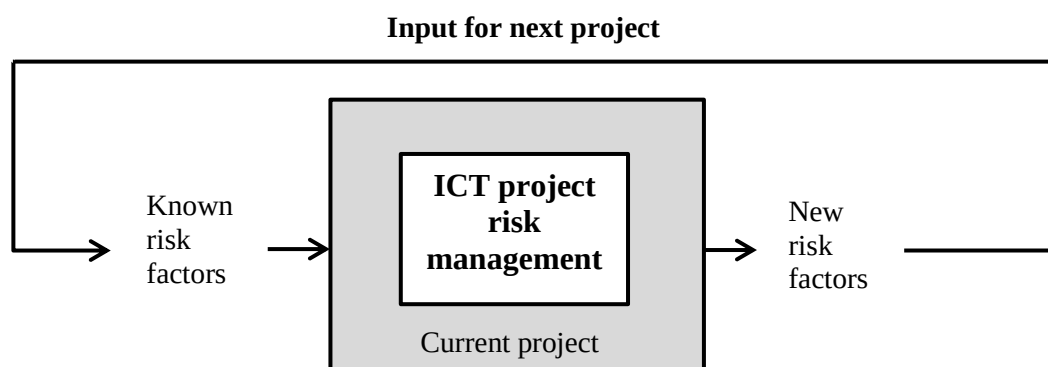


Figure 3.3: The evaluation approach to project risk management (Bakker *et al.*, 2010:494).

Traditionally, PRM is considered to form part of the project planning process whereby project risks are identified at the beginning of the project (Bakker *et al.*, 2010). Bakker *et al.* (2010) has termed this approach as the ‘management approach’. The assumption of the management approach is that project risks remain unchanged throughout the project implementation, therefore it aims to identify, plan and implement risk management strategies that can prevent ICT projects from failing (Jaafari, 2001). The strength of the management approach is that it specifically focuses on identifying and managing risks that may affect the current project (Bakker *et al.*, 2010). The limitation of the management approach is that it focuses only on known or foreseeable risks and, thus it provides limited options for managing unforeseeable risks and risks that have occurred (Bannerman, 2008). Figure 3.4 illustrates the management approach to project risk management.

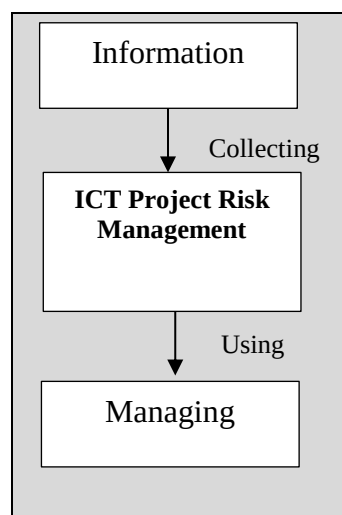


Figure 3.4: The management approach to project risk management (Bakker *et al.*, 2010:495).

Table 3.2 presents the difference between the typical characteristics of the management approach and evaluation approach to project risk management. Due to the complexity and uncertainty around ICT projects, risks associated with the previous project outcomes (risk that are caused by projects that were implemented) must also be identified and managed (Bannerman, 2008). Bakker *et al.* (2010) note that the evaluation and management approaches can be combined to manage ICT project risks. Figure 3.5 shows both of these risk management approaches

combined. The evaluation approach assumes that known ICT project risks be managed in the current projects and contribute to positive project outcomes. The management approach can be used to address new risks identified in the current project and then use lessons learnt in subsequent projects (Bakker *et al.*, 2010).

Table 3.2: The difference between the evaluation approach and management approach to project risk management (Bakker *et al.*, 2010:495).

| Evaluation approach                                | Management approach                                                              |
|----------------------------------------------------|----------------------------------------------------------------------------------|
| Focus on managing generic risks                    | Focus on managing specific risks                                                 |
| Information collected is used in future projects   | Information collected is used in the current projects                            |
| Aims at identifying and quantifying project risks. | Various activities are taken to plan, identify, analyse and treat project risks. |
| Generates general information                      | Achieves direct results                                                          |

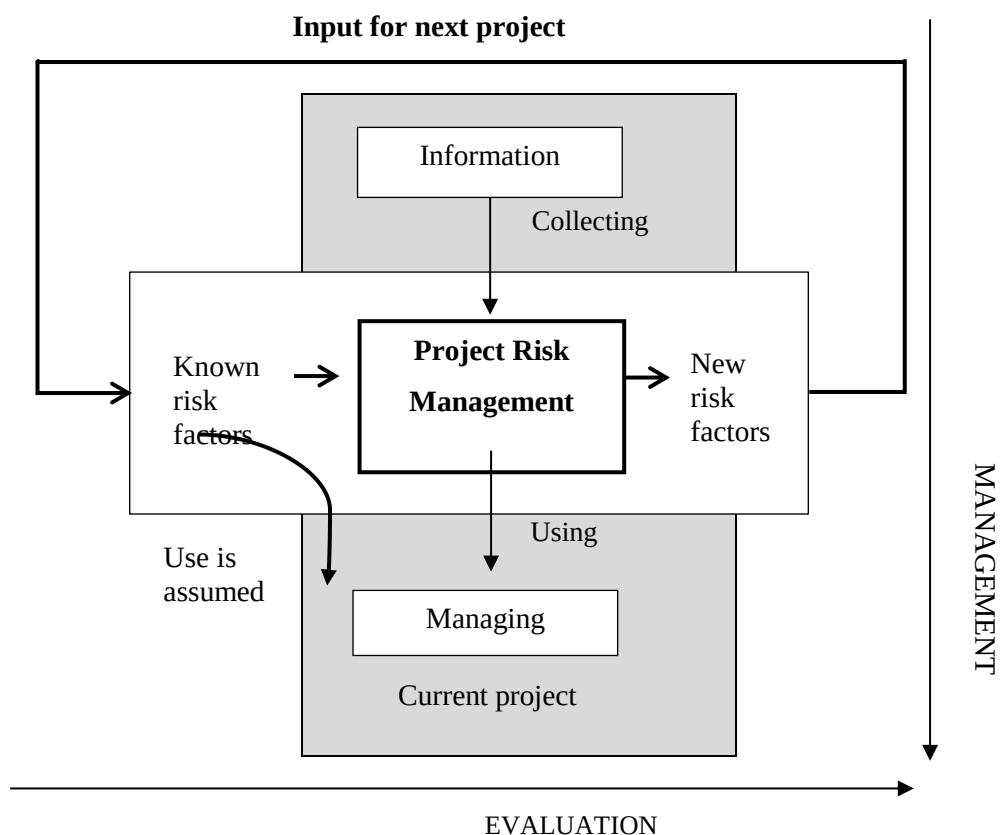


Figure 3.5: Combination of the evaluation approach and the management approach to project risk management (Bakker *et al.*, 2010:496)

A discussion of ICT project risk management processes is provided in Section 3.3.

### 3.3 ICT PROJECT RISK MANAGEMENT PROCESSES

Boehm (1981) is considered to be the father of ICT project management as he defined the first ICT PRM process, and all PRM processes that were defined afterwards were based on his basic process (Wallmüller, 2002).

Boehm (1989) suggests that ICT PRM processes consist of two primary phases, each with three subsidiary phases. The first primary phase is risk assessment which includes risk identification, risk analysis and risk prioritisation. The second primary phase is risk control, which includes risk management planning, risk resolution and risk monitoring planning.

The Institute for Electrical and Electronic Engineers (IEEE) standard for risk management defines a continuous software risk management process that is applicable to all software-related engineering and management disciplines. Phases of the risk management process defined in this standard are: plan and implement risk management, manage the project risk profile, perform risk analysis, and perform risk treatment (IEEE Standards Association, 2001).

According to the International Organisation for Standardisation (ISO 31000:2009), PRM processes include the following steps: establish the context, risk identification, risk analysis, risk evaluation, risk treatment, and monitoring and review.

The Software Engineering Institute (SEI) is a leading source of methodologies for managing ICT development projects. Since the early 1960s, SEI has been conducting research and development on the application of risk management methods, tools, and techniques in ICT projects. All this research has been compiled to form a risk management framework. According to the SEI risk management framework, the ICT PRM process consists of three phases namely: prepare for risk management, perform risk management activities, sustain and improve risk management (Alberts & Dorofee, 2010).

Chapman and Ward (2011) describe the ICT PRM process as consisting of nine phases, namely: define, focus, identify, structure, ownership, quantify, evaluate, plan responses, and monitor and control.

PMI (2013) defines the phases of the PRM process as: plan risk management, identify risk, perform qualitative risk analysis, perform quantitative risk analysis, plan risk responses, and monitor and control.

Looking at the brief description of the different ICT PRM processes, it is evident that there is general agreement on what the processes entail. ICT PRM processes have one common element: it entails planning for activities to be implemented in order to reduce the exposure and severity of ICT project risks (Ben-David & Raz, 2001).

All the proposed PRM processes (Boehm, 1991; IEEE Standards Association, 2001; ISO 31000:2009, 2009; Alberts & Dorofee, 2010; Chapman & Ward, 2011; PMI, 2013) were reviewed and used as a point of reference for the illustration in Figure 3.6 and for the discussions in section 3.3.1 to 3.3.6.

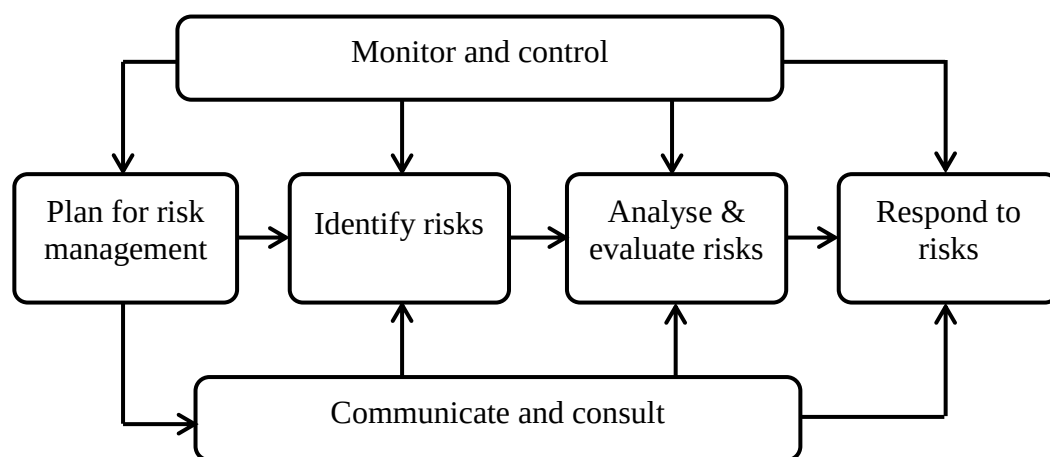


Figure 3.6: Project risk management process

### 3.3.1 Plan risk management

The first step of the ICT project risk management process is to plan for risk management by defining the internal and external parameters that the organisation must consider when managing risks. External parameters include environmental,

political, financial, and regulatory factors. The internal parameters include internal stakeholders, governance, and knowledge and resource factors.

The purpose of this step is to plan and agree on how to execute risk management. The people who are tasked with performing risk management activities should be identified and trained during this phase. Some of the key questions to ask during this phase are:

- How will the risk processes be managed?
- How will they be documented?
- Who is responsible for completing each action in the plan?
- What resources are required to effectively conduct risk management?
- How often should the risks be reviewed?
- Is a contingency plan needed for the risk? If so, what is the contingency plan?

Figure 3.7 describes the input, tools and techniques, and output of the plan risk management phase.

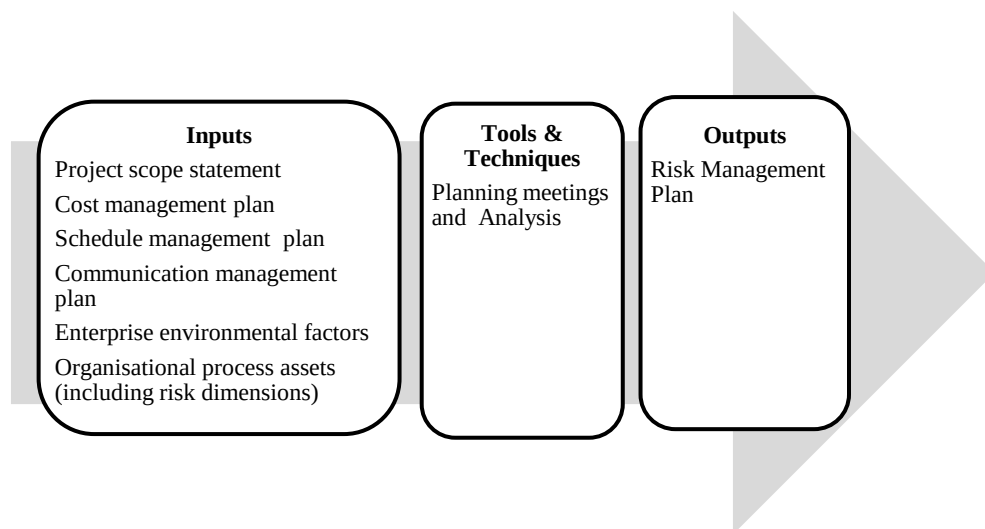


Figure 3.7: Dataflow for the plan risk management phase (Alberts & Dorofee, 2010).

The output of this phase is the risk management plan. Typical information to be included in the risk management plan includes the objectives and scope of the risk management, roles and responsibilities for conducting risk management and a

communication plan that explains how information regarding risks will be shared among key stakeholders.

### 3.3.2 Identify risks

The purpose of this phase is to investigate and determine how current conditions and potential events might negatively impact a project. The identified risks may be grouped into different categories as discussed in Section 3.2.1. Some of the key questions to ask during this phase are:

- What could go wrong? (Event).
- How and why can it happen? (Likelihood)
- What is the consequence of it happening? (Severity).

Figure 3.8 describes the input and output of the identify risks phase as well as the tools and techniques that can be used to ensure that all project risks are properly identified.

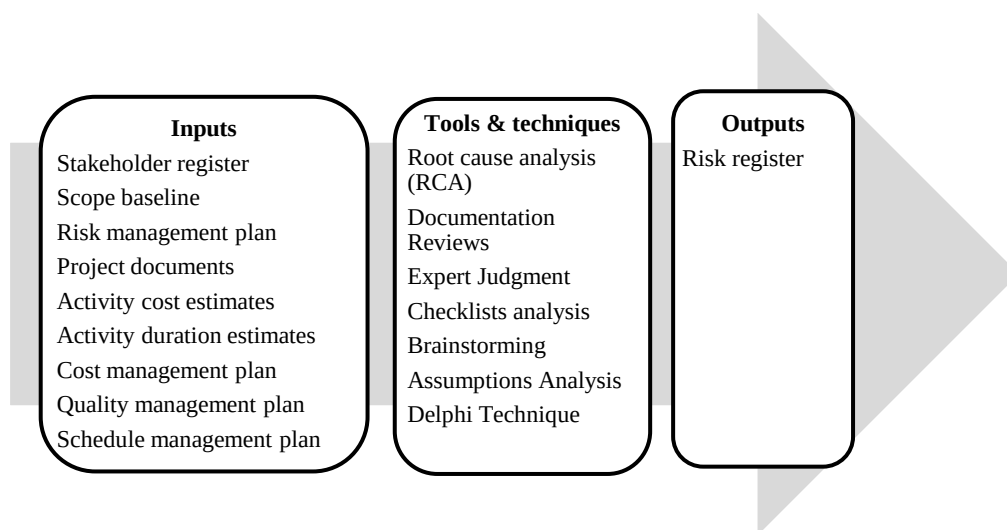


Figure 3.8: Dataflow for the identify risks phase (Alberts & Dorofee, 2010).

The output of this phase is a risk register. The risk register can be in the form a simple document, spread sheet, or a database system. Information such as description, background, severity, profile, owner and contingency plan for each risk is recorded in the risk register.

### 3.3.3 Analyse and evaluate risks

The purpose of this stage is to analyse and evaluate the likelihood and consequences of each risk. The risk factors that might potentially have the highest negative consequence on the project will receive a higher priority regarding how they will be managed. Some of the key questions to ask during this phase are:

- What is the likelihood that the risk will occur?
- What is the severity of the impact if the risk were to occur?
- What is the current snapshot or profile of all risks?

The output of this phase is the updated risk register. Figure 3.9 describes the input, tools and techniques, and output of the analyse-and-evaluate risks phase.

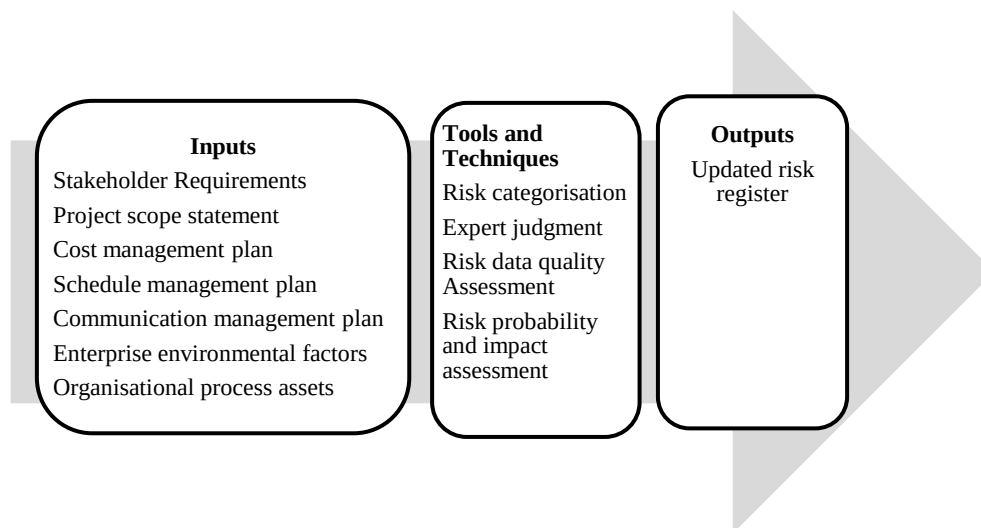


Figure 3.9: Dataflow for the analyse-and-evaluate risks phase (Alberts & Dorofee, 2010).

### 3.3.4 Respond to risks

This phase involves identifying, evaluating and implementing the most appropriate risk treatment strategies. The aim is to reduce or eliminate the likelihood of the risks occurring or to limit the impact of the risk if it occurs. Some of the key questions to ask during this phase are:

- How will we treat the risk?

- What is needed to treat the risks?
- Who has the responsibility to treat the risks?
- What is the timeframe?
- How will it be known that the risks have been successfully managed?

According to Sadgrove (2016), there are four common risk treatment strategies:

- **Accept the risk.** Acceptance of a risk means that no proactive action will be taken to address the risk; the risk will be addressed if it occurs. This strategy is mostly applied to minor risks with low severity. The reason for accepting a risk must be documented and communicated. Accepted risks are not recorded on the risk register.
- **Avoid the risk.** Risk avoidance strategies aim to eliminate the possibility risks. Risks can be avoided by adding, changing, restructuring, or completely removing certain designs or activities from project deliverables. Caution must be taken to ensure that the new added activities do not generate more risks or influence project deliverables.
- **Transfer the risk.** This strategy involves shifting the responsibility of managing risk to someone outside the project. Transferring a risk does not eliminate the chances of a risk materialising, it means giving the responsibility of managing a project risk to someone who is able to manage it effectively; resulting in a better overall outcome for the project. Insurance, guarantees and similar contract methods are classic examples of risk transference strategies.
- **Mitigate the risk.** Mitigation is a strategy whereby some proactive actions are taken to reduce the probability and/or impact of a project risk. The aim of a mitigation strategy is to manage the project in such a manner that the risk event does not occur or, if it does, the impact can be minimised.

Figure 3.10 describes the input, tools and techniques, and output of the respond to risk phase.

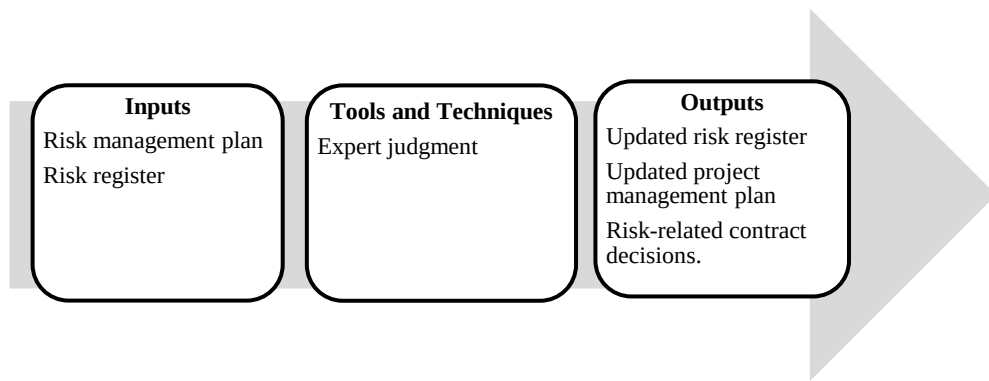


Figure 3.10: Dataflow for the respond to risks phase (Alberts & Dorofee, 2010).

Once a risk management strategy has been chosen and implemented, it becomes a control or a modification to an existing control. The output of this phase are the updated risk register, the updated project management plan, and the risk-related contract decisions.

### 3.3.5 Monitor and control

A risk control is a measure or action that is used to manage a risk. A control may be a policy, procedure, practice, technology or technique that is used to manage a risk. Risk monitoring and control is an on-going activity of risk management, and it is fundamental for every phase of ICT PRM. The aim of the monitor-and-control phase is to check and assess the effectiveness of the risk controls. The output of this phase is mostly updates to the original project documents.

Figure 3.11 describes the input, tools and techniques, and output of the monitor-and-control risks phase.

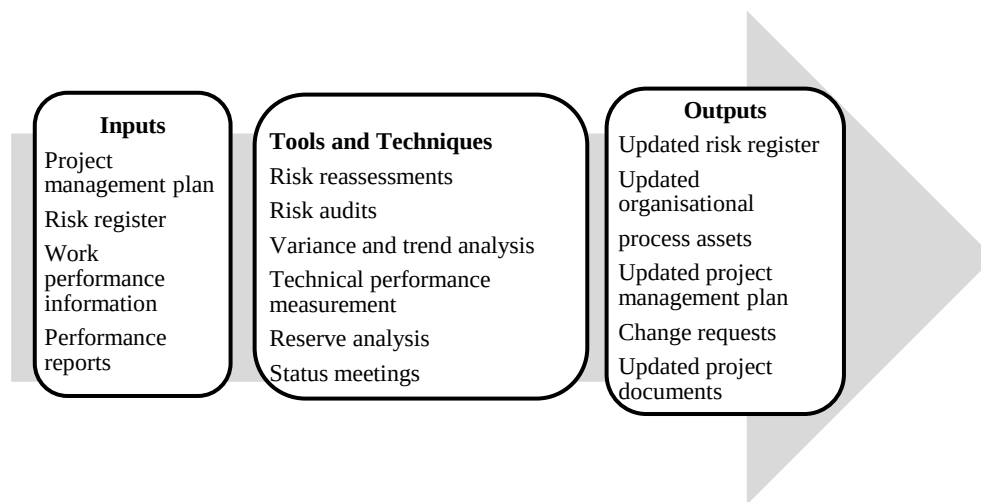


Figure 3.11: Dataflow for the monitor-and-control risks phase (Alberts & Dorofee, 2010).

### 3.3.6 Communicate and consult

Communication with and consultation of stakeholders should occur throughout all the phases of ICT PRM. Consulting with different stakeholders can assist with identifying the unknown-unknowns. The communicate and consult phase aims to ensure that important information generated during the ICT PRM process is captured, communicated, used, and maintained.

## 3.4 COMPLEXITY IN MANAGING ICT PROJECT RISKS

ICT project risk management has been a subject of interest to many researchers (Wallace *et al.*, 2004; Bannerman, 2008; Chapman & Ward, 2011; Carlton, 2017; Hughes *et al.*, 2017; Okumus *et al.*, 2017). Despite being extensively studied and recognised as one of the PBMOK knowledge areas that contribute to project success, risk management is the least practiced project management discipline in ICT projects (Hamilton, 2000:212; Tesh *et al.*, 2007).

Insufficient risk management is ranked as one of the top classic mistakes of ICT project managers (Nelson, 2007). While controls are put in place to ensure that quality projects are delivered on time and within budget, there are no enforceable controls on identifying risks, assessing their potential impact and managing them in such a way that maximum project value is realised (Chapman & Ward, 2003). ICT

project managers often fail to identify and mitigate potential risks and do not notice the risks until late in the project (Jabaghourian & Cvetko, 2002; Dekkers & Forselius, 2007a; Dekkers & Forselius, 2007b; Berghout *et al.*, 2011). The findings of a study by Park and Keil (2009) indicate that ICT project managers are reluctant to report negative information about troubled projects. The study further reveals that ICT project managers prefer to report negative project news to external auditors than to the functional managers, especially when the consequences are high.

The importance for ICT project managers to understand the risk context of their organisation, identify, analyse, evaluate and treat possible risks that may affect their projects was highlighted in Section 3.3. From the discussions in Section 3.2 and Section 3.3, it has become clear that a better understanding of the nature of ICT project risks and its impact on project performance can assist project managers in identifying risk factors that may affect their projects and in developing specific risk management strategies to address those risks. However, the complexity and uncertainty of ICT risks makes it difficult to identify and manage them (Ahmed, 2011).

As discussed in Section 2.5, ICT projects are diverse and very complex to manage when compared to other types of projects. In the same manner, it has been noted that all projects are inherently risky (Charette, 1996), but ICT projects are more risky (Islam *et al.*, 2014:117). Baccarini *et al.* (2004) notes that 60 percent of ICT projects have high consequences. As the complexity of ICT projects increases, the effort on risk management increase exponentially (Kwak & Stoddard, 2004). The uniqueness of ICT projects contribute to the high complexity in managing ICT project risks (Ahmed, 2011). The intangible and complex nature of ICT projects makes it difficult to manage stakeholder expectations (Baccarini *et al.*, 2004). According to Odzaly *et al.* (2009), the following aspects contribute to the complexity in managing ICT project risks:

- There are too many project risks to manage and few resources to manage them.
- ICT project teams are not motivated to perform risk management.
- ICT project risks are not well understood.

In recent years, much has become known about factors that contribute to ICT project failures and various lists of ICT project risk factors have been proposed. Lists of top ICT project risk factors are discussed in Section 3.5.

### **3.5 TOP ICT PROJECT RISKS**

Understanding risk factors that might affect ICT projects can be useful in reducing the probability and severity of risks (Bakker *et al.*, 2010; Jorgensen, 2014). Since the 1970s, several studies relating to ICT project risk factors have been completed and remain current (Keil *et al.*, 1998). The fact that the topic of ICT project risk factors is still relevant and popular amongst ICT researchers indicates the importance and complexity of addressing ICT project risk factors (Barki *et al.*, 2001). From these studies, several risk factors were identified and compiled into lists that ICT project managers can use to identify potential risks that might affect their projects (Bannerman, 2008; Safa'a, 2012).

A total of 245 ICT project risk factors have been identified over the past 39 years (from 1978 to 2017). The ICT project risk factors risk factor lists are summarised in Table 3.3 and further discussed in Section 3.5.1 to Section 3.5.5. The different lists are grouped according to the timeframe in which they were compiled.

Table 3.3: Summary of ICT project risk factor lists

| Author (Year)                     | Number of ICT project risk factors |
|-----------------------------------|------------------------------------|
| Alter and Ginzberg (1978)         | 8                                  |
| Zmud (1980)                       | 4                                  |
| McFarlan (1981)                   | 54                                 |
| Davis (1982)                      | 3                                  |
| Block (1983)                      | 2                                  |
| Boehm (1991)                      | 9                                  |
| Barki <i>et al.</i> (1993)        | 4                                  |
| The CHAOS report (Standish, 1994) | 10                                 |
| Keil <i>et al.</i> (1998)         | 10                                 |
| Lyytinen <i>et al.</i> (1998)     | 6                                  |
| Schmidt <i>et al.</i> (2001)      | 11                                 |
| Yardley (2002)                    | 13                                 |
| Addison and Vallabh (2002)        | 10                                 |
| Addison (2003)                    | 10                                 |
| Smith <i>et al.</i> (2006)        | 10                                 |
| Han and Huang (2007)              | 10                                 |
| Pare <i>et al.</i> (2008)         | 10                                 |
| Conboy (2010)                     | 8                                  |
| Montequin <i>et al.</i> (2014)    | 10                                 |
| Elzamly and Hussin (2015)         | 10                                 |
| Niazi <i>et al.</i> (2016)        | 10                                 |
| Carlton (2017)                    | 4                                  |
| Hughes <i>et al.</i> (2017)       | 10                                 |
| Okumus <i>et al.</i> (2017)       | 9                                  |
| <b>Total</b>                      | <b>245</b>                         |

### **3.5.1 The 1970s**

A study done by Morgan and Soden (1973) was one of the initial studies on the identification of top ICT project risk factors. In a quest to understand factors that cause ICT projects to fail, Morgan and Soden (1973) studied ten failed ICT projects and found that the majority of project failures were caused by management's inability to plan, organise and control a project. Alter and Ginzberg (1978) identified the following top ICT project risk factors:

1. Lack of designer experience with similar system.
2. Non-existent or unwilling users.
3. Multiple users or designers.
4. Turnover among users, designers or maintainers.
5. Lack of support system.
6. Inability to specify the purpose or usage patterns in advance.
7. Inability to predict and cushion impact on all parties.
8. Technical problems, cost effectiveness issues.

### **3.5.2 The 1980s**

McFarlan (1981) identified three dimensions of software risks and 54 risk factors. The three dimensions are project size (refers to size in cost, time, staffing level, or number of affected parties), technology experience (refers to the familiarity of the project team and the organisation with the chosen technology) and project structure. Table 3.4 presents other top ICT project risk factor lists that were compiled in the 1980s.

### **3.5.3 The 1990s**

According to Park and Keil (2009), the top ten ICT project risk factor list identified by Boehm (1991) had more influence on the ICT fraternity than other lists. Although most of the risk factors identified by Boehm do not appear on lists that were compiled afterwards, his list has been cited by 1819 studies. Boehm's list is presented in Table 3.5, alongside other top ICT project risk factor lists that were compiled in the 1990s. It is important to note that although only the ICT project risk factors identified in the CHAOS report (Standish, 1994) are presented in Table 3.5,

the Standish Group has been releasing CHAOS reports every year since 1994. However, Jones *et al.* (2010) note that except for some minor rewording, the top three ICT project risk factors since 1994 are still user involvement, executive management support and clear statement of requirements.

Table 3.4: ICT project risk factor lists compiled in the 1980s.

| Zmud (1980)                                          | Davis (1982)                                                                                  | Block (1983)                                   |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------|
| 1. Technological complexity                          | 1. Existence and stability of a usable requirement                                            | 1. Conflicts of people, time and project scope |
| 2. Degree of novelty or structure of the application | 2. User's ability to specify requirements                                                     | 2. Poor specification of requirements          |
| 3. Technological change                              | 3. Ability of analysts to elicit requirements and evaluate their correctness and completeness |                                                |
| 4. Project size                                      |                                                                                               |                                                |

### 3.5.4 The 2000s

Schmidt *et al.* (2001) completed a study to identify and rank common ICT project risk factors affecting ICT projects in Hong Kong, Finland and the USA. Forty-three ICT project managers participated in the study: 11 from Hong Kong, 13 from Finland and 19 from the USA. Based on the study findings, top ten ICT project risk factors were identified for each country (Safa'a, 2012). The top ten ICT project risk factor lists from the USA, Finland and Hong Kong are presented in Table 3.6, alongside other top ICT project risk factor lists that were compiled in the 2000s.

Smith *et al.* (2006) conducted a study to identify common ICT project risk factors affecting ICT projects in South Africa. The study reviewed ICT project risk factors lists compiled by (Boehm, 1989; Oz & Sosik, 2000; Schmidt *et al.*, 2001; Addison & Vallabh, 2002; Jiang *et al.*, 2002; DeMarco & Lister, 2003). The top ten ICT project risk factor list compiled by Smith *et al.* (2006) are also presented in Table 3.6. Table 3.6 indicates that the lack of top management commitment to the project was mostly identified as the number one ICT project risk factor in the 2000s.

Table 3.5: ICT project risk factor lists compiled in the 1990s.

| <b>Boehm (1991)</b>                                   | <b>Barki <i>et al.</i> (1993)</b> | <b>Standish (1994)</b>                     | <b>Keil <i>et al.</i> (1998)</b>                                 | <b>Lyytinen <i>et al.</i> (1998)</b>   |
|-------------------------------------------------------|-----------------------------------|--------------------------------------------|------------------------------------------------------------------|----------------------------------------|
| 1. Personnel shortfalls                               | 1. Task complexity                | 1. Incomplete requirement                  | 1. Lack of top management commitment to the project              | 1. Scheduling and timing               |
| 2. Unrealistic schedules and budgets                  | 2. The extent of changes          | 2. Lack of user involvement                | 2. Failure to gain user commitment                               | 2. System functionality                |
| 3. Developing wrong software functions and properties | 3. Magnitude of potential loss    | 3. Lack of resources                       | 3. Misunderstanding requirements                                 | 3. Sub-contracting                     |
| 4. Developing the wrong user interface                | 4. Resource insufficiency         | 4. Unrealistic expectations                | 4. Lack of adequate user involvement                             | 4. Requirement management              |
| 5. Gold-plating                                       |                                   | 5. Lack of executive support               | 5. Lack of required knowledge or skills in the project personnel | 5. Resource usage                      |
| 6. Continuing stream of requirements changes          |                                   | 6. Changing requirements and specification | 6. Lack of frozen requirements                                   | 6. Performance and personal management |
| 7. Shortfalls in externally furnished components      |                                   | 7. Lack of planning                        | 7. Changing scope or objectives                                  |                                        |
| 8. Shortfalls in externally performed tasks           |                                   | 8. Did not need it any longer              | 8. Introduction of new technology                                |                                        |
| 9. Real-time performance shortfalls                   |                                   | 9. Lack of IT management                   | 9. Failure to manage end-user expectations                       |                                        |
| 10. Straining computer-science capabilities           |                                   | 10. Technology illiteracy                  | 10. Insufficient/ inappropriate staffing                         |                                        |

Table 3.6: Top ICT project risk factor lists compiled in the 2000s.

| USA<br>(Schmidt <i>et al.</i> , 2001)               | Finland<br>(Schmidt <i>et al.</i> , 2001)           | Hong Kong<br>(Schmidt <i>et al.</i> , 2001)         | South Africa<br>(Smith <i>et al.</i> , 2006)        | (Addison & Vallabh, 2002)              | (Baccarini <i>et al.</i> , 2004) | (Addison, 2003)                                                                                                                   | (Han & Huang, 2007)                                   | (Pare <i>et al.</i> , 2008)                 |
|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|----------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------|
| 1. Lack of top management commitment to the project | 1. Lack of top management commitment to the project | 1. Lack of top management commitment to the project | 1. Lack of top management commitment to the project | 1. Lack of senior management committee | 1. Poor leadership               | 1. Lack of top management commitment and support                                                                                  | 1. Corporate politics with negative effect on project | 1. Lack of commitment from upper management |
| 2. Lack of adequate user involvement                | 2. Failure to gain user commitment                  | 2. Lack of adequate user involvement                | 2. Lack of adequate user involvement                | 2. Failure to gain user involvement    | 2. Unrealistic expectations      | 2. Lack of user commitment and involvement                                                                                        | 2. Inadequate estimation of required resources        | 2. Lack of project champion                 |
| 3. Misunderstanding of the requirements             | 3. Misunderstanding of the requirements             | 3. Misunderstanding of the requirements             | 3. Unclear/ misunderstood scope or objectives       | 3. Misunderstanding of requirements    | 3. Incomplete requirements       | 3. Misunderstanding the user requirement                                                                                          | 3. Unclear system requirements                        | 3. Project ambiguity                        |
| 4. Not managing change properly                     | 4. Not managing change properly                     | 4. Failure to manage end user expectations          | 4. Not managing change properly                     | 4. Continuous requirement changes      | 4. Inadequate user documentation | 4. Too narrow focus on the ICT project issues and overlooking the impact on the distribution channels and the business in general | 4. Continually changing system requirements           | 4. Poor perceived system usefulness         |

Table 3.6: Top ICT project risk factor lists compiled in the 2000s.

| USA<br>(Schmidt <i>et al.</i> , 2001)         | Finland<br>(Schmidt <i>et al.</i> , 2001)     | Hong Kong<br>(Schmidt <i>et al.</i> , 2001) | South Africa<br>(Smith <i>et al.</i> , 2006)                                                    | (Addison & Vallabh, 2002)              | (Baccarini <i>et al.</i> , 2004)                                     | (Addison, 2003)                                             | (Han & Huang, 2007)                              | (Pare <i>et al.</i> , 2008)            |
|-----------------------------------------------|-----------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------|----------------------------------------|
| 5. Failure to gain user commitment            | 5. Lack of frozen requirements                | 5. Failure to gain user commitment          | 5. Lack of available skilled personnel                                                          | 5. Gold-plating                        | 5. Diminished window of opportunity due to late delivery of software | 5. Failure to manage end-user expectation                   | 5. Project progress not monitored closely enough | 5. Lack of required knowledge or skill |
| 6. Lack of effective project management skill | 6. Lack of effective project management skill | 6. Lack of cooperation from users           | 6. Lack of client responsibility, ownership and buy-in of the project and it's delivered system | 6. Inadequate knowledge or skills      | 6. Personnel shortfalls                                              | 6. Lack of e-commerce project experience                    | 6. System requirements not adequately identified | 6. Insufficient resources              |
| 7. Changing scope or objectives               | 7. No planning or inadequate planning         | 7. Lack of frozen requirements              | 7. No planning or inadequate planning                                                           | 7. Unrealistic schedules and budgeting | 7. Unreasonable project schedule and budget                          | 7. Inadequate security features being built into the system | 7. Poor project planning                         | 7. Organisational instability          |

Table 3.6: Top ICT project risk factor lists compiled in the 2000s.

| USA<br>(Schmidt <i>et al.</i> , 2001)               | Finland<br>(Schmidt <i>et al.</i> , 2001)                       | Hong Kong<br>(Schmidt <i>et al.</i> , 2001) | South Africa<br>(Smith <i>et al.</i> , 2006) | (Addison & Vallabh, 2002)                           | (Baccarini <i>et al.</i> , 2004)                                | (Addison, 2003)                                                                           | (Han & Huang, 2007)                                    | (Pare <i>et al.</i> , 2008)                                 |
|-----------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------|----------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------|
| 8. Lack of effective project management methodology | 8. Lack of people skill in project leadership                   | 8. Change in ownership of senior management | 8. Poor risk management                      | 8. Lack of effective project management methodology | 8. Lack of agreed user acceptance testing and sign-off criteria | 8. Lack of understanding of web-page design principles                                    | 8. Lack of an effective project management methodology | 8. Changes to membership on the project team                |
| 9. Failure to manage end-user expectations          | 9. Lack of required knowledge or skill in the project personnel | 9. Changing scope or objectives             | 9. Schedule Flaw                             | 9. Development of wrong software functions          | 9. Continuous changes to requirements by client                 | 9. Insufficient procedures to ensure security, integrity and availability of the database | 9. Incorrect system requirements                       | 9. Political games or conflicts                             |
| 10. Unclear/ misunderstood scope or objectives      | 10. Artificial deadlines                                        | 10. Conflict between user departments       | 10. Project not based on sound business case | 10. Unclear or misunderstood scope or objectives    | 10. Poor production system performance                          | 10. Absence of the declared business benefits                                             | 10. Project involved the use of new technology         | 10. Misalignment of system with local practices and process |

### 3.5.5 2010 to present

According to Conboy (2010), most of the previous studies on ICT project risk factors focused on identifying risk factors related to people or processes only and not on identifying risk factors related to project budget control. In 2010, he completed a study to investigate and identify risk factors that contribute to overspending in ICT projects. The results of the study are presented in Table 3.7. Similar studies completed between 2010 and 2017 include studies by Montequin et al. (2014), Elzamly and Hussin (2015), Niazi et al. (2016), Carlton (2017), Okumus et al. (2017) and Hughes et al. (2017). The top ICT project risk factors as identified in these studies are presented in Table 3.7

The main objective of Montequin et al. (2014) study was to identify common factors that contribute to the success and failure of ICT projects in Spain. A questionnaire was distributed to 36 Project Management groups in LinkedIn, resulting in 26 risk factors being identified and ranked according to their frequency. The results show that most of the risk factors relate to project management processes.

The aim of Elzamly and Hussin (2015) study was to identify risk factors affecting ICT projects in Palestinian software development organizations, rank the risk factors according to their importance, severity and occurrence frequency and to propose controls that can be used to mitigate the risks. Data was collected using a structured questionnaire, whereby top ten ICT project risk factors and controls from literature were presented to the respondents. All questions relating to the occurrence, frequency and importance of ICT project risk factors were measured on a seven-point Likert scale from unimportant to extremely important and ICT project risk controls were measured on a seven-point Likert scale from never to always. The findings of this study show that all ICT project risk factors were very important, according to project managers' perspective.

The objective of Niazi et al. (2016) study was to identify risk factors from clients and vendors perspectives, that might affect global ICT projects. The risk factors were identified through a systematic literature review of documents retrieved from different online databases (ACM Digital Library, IEEE Explore, Science Direct, Springer Link and John Wiley). Based on the literature review findings, a web-based

questionnaire was developed and used to validate the existence of identified risk factors in global ICT projects. As a result, 19 risk factors were identified. Most of the identified ICT project risk factors relates to risk management, human resource management and communication management knowledge areas (Section 2.2.3). There were no risks related to procurement and stakeholder management knowledge areas.

Carlton (2017) study focused on undertaking a post-mortem examination of a very large ICT project in Australia. The objective of the study was to identify risk factors that ultimately caused the project to fail and to propose new set of measures to improve project performance. A comprehensive analysis of project documentation (emails, reports, project plans and other data) indicates that factors that caused the project to fail appear in the literature on failed projects, and that project managers highlighted the risk factors throughout the project and identified possible risk treatment strategies, however the risk factors were not managed until the project costs were overspent.

The purpose of Okumus et al. (2017) was to identify possible risk factors that may affect ICT projects in hotel companies and to evaluate strategies to overcome them. Empirical data was collected through in-depth semi-structured interviews with information technology managers, chief information officers (CIOs), and hotel general managers. Nine ICT project risk factors were identified and specific strategies that can be employed to overcome them were recommended.

Hughes et al. (2017) study was concluded as an attempt to provide an up to date review of the most common ICT project risk factors and to provide practical recommendations that ICT project managers can apply to manage the top ten risk factors. Relevant sources from different academic journals were reviewed and analysed to identify groupings of the most common ICT project risk factors. According to the study findings, lack of effective and engaged sponsorship from executive is the most critical risk factors.

| Table 3.7: Top ten ICT project risk factor lists compiled from 2010 to present.     |                                                                  |                                                                    |                                       |                                                                                                                                                                         |                                                    |                                                                            |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------|
| <b>Conboy (2010)</b>                                                                | <b>Montequin <i>et al.</i> (2014)</b>                            | <b>Elzamly and Hussin (2015)</b>                                   | <b>Niazi <i>et al.</i> (2016)</b>     | <b>Carlton (2017)</b>                                                                                                                                                   | <b>Okumus <i>et al.</i> (2017)</b>                 | <b>Hughes <i>et al.</i> (2017)</b>                                         |
| 1. Accounting staff's lack of familiarity regarding ICT projects                    | 1. Lack of management support                                    | 1. Lack of senior management commitment and technical leadership   | 1. Lack of co-ordination              | 1. Stakeholders' conflicts remained throughout the life of the project                                                                                                  | 1. Resistance from owners/executives               | 1. Poor executive support, sponsorship and inadequate management structure |
| 2. Organisational culture (no budget-related communication within the organisation) | 2. Customer's requirements inaccurate, incomplete or not defined | 2. Misunderstood/unrealistic scope and objectives (goals)          | 2. Requirement engineering activities | 2. Internal advice was ignored and team members were unable to find an avenue to raise their concerns                                                                   | 2. Cost of implementation                          | 2. Poor requirements management                                            |
| 3. Length of development iteration                                                  | 3. Inaccurate time estimations                                   | 3. Unrealistic schedules and budgets                               | 3. Cost and effort estimation         | 3. There was a complete lack of accountability for failure evident throughout the project and especially when it came to vendor and contract management                 | 3. Time delays (non-adherence to project schedule) | 3. Poor project management and project planning                            |
| 4. Customer involvement                                                             | 4. Continuous dramatic changes to original requirements          | 4. Change in organizational management during the software project | 4. Change management activities       | 4. A lack of domain expertise by senior management responsible for the project as evidenced by the inability or unwillingness to adopt appropriate governance processes | 4. Resistance from employees                       | 4. Factors relating to poor change management and user resistance          |

|                                                    |                                                                              |                                                                     |                                                                |  |                                                       |                                                                  |
|----------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------|--|-------------------------------------------------------|------------------------------------------------------------------|
| 5. Transparency of budget process                  | 5. Quality checks not or badly performed                                     | 5. Lack of an effective software project management methodology     | 5. Lack of a uniform process among different development sites |  | 5. Lack of benefits (Return on investment) management | 5. Inadequate post-mortem process.                               |
| 6. Project culture                                 | 6. Wrong number of people assigned to projects (too many or too few)         | 6. Insufficient/inappropriate staffing                              | 6. Allocation of tasks                                         |  | 6. Inadequate training                                | 6. Staff turnover, commitment, motivation and performance issues |
| 7. Complexity of the business/ development context | 7. Not or badly defined specifications at the time the project start to work | 7. Ineffective communication software project system                | 7. Lack of knowledge management and transfer among teams       |  | 7. System integration                                 | 7. Poor business case, objectives and evaluation stage           |
| 8. Customer type                                   | 8. Inaccurate costs estimations                                              | 8. Poor/inadequate software project planning and strategic thinking | 8. Lack of control                                             |  | 8. Communication problems with the vendor             | 8. Risk and budget management failings                           |
|                                                    | 9. Project requirements inadequately documented                              | 9. Low key user involvement                                         | 9. Conflict management                                         |  | 8. Resistance from customers                          | 9. Poor contractor and stakeholder relationship                  |
|                                                    | 10. Unrealistic customer's expectations                                      | 10. Absence of historical data (templates)                          | 10. Lack of trust                                              |  |                                                       | 10. Project too large and complex                                |

### 3.5.6 Analysis of top ten ICT project risk factors lists

Considering the ICT project risk factors presented in Sections 3.5.1 to 3.5.5, there are various lists that exist in the literature, which makes it difficult for project managers to identify the most important ICT project risk factors. In his study, Arnuphaptrairong (2011) reviewed and analysed eight top ten ICT project risk factor lists available in the literature. Out of all the lists discussed in Sections 3.5.1 to 3.5.5, only the lists by Boehm (1991), Schmidt *et al.* (2001), (Addison & Vallabh, 2002); Addison (2003), Han and Huang (2007) and Pare *et al.* (2008) were reviewed in Arnuphaptrairong (2011) study. The findings of his study are presented in Table 3.8 and Table 3.9.

Table 3.8 shows the risk dimensions and the frequency of each dimension (Section 3.2.1). Table 3.8 indicates that out of the eighty top ICT project factors identified, most (27) of the risk factors fall under the planning and control dimension, with only four risk factors falling under the complexity dimension.

Table 3.8: ICT project risks frequency by dimension (Arnuphaptrairong, 2011:4).

| Dimensions of ICT project risks | Total frequency |
|---------------------------------|-----------------|
| Planning & control              | 27              |
| Requirements                    | 17              |
| User                            | 14              |
| Team                            | 9               |
| Organisational environment      | 9               |
| Complexity                      | 4               |
| <b>Total</b>                    | <b>80</b>       |

Table 3.9 presents the top ICT project risk factors as identified by project managers (most frequently mentioned across the eight lists) as well as the dimension that each risk factor falls under. These are risk factors that appeared on two or more lists.

Table 3.9: Top ICT project risk factors frequency (Arnuphaptrairong, 2011:4).

| Rank | ICT project risk factors                      | Frequency | Dimension                  |
|------|-----------------------------------------------|-----------|----------------------------|
| 1.   | Misunderstanding of requirements              | 5         | Requirements               |
| 2.   | Lack of top management commitment and support | 5         | Organisational Environment |
| 3.   | Lack of adequate user involvement             | 4         | User                       |
| 4.   | Failure to gain user commitment               | 3         | User                       |
| 5.   | Failure to manage end user expectation        | 3         | User                       |
| 6.   | Changes to requirements                       | 3         | Requirements               |
| 7.   | Lack of an effective project management       | 3         | Planning & Control         |

The results further show that out of the seven frequently mentioned ICT project risk factors, three falls under user dimension, two falls under requirements, and the organisational and planning and control dimensions have one risk factor each. This analysis provides a different perspective than Table 3.8. Table 3.8 shows that out of the eight top ten lists, only 17.5% (14 out of 80 risk factors) of the identified ICT project risk factors fall under the user dimension. One would have expected that most of the factors presented in Table 3.9 would fall under the planning and control risk dimensions as it is the most prevalent dimension, based on the analysis presented in Table 3.8. According to Arnuphaptrairong (2011), the reasons for these differences may be due to the different people, application areas, culture or time that the lists were compiled in. It is for this same reason that Arnuphaptrairong (2011) encourages organisations to develop their own top ICT project risk factor lists.

The recently compiled lists of ICT project risk factors (Hughes *et al.*, 2017; Okumus *et al.*, 2017) indicate that the lack of top management commitment and support, poor requirements management, poor project management and project planning, poor change management and lack of effective project management processes are the most prevalent causes of ICT project failures.

### 3.6 SUMMARY

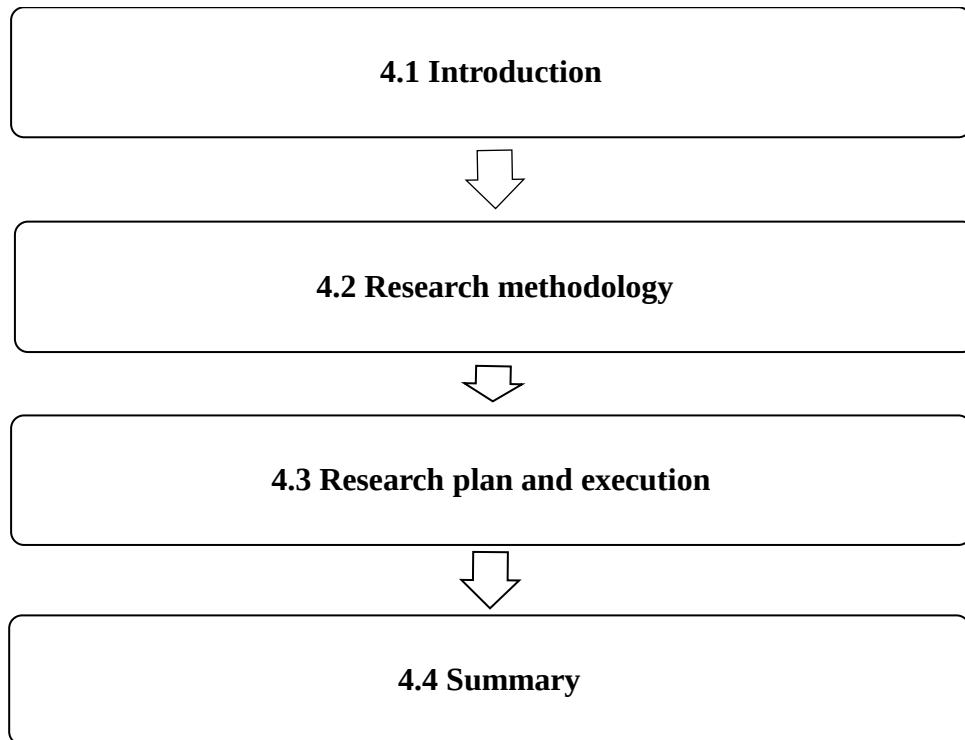
In this chapter definitions of ICT project risks and ICT project risk management were provided. Risk management is regarded as the least mature of all project management knowledge areas in the PMBOK. This chapter explained the benefits of project risk management and how important it is to other project management knowledge areas. This chapter identified and briefly discussed the PRM processes. Input, output, and tools and techniques used in each phase of the PRM process were also discussed. Finally, lists of top ICT project risk factors from the literature were reviewed and analysed.

There are more than 245 ICT project risk factors identified in literature (Table 3.3), which makes it very difficult for project managers to choose a list to use as the lists were compiled at different periods of time, by people from different backgrounds, using different research methods. It is therefore, important for organisations to compile their own lists of top ICT project risk factors.

An exploratory study was done to identify the top ten ICT project risks in one South African organisation. Chapter 4 describes the research methodology that was used to conduct the exploratory study.

## CHAPTER 4

### RESEARCH DESIGN AND METHODOLOGY



## 4.1 INTRODUCTION

Research refers to the process of applying methods and techniques to draw new conclusions and expand scientific knowledge in a systematic, controlled and replicable manner (Welman & Kruger, 1999:2). It is “something that people undertake to find out things in a systematic way, thereby increasing their knowledge” (Saunders *et al.*, 2009:5). Based on this definition, Saunders *et al.* (2009) further note that research has the following characteristics:

- Data is collected systematically.
- Data is interpreted systematically.
- There is a clear purpose.

It is important that researchers plan and define how they are going to conduct research before they embark on it (Remenyi *et al.*, 2002). Researchers need to identify and explain the philosophical assumptions and research methods and techniques that they will use to ensure that data is collected and analysed systematically and that research objectives are achievable (Myers, 1997; Holden & Lynch, 2004). As Trauth (2001) puts it, researchers must define what they want to learn and how they will go about learning it.

The aim of this chapter is to describe the different research methodologies from the literature and to explain the research plan that was proposed and executed in this study. In Section 4.2, the research methodology is discussed in terms of its philosophical assumptions, designs, methods, participant selection techniques, data collection and data analysis procedures. Section 4.3 describes the research plan that was used to conduct this study, and explains why the researcher adopted the specific approach.

## 4.2 RESEARCH METHODOLOGY

After conducting research, researchers should provide a narrative of how they started their studies, how they identified the research problem and how they addressed the research questions (Rowlands, 2005). Research can be considered unreliable if the chosen research methodology and methods are not compatible to the researchers’ philosophical assumptions (Smith *et al.*, 2009). As such, Gray

(2004:19) advise researchers to ensure that there is a connection between the philosophical assumptions that they adopt and the methods and techniques that they choose to use for their studies. According to Blaikie (2007:5) researchers must even be able to link their philosophical assumptions and chosen methods and techniques back to the research problem and objectives.

Remenyi *et al.* (1998:23) suggest that to ensure that their studies are reliable, researchers should ask themselves questions like “What to research?”, “How to research?” and “Why research?”. Answers to these questions will assist the researchers in ensuring that their philosophical assumptions and chosen research methods and techniques are related (Remenyi *et al.*, 1998:23).

The suggestions by Remenyi *et al.* (1998) are discussed next.

### **Why research?**

Researchers should be able to explain the need and relevance of their studies, and how their research will contribute to the growth of the knowledge base (Remenyi *et al.*, 1998). Researchers should define clear research objectives that indicate the purpose and direction of how the research will be carried out (Saunders *et al.*, 2009:34). As Carroll (2014) explains, there are two possible forms of research: experimental or non-experimental research. Experimental research attempts to explore a cause-effect relationship whilst non-experimental research aims to gain more insight and explore the depth, richness, and complexity of phenomena (Carroll, 2014). Non-experimental research can be further classified as descriptive, exploratory or explanatory studies:

- **Descriptive studies:** Descriptive studies are generally used to accurately describe the characteristics of a phenomenon before collecting data on it (Robson, 2002:59). When conducting descriptive studies, researchers are more interested in understanding the characteristics of the phenomenon, and not in reasons why they present those characteristics (Saunders *et al.*, 2009:138; O'Dwyer & Bernauer, 2014).
- **Exploratory studies:** Exploratory studies are particularly useful in research that aims to understand a problem, ask questions and assess the phenomena in a new light. An exploratory study can be conducted by doing the literature review,

interviewing subject matter experts and conducting focus group interviews (Saunders *et al.*, 2009:140).

- Explanatory studies: Explanatory studies explain the problem or situation in a form of causal relationships. Explanatory studies are more suitable to help researchers understand participants' attitudes, opinions and decisions (Saunders *et al.*, 2009:138; O'Dwyer & Bernauer, 2014).

### **What to research?**

As part of their research methodology researchers should explain what they intend to study and identify the institution they will use to pursue their research (Remenyi *et al.*, 1998; Saunders *et al.*, 2009:43).

### **How to research?**

Researchers should adopt a strict scientific methodology that will ensure that their study findings are considered valid and reliable (Remenyi *et al.*, 1998). Researchers should not accept scientific knowledge just based on conclusions by a single source, they should also check how the findings were concluded (Welman & Kruger, 1999).

Research philosophies are discussed in Section 4.2.1.

#### **4.2.1 Research philosophies**

Research philosophies describe the perceptions, beliefs and assumptions regarding the nature of reality and about the development of knowledge (Blaikie, 2007:12; Richards & Morse, 2007:10). According to Hirschheim and Klein (1989), research philosophies consist of assumptions about ontology, epistemology, axiology and methodology:

- Ontology relates to the views regarding the nature of reality.
- Epistemology relates to how knowledge can be obtained.
- Axiology relates to the researcher's view of the role of values in research.
- Methodology relates to how knowledge is gained. It concerns the data collection and data analysis procedures that researchers can use to gain knowledge.

Therefore, the philosophy that researchers choose to adopt reflects the way they view the world as well as the relationship between knowledge and the process by which it is developed (Krauss, 2005:759; Cooke-Davies *et al.*, 2009). It should be noted that different phenomena may require the use of different philosophies and that even though the philosophies are theoretically distinct, the distinction can be less clear in practice (Nieuwenhuis, 2007:57; Kura, 2012).

In ICT research, the starting point of a researcher's methodological choice is not about what method to employ or the nature of chosen methods, but it is about the researcher's philosophical assumptions (Dobson, 2001). Orlikowski and Baroudi (1991:5) suggest the three underlying philosophies for ICT research as positivism, interpretivism, and realism. However, pragmatism is seen as an independent and viable alternative philosophy for ICT research (Tashakkori & Teddlie, 1998:30; Goldkuhl, 2008).

The four philosophies are summarised in Table 4.1 and discussed in Section 4.2.1.1 to Section 4.2.1.4.

#### **4.2.1.1 Positivism**

Positivism is concerned with uncovering and generalising laws of relationships (Welman *et al.*, 2005). Positivists assume that objective knowledge is gained by testing theories against facts (Robson, 2002). Their approach to research is to focus on quantifiable observations that lend themselves to statistical and experimental analysis (Cohen D & Crabtree B, 2006). Findings of positivist research are law-like generalisations similar to those in the physical and natural sciences (Saunders *et al.*, 2009:114).

ICT research can be classified as positivistic if it focuses on the evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and generalising on conclusions drawn from samples (Orlikowski & Baroudi, 1991:5).

Table 4.1: Summary of four main research philosophies ICT research (Saunders *et al.*, 2009:119).

|                                                                                            | Positivism                                                                                                                                                                                                   | Interpretivism                                                                                                                                         | Realism                                                                                                                                                    | Pragmatism                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ontology:</b><br>Researcher's view of the nature of reality or being                    | <ul style="list-style-type: none"> <li>• External</li> <li>• Objective</li> <li>• Independent of social actors</li> </ul>                                                                                    | <ul style="list-style-type: none"> <li>• Socially constructed</li> <li>• Subjective</li> <li>• May change</li> </ul>                                   | <ul style="list-style-type: none"> <li>• Objective</li> <li>• Independent of human thoughts, knowledge and beliefs</li> <li>• Critical realist</li> </ul>  | <ul style="list-style-type: none"> <li>• External</li> <li>• Multiple view chosen to best enable answering of research question</li> </ul>                                                                        |
| <b>Epistemology:</b><br>Researcher's view regarding what constitutes acceptable knowledge  | <ul style="list-style-type: none"> <li>• Only observable phenomena can provide credible data</li> <li>• Facts</li> <li>• Focus on generalisation</li> <li>• Reduce phenomena to simplest elements</li> </ul> | <ul style="list-style-type: none"> <li>• Subjective phenomena</li> <li>• Subjective meaning</li> <li>• Focus on realities behind situations</li> </ul> | <ul style="list-style-type: none"> <li>• Direct realism</li> <li>• Critical realism</li> <li>• Focus on explaining within a context or contexts</li> </ul> | <ul style="list-style-type: none"> <li>• Observable phenomena and subjective meanings can provide knowledge</li> <li>• Focus on practical applied research</li> <li>• Integrate different perspectives</li> </ul> |
| <b>Axiology:</b><br>Researcher's view of the role of values in research                    | <ul style="list-style-type: none"> <li>• Value-free</li> <li>• Independent</li> <li>• Objective</li> </ul>                                                                                                   | <ul style="list-style-type: none"> <li>• Value-bound</li> <li>• Subjective</li> </ul>                                                                  | <ul style="list-style-type: none"> <li>• Value laden</li> <li>• Biased by world views, cultural experiences and upbringing</li> </ul>                      | <ul style="list-style-type: none"> <li>• Objective and subjective</li> <li>• Values play a role in interpreting results</li> </ul>                                                                                |
| <b>Research methods:</b><br>Data collection and analysis techniques that are commonly used | <ul style="list-style-type: none"> <li>• Highly structured</li> <li>• Large samples</li> <li>• Quantitative, but can use qualitative</li> </ul>                                                              | <ul style="list-style-type: none"> <li>• Small samples</li> <li>• In-depth investigations</li> <li>• Qualitative</li> </ul>                            | <ul style="list-style-type: none"> <li>• Subjective</li> <li>• Quantitative or qualitative</li> </ul>                                                      | <ul style="list-style-type: none"> <li>• Mixed or multiple methods</li> <li>• Quantitative and qualitative</li> </ul>                                                                                             |

#### 4.2.1.2 Interpretivism

Interpretivism is concerned with understanding phenomena from the perspectives of the people involved in it (Welman & Kruger, 1999:8). Interpretivists advocate that the world is constructed by a series of multiple, unique and holistic realities and that each reality must be understood and taken account of (Saunders *et al.*, 2009:116). On an epistemological level, interpretivists accept that knowledge is

personal, subjective and unique and the only way of gathering knowledge is by exploring the participants' perceptions and experiences regarding a phenomenon (Jorgensen, 2012:376) . Hence, interpretivists consider researchers' interpretations and sense making as part of scientific knowledge (Kura, 2012).

In recent years, interpretive research has emerged as a prevalent philosophy in ICT research (Walsham, 1995a). It is well established and published in ICT literature (Orlikowski & Baroudi, 1991; Myers, 1997; Klein & Myers, 1999; Walsham, 2006). In ICT, interpretive research is aimed at investigating human and social aspects of ICT systems (Walsham, 1995b).

ICT research can be classified as interpretive if it assumes that the knowledge of reality is gained through shared meanings (Klein & Myers, 1999), and that those shared meanings are intersubjective (Walsham, 2006:320). Suchman (1987) provides an example of interpretive ICT research when she investigated the problem of human-machine interaction by analysing how novice users used the ICT system. She argues that in order to understand a particular phenomenon, we need to look at how its actors interact with it (Suchman, 1987).

In a quest to guide ICT researchers in conducting and evaluating interpretive studies, Klein and Myers (1999) propose seven Principles. They encourage ICT researchers to consider and apply all the principles systematically. The principles are summarised in Table 4.2.

Table 4.2: Summary of seven principles for conducting and evaluating interpretive research (Klein & Myers, 1999:72).

|                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>1. The fundamental principle of the hermeneutic circle</b></p> <p>This principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.</p>                  |
| <p><b>2. The principle of contextualisation</b></p> <p>Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.</p>                                                                                              |
| <p><b>3. The principle of interaction between the researcher(s) and the participants</b></p> <p>Requires critical reflection on how the research data was socially constructed through the interaction between the researcher(s) and participants.</p>                                                                                             |
| <p><b>4. The principle of abstraction and generalisation</b></p> <p>Requires relating the idiographic details revealed by the data interpretation through the application of principles of the hermeneutic circle and of contextualisation to theoretical, general concepts that describe the nature of human understanding and social action.</p> |
| <p><b>5. The principle of dialogical reasoning</b></p> <p>Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (the story that the data tells) with subsequent cycles of revision.</p>                                                                           |
| <p><b>6. The principle of multiple interpretations</b></p> <p>Requires sensitivity to possible differences in interpretation among the participants, and are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.</p>        |
| <p><b>7. The principle of suspicion</b></p> <p>Requires sensitivity to possible ‘biases’ and systematic ‘distortions’ in the narratives collected from the participants</p>                                                                                                                                                                        |

#### 4.2.1.3 Realism

Realists accept that reality exists independently of people’s beliefs, thoughts and perceptions (Carlsson, 2011). From an ontological viewpoint, realists believe that reality exists independently of people’s beliefs, thoughts and perceptions. Krauss (2005:761) defines two forms of realism, namely direct and critical realism. Direct realism claims that “what you see is what you get” and that people’s experience portrays the world accurately (Krauss, 2005:761). Critical realism claims that “what

we really see are sensations that represent reality” (Krauss, 2005:761). In other words, what we see is only part of the bigger picture. Critical realism assumes that reality is not dependent on scientific theories and that scientific theories do not have a privileged position in the way reality is viewed (Saunders *et al.*, 2009:114).

Critical realism is more common in ICT research because critical realists’ view that the social world is constantly changing is more aligned to ICT research (Saunders *et al.*, 2009:115). ICT research can be classified as critical realism if it is heavily concerned with the application of ICT in the business (Dobson, 2001). Orlikowski (1992) provides an example of the use of critical theory in ICT when she investigates the implementation of computer-aided software engineering (CASE) tools using a structuration approach. She argues that the formulation of technological concepts and the structuration model of technology allows for a deeper understanding of the interaction between the technology and the organisation.

#### **4.2.1.4 Pragmatism**

According to Tashakkori and Teddlie (1998:30), pragmatism is a philosophy that is guided by practical matters that can lead to change. Although they are not particularly concerned about the researchers’ views and assumptions of reality, pragmatists acknowledge that these two aspects play an important part in conducting research and concluding on research findings (Teddlie & Tashakkori, 2009:90). Pragmatists believe that it is possible to work with both positivist and interpretivist philosophies, especially if the research questions do not explicitly suggest that either a positivist or interpretivist philosophy be adopted (Saunders *et al.*, 2009:109) .

Goldkuhl (2008:4) identifies three kinds of pragmatisms in ICT research, namely functional, referential, and methodological pragmatism.

- Functional pragmatism. Functional pragmatism is based on the foundation of “knowledge for action”. This kind of pragmatism aims at gaining practical knowledge that can be used to improve ICT systems.
- Referential pragmatism. Referential pragmatism is based on the foundation of “knowledge about action”. It is concerned with describing ICT concepts in a practical manner.

- Methodological pragmatism. Methodological pragmatism is based on the foundation of “knowledge through action”. People can learn ICT systems through experiences, action and reflections on actions.

ICT research can be classified as pragmatic if it assumes that ICT systems are fundamentally symbolic language systems and that the real value of ICT systems lies in their potential to support human communication and collaboration activities (Ågerfalk *et al.*, 2008).

Once the research philosophy has been adopted, considerations can be given to research design (Remenyi *et al.*, 1998:44). The research design is discussed in Section 4.2.2.

## **4.2.2 Research Design**

The research design refers to the general plan of how the researcher will go about answering research questions (Richards & Morse, 2007). Researchers’ choice of research design is consistent with the research questions, objectives and the research philosophy (Kura, 2012). Research designs that are popular and often used in ICT research are grounded theory, case study, action research, design science research and phenomenology. The research designs are discussed from Section 4.2.2.1 to Section 4.2.2.5.

### **4.2.2.1 Grounded theory research**

Grounded theory is a research methodology that aims to generate theory that is grounded and shaped by the realities of different participants’ daily lives. The theory evolves during the actual research, through continuous interplay between data collection and analysis (Strauss & Corbin, 1994).

### **4.2.2.2 Case study research**

Robson (2002:178) describes a case study as “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence”. Case study strategy gives answers to ‘Why?’, ‘What?’ and ‘How?’ questions, and is often used in explanatory and exploratory research (Saunders *et al.*, 2009:146).

#### **4.2.2.3 Action research**

Action research focuses on bringing change to solve a real organisational problem together with those who experience the problem directly (Saunders *et al.*, 2009:147) and on expanding scientific knowledge (Halonen, 2008). Rapoport (1970) explains action research as research that aims to contribute both to the practical concerns of people and to the goals of social science by collaborating within a mutually acceptable framework. Action research makes assumptions that there is a concrete client involved, there is a specific problem that must be addressed and there is a collaborative democratic partnership between a researcher and participants (Iivari & Venable, 2009). According to Susman (1983), the formulation of action research is a cyclical process that consists of the following phases.

- Diagnosing. The diagnosis phase includes defining the problem statement, identifying theoretical concepts related to the research, defining research objectives and identifying participants.
- Action planning. The action planning phase focuses on establishing a research approach.
- Action taking. During this phase, a researcher and participants actively work together to implement the planned action.
- Evaluating. The evaluating phase focuses on determining whether undertaken actions solved a research problem.
- Specifying learning. Action research considers learning as an on-going activity. Lessons learnt may be applied in practice, added to the knowledge base or be used in diagnosing further action research interventions.

#### **4.2.2.4 Design science research**

Design science research involves the creation and evaluation of new innovative ICT artefacts intended to solve identified organisational problems, and the design is used as a method of solving organisational problems (Vaishnavi & Kuechler, 2004). The fundamental principle of design science is that knowledge and understanding of a design problem and its solution are acquired in the building and application of an artefact. Artefacts can be instantiations, constructs, models and methods applied in

the development and use of information systems (Hevner *et al.*, 2004). The iterative process of design science research consists of the following phases.

- Problem Awareness. The aim of this step is to identify the problem that the organisation is experiencing.
- Suggestion. The aim of this phase is to suggest a possible design solution in a form of an artefact.
- Development. The development of an artefact is done in this phase.
- Evaluation. The aim of this step is to evaluate if the artefact can solve the problem that the organisation is facing.
- Conclusion. The conclusion phase indicates the end of a research project (Vaishnavi & Kuechler, 2004).

#### **4.2.2.5 Phenomenology**

Phenomenological research explains perspective, situations and people's daily experiences (Smith, 2007:28). Phenomenological research is suitable for research whereby participants are diverse and have different experiences (Smith, 2007:29). In phenomenological research, the researchers' interpretation of people's perspective, situations and daily experiences are regarded as reality (Welman & Kruger, 1999). According to Gray (2004:28), phenomenological research has the following characteristics:

- Emphasises inductive logic.
- Seeks the opinions and subjective accounts and interpretations of participants.
- Relies on qualitative analysis of data.
- Is not so much concerned with generalisations to larger populations, but with contextual description and analysis.

Section 4.2.3 provides a discussion on different research methods that can be employed to answer research questions.

#### **4.2.3 Research Methods**

A research method is a "consistent way of making, interpreting, analysing and judging the resulting theoretical outcome" (Richards & Morse, 2007:10). A decision

to choose a specific method is based on researchers' ontological and epistemological perspectives, phenomena, research objectives, theoretical framework of analysis, time and resources disposable to researchers, research audiences and suitability to answer the research questions (Kura, 2012; Creswell, 2013). The way researchers answer research questions will lead to research that tends to take a qualitative, quantitative or multiple method approach (Creswell, 2013). Research method choices are explained in Section 4.2.3.1 to Section 4.2.3.3 and contrasted in Table 4.3.

#### **4.2.3.1 Qualitative research methods**

Qualitative research methods enable researchers to understand the social and cultural contexts of the phenomenon from the participants' point of view (Saunders *et al.*, 2009:151). Generally, research that aims to answer 'What?', 'How?' or 'Why?' questions tends to use qualitative methods as they allow researchers to probe and ask open-ended questions (Myers, 1997; Mack *et al.*, 2005). Collected data is usually descriptive and can be used to explaining what is going on in organisations (Avison *et al.*, 1999). Therefore, qualitative research methods are more suitable for exploratory research that aims at providing:

- Rich data about the phenomena.
- Understanding of the contextual nature of the phenomena.
- Clear understanding of the multidimensionality and complexities of issues.
- Insight into how individuals understand and perceive the phenomena.
- More insight into causal processes (Kura, 2012:10).

The process of qualitative research begins with identifying research questions, collecting data in the participants' setting, analysing the data by identifying emerging themes, interpreting data and reporting on the findings (Creswell, 2013:4). Data collection techniques commonly used in qualitative research are observations, unstructured interviews and documentary analysis (Creswell, 2009). Interviews and observation are discussed in sections 4.2.5.2 and 4.2.5.3. Qualitative research usually adopts grounded theory, case study or phenomenology research design (Creswell, 2009).

According to Trauth (2001), the research problem, the researcher's philosophical assumptions and the degree of uncertainty surrounding the problem influence the researcher's choice of qualitative research methods. Trauth (2001) further explain that the nature of a research problem has the most significant influence on the choice of research method. Remenyi *et al.* (2002) agree that what the researcher want to study has a lot of influence on the choice of research method.

Due to the complexity, diversity and richness of ICT research, ICT researchers are encouraged to use research methods that can help them get a holistic understanding of the phenomena they are studying (Davison & Martinsons, 2015). As such, qualitative research methods are commonly applied in ICT research (Myers, 1997).

#### **4.2.3.2 Quantitative research methods**

Quantitative research methods were originally developed in the natural sciences (Myers, 1997). As such, they are deeply rooted in the positivistic epistemological orientations and are used to collect and analyse quantifiable data (Kura, 2012:11). Generally, research that aims to answer 'How many?' or 'How much?' questions tend to use quantitative research methods (O'Dwyer & Bernauer, 2014:5). Collected data is usually quantifiable and the findings are generalisable (Creswell, 2013).

Examples of quantitative data collection methods are questionnaires and experiments (Myers, 1997). Questionnaires are discussed in Section 4.2.5.3.

#### **4.2.3.3 Multiple research methods**

Multiple research methods refer to the use of more than one data collection and analysis procedure to answer the research questions (Saunders *et al.*, 2009:151). Multiple research methods can be classified as the multi-method approach or the mixed method approach.

The multi-method approach refers to the use of associated multiple data collection and analysis procedures, but it is restricted to either qualitative or quantitative methods. Meaning that in order for a study to be considered as a multi-method qualitative study, a combination of either qualitative data collection methods and qualitative data analysis procedures or a combination of quantitative data collection methods and quantitative data analysis should be used (Saunders *et al.*, 2009:152).

The mixed-method approach refers to the use of both qualitative and quantitative data collection and analysis procedures. Mixed-method research uses a combination of both qualitative and quantitative data collection and analysis procedures to either quantify qualitative data or qualify quantitative data (Saunders *et al.*, 2009:152).

The differences between qualitative and quantitative research methods are explained in Table 4.3.

Table 4.3: Comparison of quantitative and qualitative research approaches (Mack *et al.*, 2005:3).

|                                    | Quantitative                                                                                                                                                                                                                                                                                         | Qualitative                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General framework</b>           | <ul style="list-style-type: none"> <li>• Seek to confirm hypotheses about phenomena</li> <li>• Instruments use more rigid style of eliciting and categorising responses to questions</li> <li>• Use highly structured methods such as questionnaires, surveys, and structured observation</li> </ul> | <ul style="list-style-type: none"> <li>• Seek to explore phenomena</li> <li>• Instruments use more flexible iterative style of eliciting and categorising responses to questions</li> <li>• Use semi-structured methods such as in-depth interviews, focus groups, and participant observation</li> </ul>                                                                      |
| <b>Analytical objectives</b>       | <ul style="list-style-type: none"> <li>• To quantify variation</li> <li>• To predict causal relationships</li> <li>• To describe characteristics of a population</li> </ul>                                                                                                                          | <ul style="list-style-type: none"> <li>• To describe variation</li> <li>• To describe and explain relationships</li> <li>• To describe individual experiences</li> <li>• To describe group norms</li> </ul>                                                                                                                                                                    |
| <b>Question format</b>             | <ul style="list-style-type: none"> <li>• Close-ended</li> </ul>                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Open-ended</li> </ul>                                                                                                                                                                                                                                                                                                                 |
| <b>Data format</b>                 | <ul style="list-style-type: none"> <li>• Numerical (obtained by assigning numerical values to responses)</li> </ul>                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• Textual (obtained from audiotapes, videotapes, and field notes)</li> </ul>                                                                                                                                                                                                                                                            |
| <b>Flexibility in study design</b> | <ul style="list-style-type: none"> <li>• Participant responses do not influence or determine how and which questions researchers ask next.</li> <li>• Study design is subject to statistical assumptions and conditions</li> <li>• Study design is stable from beginning to end</li> </ul>           | <ul style="list-style-type: none"> <li>• Participant responses affect how and which questions researchers ask next</li> <li>• Study design is iterative, that is, data collection and research questions are adjusted according to what is learned</li> <li>• Some aspects of the study are flexible (e.g. addition, exclusion, or wording of interview questions).</li> </ul> |

Section 4.2.4 explains sampling techniques and sample size guidelines for qualitative research.

#### **4.2.4 Participant selection**

Data is a very critical aspect for the success of any research project, researchers need to think about how they will access the data they need for their studies. The ability to gather research data depends on the availability of reliable participants (Saunders *et al.*, 2009:169). Ritchie *et al.* (2013) advise researchers to review similar studies in the literature to identify characteristics of people who are known to have interest and impact in their research topic before they select participants for their studies. Sampling techniques that are commonly used in qualitative research are accidental sampling, purposive sampling, and snowball sampling:

- Accidental sampling (also known as incidental sampling) is the most convenient sampling technique. It refers to the collection of members of the population that are near and readily available for research purposes (Welman & Kruger, 1999).
- The purposive sampling technique is regarded as the most important sampling technique (Welman & Kruger, 1999). With the purposive sampling technique, researchers select suitable participants based on their experiences and knowledge of the research topic (Saunders *et al.*, 2009:237). A purposive approach is well-suited for small-scale and in-depth studies (Ritchie *et al.*, 2013:80).
- Snowball sampling begins with the researcher asking participants to refer and recommend other individuals who would be able to add value to the research (O'Dwyer & Bernauer, 2014).

In qualitative research, researchers may decide on the sample size prior to data collection or use the data saturation point as a guideline for their sample size (Guest *et al.*, 2006:65; Mason, 2010). Smith *et al.* (1997:57) recommend that a minimum of three and maximum of six participants be used for a first qualitative interpretative study. Creswell (1998:64) recommends between five and 25 participants whilst Morse (1994:225) and Guest *et al.* (2006) agree that six participants are a suitable sample size for a qualitative study that uses interviews as data collection technique.

Using the data saturation point as a guideline for their sample size means that researchers will continue collecting data until nothing new is generated (Green & Thorogood, 2004). Glaser and Strauss (1967:65) define data saturation as the point at which “no additional data are being found whereby the researcher can develop properties of the category. As he sees similar instances repeatedly, the researcher becomes empirically confident that a category is saturated”. Reaching data saturation point is dependent on the depth of participants’ knowledge on the research topic, how the researcher wants to compare or contrast data received from participants and the practical restrictions (time or access to participant) that the researcher is working under (Pietkiewicz & Smith, 2014).

Section 4.2.5 discusses different data collection techniques suitable for ICT research.

#### **4.2.5 Data Collection**

Data collection refer to the ways in which the researcher gains insight into situations and into people’s perception, views and opinions (Easterby-Smith *et al.*, 2002:10). Data collection techniques are the specific procedures and instruments that researchers use to investigate and gather data about the research problem (Myers, 2013). According to Welman and Kruger (1999:147), there are two sources of data: primary data and secondary data. Primary data is original data collected for a specific purpose. Primary data can be collected through interviews, questionnaires or observation (Saunders *et al.*, 2009). Secondary data include raw and published data already collected by individuals or institutions for other purposes (Welman & Kruger, 1999:147). Sources of secondary data includes written materials (e.g. emails, reports, minutes of meetings, books, journal articles, dissertations, theses and the Internet), non-written materials (e.g. voice and video recordings, pictures, drawings) or survey results (Welman & Kruger, 1999:147). Smith (2007:32) advises researchers to clear up any possible misunderstandings or misinterpretations of concepts before they collect data.

Data collection techniques that are popular and often used in ICT research are discussed in section 4.2.5.1 to section 4.2.5.4.

#### **4.2.5.1 Interviews**

Interviews are purposeful discussions between two or more people. Interviews can be structured, semi-structured or unstructured. Structured interviews are suitable for collecting quantifiable data using identical sets of questions. Semi-structured interviews are suitable to be used in research in which a prime concern is to understand the way participants describe the phenomena (Saunders *et al.*, 2009:320). When conducting semi-structured interviews, researchers may use interview schedules containing lists of specific themes and questions to be covered, but the flow of the conversation will direct the order of questioning. Unstructured interviews are informal discussions whereby participants are given the opportunity to talk freely about events, behaviour, and beliefs in relation to the topic (Welman & Kruger, 1999; Saunders *et al.*, 2009). In phenomenological research, it is not advisable to conduct interviews without recording them (Smith, 2007:64),

#### **4.2.5.2 Observations**

Observation refers to the systematic data gathering approach that includes viewing, recording, describing, analysing and interpreting people's behaviour (Saunders *et al.*, 2009:288).

#### **4.2.5.3 Questionnaires**

Questionnaires are used to gather data that is subject to quantitative analysis (Saunders *et al.*, 2009). According to Blaxter *et al.* (2010), questionnaires are a suitable data collection technique to use if the researcher wants to formulate precise written questions to specific people whose opinion and experiences are important to the research (Blaxter *et al.*, 2010).

#### **4.2.5.4 Literature review**

Researchers should consult the literature (anything related to their studies that is already known and documented), be able to choose information that they consider valuable to their studies and organise it into a review (Saunders *et al.*, 2009:58; Robson & McCartan, 2016). Reviewing the literature involves searching, identifying, and analysing documents related to the research problem (Creswell, 2013; Robson & McCartan, 2016). The purpose of reviewing the literature is to

ensure that there is no duplication of research (Saunders *et al.*, 2009:58). From the literature review, researchers can identify gaps in the knowledge base and formulate research questions (Trauth, 2001)

Jankowicz (2005:161) explains the concept of the literature review very well: “there is little point in reinventing the wheel, the work that you do is not done in a vacuum, but builds on the ideas of other people who have studied the field before you. This requires you to describe what has been published, and to marshal the information in a relevant and critical way”.

It is equally important for researchers to clarify whether the literature was used inductively or deductively (Saunders *et al.*, 2009). By means of a deductive approach (also known as testing a theory), researchers develop theory and adopt research strategies to test the formulated theory. With an inductive approach (known as building a theory) researchers collect data and attempt to develop a theory based on that data (Saunders *et al.*, 2009). According to Creswell (2013), qualitative researchers use the literature inductively, in an exploratory manner that is consistent with expectations of what they want to learn from the participants. In qualitative research, the literature review is usually presented at the following sections of the research report.

- Introductory chapter. The literature is used to provide background to the research problem that the research aims to address and to highlight the need and importance of embarking on the study.
- Separate chapters or sections. The literature is discussed in separate sections or chapters, typically at the beginning of the report to describe concepts integral to the study.
- Final chapters. In the final chapters of the dissertation, the findings of the study are compared and contrasted to the literature (Walsham, 1995b; Creswell, 2013).

#### **4.2.6 Data Analysis**

Data analysis refers to the process of revising, transforming and organising data in such a way that it can make sense (Welman & Kruger, 1999). Qualitative data is based on meanings expressed through words and as such need to be summarised and

grouped before it is analysed (Saunders *et al.*, 2009). Pietkiewicz and Smith (2014:11) recommend that qualitative researchers should “try to step into the participants’ shoes as far as possible” for them to be able to view data according to the participants’ perspective but at the same time be able to view data according to the outsider’s perspective. Viewing data according to the participants’ perspective gives researchers a chance to understand the participants’ world. On the other hand, viewing data according to the outsider’s perspective gives researchers a chance to develop a higher level of understanding and knowledge into the participants’ world (Pietkiewicz & Smith, 2014:11). Researchers may use computer-aided qualitative data analysis software applications (CAQDAS) to support the data analysis process (Welman & Kruger, 1999:225).

Interpretative phenomenological analysis (IPA) is a qualitative analytic method that aims at providing researchers’ interpretation of the participants’ meaning about their perspective, situations and daily experiences (Smith, 2007). According to Larkin and Thompson (2012), the analytic process of IPA consists of the following steps.

- Step 1. Familiarisation with text.

IPA begins at the level of the individual case, with close analysis (coding) of the claims, concerns, and understanding of each participant. At this stage, the researcher reads the interview transcript repeatedly (usually in conjunction with listening to the audio recording) and makes notes and comments where the participant said something interesting or significant.

- Step 2. Identification of the emerging themes.

The researcher works through the transcript again and records emerging themes.

- Step 3. Grouping themes together.

The researcher starts to interpret the data by continually referring to the transcripts and connecting related themes. This step leads to the development of a more interpretative account.

- Step 4. Development of a structure or frame that illustrates the relationships between themes.

Extracts and commentary are used to explain the data. The data is then organised according to the themes identified, in a format that allows for coded data to be traced right through the analysis. The format can be in a form of a visual guide like a simple diagram or table.

#### **4.2.7 Rigour and evaluation of method**

All research studies are open for evaluation to assess their worth, the credibility of the methodology used and the accuracy of the study findings (Myers, 1997; Long & Johnson, 2000; Remenyi *et al.*, 2002). Qualitative studies are assessed on reliability and validity of the study findings (Saunders *et al.*, 2009).

- Reliability refers to the extent to which data collection or analysis techniques can be relied upon in order to ensure that the study findings are consistent over time (Saunders *et al.*, 2009:156). The reliability of a qualitative research study can be demonstrated by providing an audit trail of the research methodology chosen by the researcher and the factors that influenced those choices (Koch, 2006).
- The validity of a qualitative research study refers to the degree to which the research findings are accepted as sound and legitimate by people with an interest in them (Smith, 2007:236). According to Long and Johnson (2000), the validity of a qualitative research study is concerned with determining how well the research method measures exactly what it intends to measure. It reflects the relevance of data to the research questions (Long & Johnson, 2000). The validity of a qualitative research study can be enhanced by demonstrating the validity of the data collection method used and the validity of the researcher's interpretation of the study findings (Mason, 2002).

#### **4.2.8 Ethical considerations**

In qualitative studies, ethics are considered as a moral stance that involves respecting and protecting participants (Myers, 2013:48). Myers (2013:49) states that one of the most important ethical aspects for qualitative research is the responsibilities toward the research participants. The well-being of the participants is the researcher's main focus. During interviews, researchers should monitor the

participant's reactions and should stop the interview if the participant is uncomfortable discussing specific issues (Pietkiewicz & Smith, 2014). McNabb (2002) and (Myers, 2013) identified four practical ethical principles that must be considered in qualitative research.

- **Truthfulness.** The principle of truthfulness means that it is unethical for researchers to purposely lie, misrepresent any findings, claim other researchers' work as their own, deceive or commit any form of fraud. Researchers should always indicate limitations of their findings and must always acknowledge any previous work that was consulted and contributed to their own research.
- **Thoroughness.** The principle of thoroughness means that researchers must provide a comprehensive description of their research methodology.
- **Objectivity.** This principle means that researchers should not allow their values to affect the research process and findings.
- **Relevance.** The principle of relevance means that research must establish the need and relevance of their studies before they embark on it.

Section 4.3 explains how the study was initiated, explored and how data was collected to understand the problem and reflect on the way the participants view their world.

### **4.3 RESEARCH PLAN AND EXECUTION**

In this section, the research plan that was executed and the rationale for conducting this research is discussed. The research methodology that was followed to address the research questions will be discussed and explanations of how the researcher came to decide which approach to adopt will be provided. The section comprises of six sub-sections: Section 4.3.1 provides a narrative of how this study started and explains the relevance of this study; Section 4.3.2 describes the philosophical stance that the researcher adopted; Section 4.3.3 describes the research method that was used; Section 4.3.4 explains the criteria and techniques used to select participants for this study; Section 4.3.5 explains how data was collected; Section 4.3.6 explains steps taken to ensure that findings of this study are valid and reliable and Section

4.3.7 explains the actions that were taken to ensure that the study is conducted in an ethical manner.

Figure 4.1 illustrates a summary of the research methodology adopted in this study.

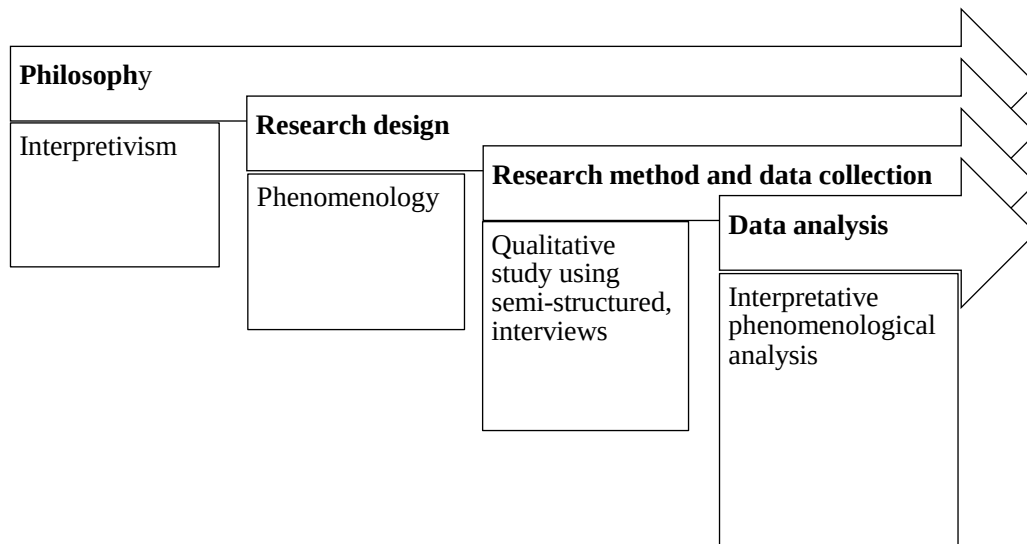


Figure 4.1: Summary of the research methodology adopted in this study

### 4.3.1 Background

The researcher developed an interest to pursue this study after being involved in the development of ICT projects for different organisations for over ten years. As an ICT manager who leads a team of ICT project managers, the researcher's own interests lie in ensuring that ICT projects deliver expected benefits. However, being part of the change advisory board, architecture review board, tactical planning, priority management and programme management committees exposed the researcher to the high failure rate of ICT projects in the organisation. Concerned about this high failure rate, the researcher wanted to explore and investigate the common ICT project risk factors, check if these factors are unique to the organisation and define strategies that can be used to manage these factors. The researcher wanted to know how she can make it easier for project managers to understand and manage the ICT project risk factors. Eventually, this experience led to the commencement of this study.

The research problem for this study was identified as the difficulty for ICT project team members to identify top ten risk factors affecting ICT projects and define strategies to manage them (Section 1.2). The researcher wanted to widen her knowledge in the ICT project management and ICT project risk management field by investigating the research problem. This research forms part of a postgraduate study and therefore, findings of this research are reported in a form of a dissertation. The audience of this study were identified as the examiners who will assess the study findings, ICT project managers, ICT project team members, students and researchers who are interested in learning about ICT project risk factors.

The main objective of this study is to identify top ten ICT project risk factors in one South African organisation and to propose risk treatment strategies that can be used to manage these risks.

The organisation falls within the manufacturing sector and has a very focused and strong project pipeline intended to capitalise on growth opportunities both in Southern Africa and North America. The organisation's ICT project portfolio includes data analytics, collaboration services, infrastructure projects to cater for business growth, and introduction of cloud computing services (such as software as a service, platform as a service, and infrastructure as a service). The organisation has adopted a global integrated business services model that is built on principles of global ICT process ownership, standardised ICT processes and methodologies and shared ICT services. ICT support services are mostly outsourced. External project management services may be sourced if specific skills do not exist within the internal project teams.

Two research questions were formulated:

- What are the top ten ICT project risk factors in one South African organisation?
- What are the most appropriate risk treatment strategies for managing the top ten ICT project risks?

The researcher conducted the literature review to identify the most common ICT project risk factors. However, after completing the initial literature review, the researcher realised that there are many top ICT project factor lists in the literature and did not know which list to use as all the lists were compiled at different periods

of time, by people from different backgrounds using different research methods. The researcher then decided to first embark on an exploratory study, with the aim of understanding and compiling an ICT project risk factor list that is specific to the organisation.

The philosophical assumptions that the researcher adopted are explained in Section 4.3.2.

### **4.3.2 Philosophical stance**

On an epistemological level, the researcher accepts the same assumptions as Jorgensen (2012:376); that knowledge is personal, subjective and unique and that the only way of gathering knowledge is by exploring the participants' perceptions and experiences regarding a phenomenon (Table 4.1). This assumption situates this research within the interpretive philosophy and suggests that phenomenology be used as the research design. In the case of this inductive study, ICT project team members were asked to identify risk factors that they consider to be commonly affecting ICT projects in the organisation.

As discussed in Section 4.2.1.2, Klein and Myers (1999) propose seven principles for the conduct and evaluation of interpretive ICT research. Table 4.4 summarises the seven principles and illustrates how they were applied in this study.

Table 4.4: Application of the seven principles for conducting and evaluating interpretive research (Klein & Myers, 1999:72) in this study.

| Principles for interpretive study                                                                                                                                                                                                                                                                                                        | Application in this study                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>1. The fundamental principle of the hermeneutic circle</b></p> <p>This principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form.</p> <p>This principle of human understanding is fundamental to all the other principles.</p> | <p>This study applied the fundamental principle of the hermeneutic circle by first understanding the participants' definition of 'risks' before asking them to identify common ICT project risk factors.</p> <p>This study attempts to understand the whole (main objectives) and its parts (secondary objectives) by first addressing the first objective (identifying top ICT project factors from one organisation).</p>         |
| <p><b>2. The principle of contextualisation</b></p> <p>Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.</p>                                                                                    | <p>This study applied the principle of contextualisation by conducting a literature review that gives background on key concepts that are integral to this study: ICT project management (Chapter 2) and ICT project risk management (Chapter 3).</p> <p>A narrative of how the study was initiated and where it was conducted is provided in Section 4.3.1.</p>                                                                    |
| <p><b>3. The principle of interaction between the researchers and the subjects</b></p> <p>Requires critical reflection on how the research data was socially constructed through the interaction between the researchers and participants.</p>                                                                                           | <p>The principle of interaction was applied by describing and reflecting on the way in which the researcher chose and interacted with participants of the research. Section 4.3.4 explains how participants were selected. Section 4.3.5 describes the interactions between the researcher and the participants during data collection. A reflection of this interaction was also important during data analysis (Section 5.2).</p> |

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>4. The principle of abstraction and generalisation</b></p> <p>Requires relating the idiographic details revealed by the data interpretation through the application of principles of the hermeneutic circle and of contextualisation to theoretical, general concepts that describe the nature of human understanding and social action.</p> | <p>The researcher's interpretation of the interview data resulted in the identification of 44 themes (Section 5.4.1). Themes were grouped into main themes, which resulted in ten main themes identified. The ten main themes represent the top ten ICT project risk factors (Section 5.4.2).</p>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p><b>5. The principle of dialogical reasoning</b></p> <p>Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (the story that the data tells) with subsequent cycles of revision.</p>                                                                           | <p>The researcher initially planned to take one of the ICT project risk factor lists from the literature and ask participants to rank the risk factors according to their criticality in the organisation.</p> <p>However, after completing the initial literature review, the researcher realised that there are many top ICT project factor lists described in literature and did not know which one to use. The researcher then decided to first embark on an exploratory study, with the aim of understanding and compiling an ICT project risk factor list that is specific to the organisation.</p> <p>An exploratory study was carried out to prevent bias and improve reliability of interpretations.</p> |
| <p><b>6. The Principle of Multiple Interpretations</b></p> <p>Requires sensitivity to possible differences in interpretation among the participants, and are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.</p>        | <p>All the interviews were audio recorded and notes were taken. The notes were used to supplement recorded data. After each interview, the researcher played the audio tape repeatedly as data was being transcribed. The transcribed data was saved and coded into themes using Atlas.ti software.</p>                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>7. The Principle of Suspicion</b></p> <p>Requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants</p>                                                                                                                                                                        | <p>This principle was applied by asking probing questions and seeking clarity (if needed) during the interviews.</p> <p>Participants were asked to confirm data that had been collected from previous interviews. For example, a third participant was asked to confirm data that had been collected from first and second participants.</p>                                                                                                                                                                                                                                                                                                                                                                      |

### 4.3.3 Research method

Qualitative data collection methods and data analysis procedures were selected for this study. Qualitative research methods allowed the researcher to uncover the story behind common causes of ICT project failures in one South African organisation and at the same time address the first research objective: to identify the top ten ICT project risks in one South African organisation.

As discussed in Section 4.2.3.1, the research problem, the researcher's philosophical assumptions, and the degree of uncertainty surrounding the problem influenced the choice of qualitative methods in ICT research. Below is an explanation of how these factors influenced the researcher's choice of qualitative research methods.

- The research problem

The research problem relates to the identification of common risk factors that contribute to the high failure rate of ICT projects (Section 1.2). As a starting point, the researcher reviewed the literature to look for possible answers. A review of the literature indicated that many ICT project risk factor lists have been compiled (Section 3.5), but she was uncertain as to which list to use as all the lists were compiled under different circumstances. The problem statement for this study is defined as:

*It is difficult for ICT project team members to identify top ten risk factors affecting ICT projects and define strategies to manage them.*

To be able to address this problem, it was important that the researcher choose a research method that allowed for the research problem to be explored, investigated and understood according to the ICT project team members' point of view.

- The researcher's philosophical assumptions

The researcher adopted interpretive philosophical assumptions that knowledge is personal, subjective and unique and that the only way of gathering knowledge is by exploring the participants' perceptions and experiences regarding a phenomenon (Table 4.1). Therefore, it was important that the researcher choose a research method

that could capture and accept multiple, unique, and holistic view of realities as experienced by participants (Section 4.3.2).

- Degree of uncertainty surrounding the problem

There are ongoing debates on whether risks are inherently negative or if they can be both negative and positive (Section 3.2.1). So, it was important that the researcher choose a research method that would allow for the participants' perceived meaning of 'risks' to be clarified and understood (Table 4.3).

#### **4.3.4 Participant selection**

A combination of purposive and snowball sampling techniques was used to select participants for this study (Section 4.2.4). The criterion for selecting participants was that they should have experience in the implementation of ICT projects in the organisation. This criterion was based on the guidance from the literature. Using purposive sampling, participants were selected based on their involvement in ICT projects implementation. Using snowball sampling, participants were asked to recommend other individuals who would be able to add value to the research. For example, participant 2 recommended that participant 3 be interviewed for this study. Participant 5 also recommended that participant 3 be interviewed, but the researcher had already conducted an interview with participant 3. Section 5.3.1 discusses the participants' roles and their level of involvement in the implementation of ICT projects.

Data analysis was performed after each interview and if data saturation was not yet achieved, another interview was conducted. As a result, a total of six interviews were conducted for this study (Section 5.2).

#### **4.3.5 Data collection**

Both primary data and secondary data were collected for this study. Primary data was collected through interviews and secondary data was collected through the literature review.

#### **4.3.5.1 Primary data**

Semi-structured, one-on-one interviews were conducted at participants' offices. Semi-structured interviews gave the researcher an opportunity to probe for more information and ask participants to give more clarification where needed. Interviews were audio recorded and notes were taken. After each interview, the audio-recorded data was transcribed verbatimly. Based on guidance from the literature, the interview schedule was developed and used during the interviews. An example of the interview schedule used is presented in Appendix A. The interview schedule was split into three sections.

- Section 1: Participants' background information

The main objective of this study is to identify top ten ICT project risk factors in one South African organisation and to propose risk treatment strategies that can be used to manage these risks (Section 1.3). Therefore, the criterion for selecting participants in this study was that they should be involved in the implementation of ICT projects in the same organisation. In this section, questions were asked to determine the participants' involvement in the implementation of ICT projects.

- Section 2: Understanding of 'risks'

There are ongoing debates on whether risks are inherently negative or if they can be both negative and positive (Section 3.2.1). So, it was important that the participants' perceived meaning of 'risk' be understood before they were asked to identify common ICT project risk factors. In this section, participants were asked to explain their understanding of what a 'risk' is.

- Section 3: Top ICT project risk factors

In this section, participants were asked to identify risk factors that they perceive to be commonly affecting ICT projects in the organisation.

#### **4.3.5.2 Secondary data**

The literature was consulted and inductively used in the following sections of the dissertation (Section 4.2.5.4).

- Introductory chapter (Chapter 1)

As a starting point, the researcher consulted academic sources (books, journal articles, dissertations, theses and the Internet) to get a background of top ICT project risk factors. The researcher evaluated the literature to check what has been written about the research topic and if there were any related studies that were previously conducted. The literature review indicated that although there are many lists compiled and several studies completed on top ICT project risk factors, it is difficult to choose a list to use as all the lists were compiled at different periods of time, by people from different backgrounds using different research methods. Based on this constraint, the problem statement of this research was formulated (Section 1.2).

The researcher also reviewed similar studies in the literature to identify characteristics of people who are known to have an interest in and influence on the ICT project risk factor topic. The participants for this study were chosen based on the suggestions from the literature.

- Separate chapters

After establishing the background and need for the study, the researcher used similar studies in the literature to identify concepts that are key to the study. Key concepts were identified as ICT project management and ICT project risk management. To ensure that the key concepts were reviewed comprehensively, the researcher decided to have separate chapters for each key area. The available literature on project management and ICT project management was discussed in Chapter 2 of the dissertation. The available literature on risk management and ICT project risk management was discussed in Chapter 3 of the dissertation.

- Final chapters

In Chapter 5 of the dissertation, findings of this study are compared to the findings from similar studies in the literature. Following the exploratory study, the literature was also consulted and used in conjunction with the researcher's experience to identify possible strategies that can be used to manage the top ten ICT risk factors. The proposed risk treatment strategies are presented in Chapter 6.

### **4.3.6 Rigour and evaluation of method**

Two strategies were employed to ensure that the findings of this study are valid and reliable:

- To ensure that the findings of this study are reliable, a detailed description of the research process and researcher's actions and influences were provided so that other researchers can repeat the research (Section 4.3). It is important to note that repeating the research process will not necessarily yield the same results or reach the same conclusions since participants' situations, experiences, and perceptions might be different.
- To ensure the validity of the findings, an interview schedule was used to ensure that all participants were asked the same questions in a standard way. The top ten ICT project risk factors identified in this study were also compared to the top ten ICT project risk factors from the literature.

### **4.3.7 Ethical considerations**

The following actions were undertaken to ensure that the study is conducted in an ethical manner:

- The researcher completed the work-well ethics checklist and consulted the North-West University's ethical review decision tree.
- The researcher requested and was granted an approval from the university to conduct the research.
- Permission to conduct interviews was sought from Senior ICT manager.
- Participants were contacted and asked to identify convenient days and times to conduct the interviews.
- Participants were assured that participation on this study was voluntarily and that they were free to decline or withdraw from the study at any point.
- Written consent was obtained from all participants.
- The researcher made sure that the data of participants was kept confidential and that participants' personal information was not retained.
- All the literature sources used in the study were acknowledged.

Appendix B shows a sample consent form used. Figure 4.2 explains specific activities prior to, during, and after the interviews.

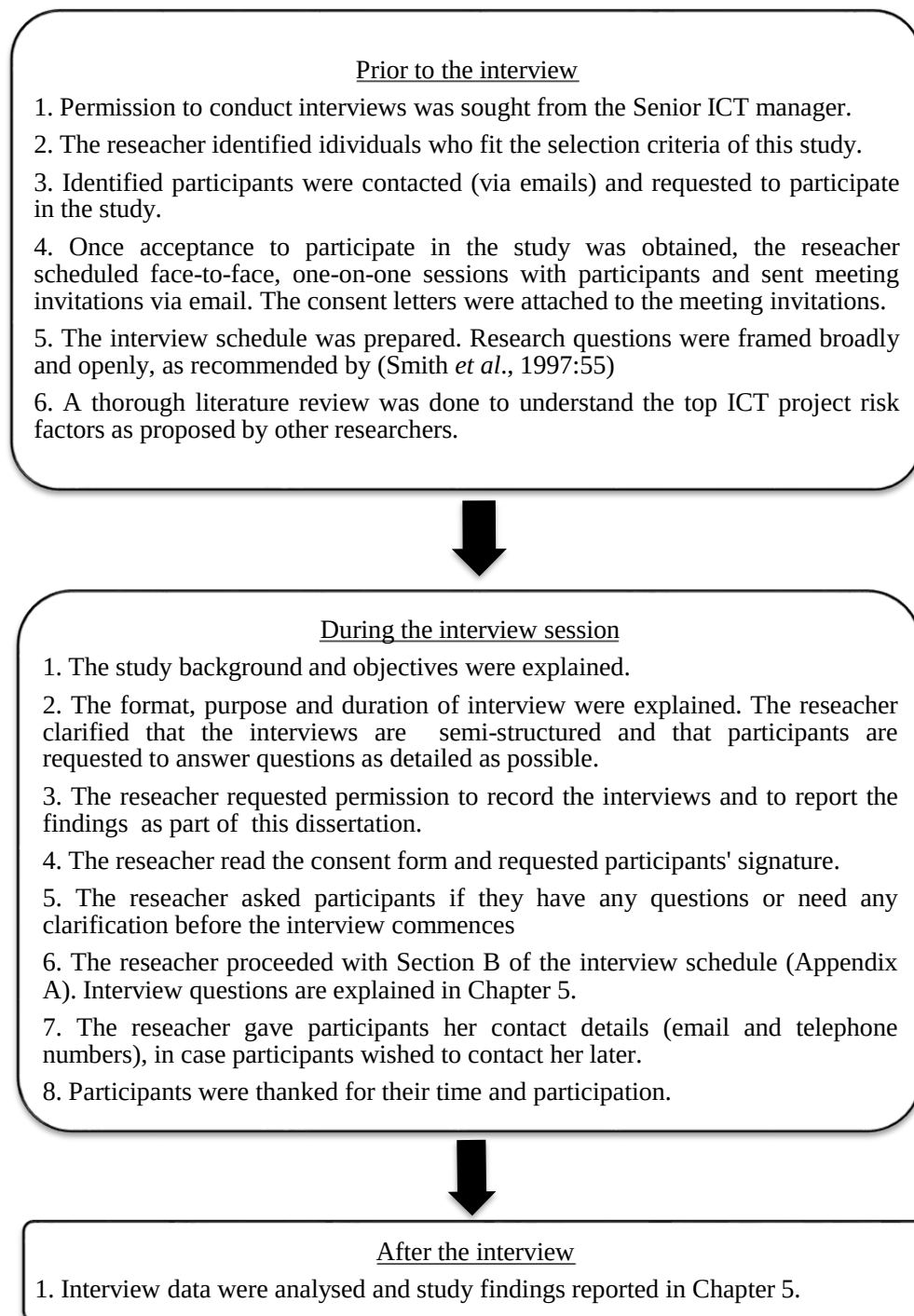


Figure 4.2: Summary of activities prior to, during and after interviews

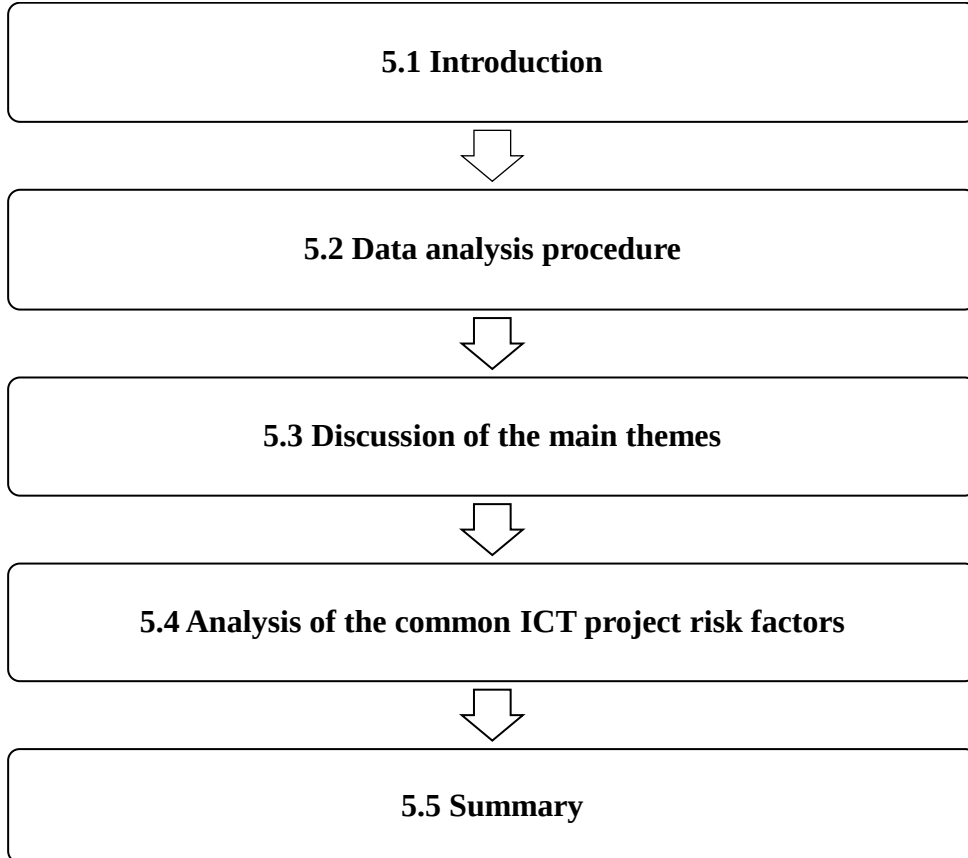
## **4.4 SUMMARY**

Chapter 4 explained the research methodology in terms of its philosophical assumptions, designs, research methods, sampling strategies, data collection and data analysis approaches. This chapter further explained the research plan that was executed in this study. Strategies that were employed to ensure that the findings of this study are valid and reliable were also discussed in this chapter. Lastly, the ethical considerations observed by the researcher were discussed

The results of interviews conducted for this study are analysed and discussed in Chapter 5.

## **CHAPTER 5**

### **DATA ANALYSIS AND DISCUSSION**



## 5.1 INTRODUCTION

The literature review discussed in Chapter 3 provides an overview of ICT project risk management, the benefits of applying risk management principles in ICT projects and the lists of top ICT project risk factors from the literature. A limitation was identified regarding the use of the top ICT project risk factor lists from the literature. There are many top ICT project risk lists and project managers end up not knowing which list to use as they were all compiled at different periods of time, by people from different backgrounds using different research methods. The problem statement for this study is defined as: it is difficult for ICT project team members to identify top ten risk factors affecting ICT projects and define strategies to manage them.

An exploratory empirical study was conducted to address the research problem (Chapter 4). This chapter reports on the findings from the empirical study and presents an answer to the main research question: what are the top ten ICT project risk factors in one South African organisation?

## 5.2 DATA ANALYSIS PROCEDURE

The collected data was analysed according to the interpretative phenomenological analysis process (Section 4.2.6). The four steps of the IPA data analysis process were applied as follows:

- Step 1: Familiarisation with text.

The researcher read though the interview transcript line by line several times while listening to the interview audio recording. The reason for listening to the interview audio while reading the transcripts was to ensure that the participants' views were accurately recorded. The researcher marked interesting and significant remarks made by participants. The highlighted remarks included detailed descriptions of what the participant was saying, the participants' emotions and the researcher's own reflections of the interview.

- Step 2: Identification of emerging themes.

A computer-aided qualitative data analysis software, called Atlas.ti, was used to support the process of data analysis. The researcher uploaded the interview transcript to the software application, then read through the marked transcript again and identified and listed emerging themes. The researcher's interpretation of the interview data resulted in the identification of 44 themes. Table 5.4 to Table 5.9 presents the themes that emerged through the analysis of each interview transcript. An extract of the marked interview transcript is presented in Appendix C.

- Step 3: Grouping themes together.

The researcher checked the themes, looked for connections between them and grouped related themes into clusters. The clusters were labelled into main themes. Main themes were analysed individually to check interpretation, sense-making and development of connections against what participants said. As a result, ten main themes emerged from the analysis, which resembled top ICT project risk factors in the organisation. Table 5.11 indicates the number of times each main theme was identified by participants.

Table 5.1 shows an example of how main themes were generated.

- Step 4: Development of a structure or frame that illustrates the relationships between themes.

A report of final themes was produced in a form of a table which listed and described the main themes along with quotations from the transcripts (Section 5.2.3).

The researcher followed the four steps to analyse the first interview transcript. Four new themes were identified. The researcher then went to have a second interview with the Service Owner: Global PMO. The main themes identified from previous interviews were used to position the subsequent analysis. Five new themes emerging from the analysis of interview data. The researcher then continued to have a third interview, then followed the four steps to analyse interview data by considering themes identified during previous interviews. Only one new theme emerged from the analysis of interview data. The researcher went on to conduct the fourth, fifth and sixth interviews and no new themes emerged from these interviews. After the

sixth interview, the researcher was confident that the data gathered throughout the interviews was rich enough to describe the most common ICT risk factors in the organisation. No further interviews were conducted.

Table 5.1: Example of how main themes were generated.

| Main theme                   | Participants' comments                                                                                                                                                                                                                                                           | Participant number |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Poor stakeholder involvement | Major ICT projects normally have stakeholders from different business units or departments, and they are usually divided into different phases. The problem arises when each stakeholder believes their requirements are a priority and should be addressed first (in phase 1).  | Participant 1      |
|                              | The project will fail if the project manager does not have a strategy of managing and prioritising different stakeholders' requirements.                                                                                                                                         | Participant 1      |
|                              | Multi-vendor dependencies contribute to project delays.                                                                                                                                                                                                                          | Participant 1      |
|                              | Only senior managers are involved in evaluating quotes from service providers; the actual users of the system are not involved.                                                                                                                                                  | Participant 2      |
|                              | It is a common practice in the organisation to engage only with the heads of departments. In most cases, ICT project managers fail to engage with the end-users who are doing the job.                                                                                           | Participant 3      |
|                              | Enterprise architects are not involved in ICT project implementations or they are involved late in the project and they cannot determine if it feasible to go ahead with implementing the proposed solution or not. This may result in an obsolete technology being implemented. | Participant 2      |
|                              | Current processes do not make it compulsory for service owners to be part of project teams, as a results operational teams do not have an input on the project whilst in development.                                                                                            | Participant 4      |
|                              | Information security specialists are involved late in the project, and as a result, information security requirements are missed at the initial stages of the project                                                                                                            | Participant 5      |
|                              | Failure to establish project leadership structure can hinder project success.                                                                                                                                                                                                    | Participant 6      |

## **5.3 DISCUSSION OF THE MAIN THEMES**

The participants' responses during interviews are presented and analysed in the following sections. The responses are categorised according to the sections of the interview schedule (Section 4.3.5.1). Participants' background information is presented in Section 5.3.1. The participants' understanding of the term 'risk' is presented in Section 5.3.2. Section 5.3.3 presents risk factors that participants perceive to be commonly affecting ICT projects in the organisation.

### **5.3.1 Section 1: Participants background information**

The criterion for selecting participants in this study was that they should be involved in the implementation of ICT projects in the organisation. In this section, two questions were asked to determine the participants' involvement in the implementation of ICT projects. The responses are presented in Table 5.2.

Based on the information presented in Table 5.2, it is evident that all participants have varying degrees of involvement in ICT project implementation. Participants' job titles and involvement in ICT project implementation are further discussed below:

- ICT project management: ICT project managers have the responsibility of ensuring that ICT projects are completed on time, within budget and according to the agreed scope.
- ICT programme management: ICT Programme managers can assist with validation of the study as they have access to the central repository of historic project information, issues, risks and lessons learnt.
- ICT risk management: ICT risk management specialists have experience in identifying, measuring, evaluating and defining processes for managing ICT risks.
- ICT Service Ownership: ICT service owners are accountable for specific services in the organisation. They ensure that services are managed with a business focus and that services are provided within agreed service levels. They are responsible for continuous improvement and change management of services under their care.

- ICT security management: ICT security specialists are responsible for managing the risks to the security of information or data.
- ICT infrastructure architecture: ICT infrastructure architects are responsible for defining end-to-end architecture for new technology and to ensure that ICT projects do not duplicate the functionality or diverge from business and ICT strategy.

Table 5.2: Participants' background information.

| <b>Participant Number</b> | <b>Job title</b>                             | <b>Involvement in ICT project implementation</b>                                                                                                                                                                                                    |
|---------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participant 1             | Senior Manager: Information Management       | The participant is a former project manager, with experience of managing various ICT projects in different organisations.                                                                                                                           |
| Participant 2             | Service Owner: Global PMO                    | The participant is responsible for overseeing and ensuring that global PMO methodology, tools and processes are rolled out.                                                                                                                         |
| Participant 3             | Group IM Risk Management Specialist          | The participant is involved in ICT projects, responsible for doing quality assurance, as per the organisation's project management methodology. This includes facilitating and providing expert advice on risk management.                          |
| Participant 4             | Service Owner: Collaboration services        | The participant is responsible for the end-to-end management of ICT collaboration solutions in the organisation, including the support services of ICT projects. The participant is also responsible for managing small ICT collaboration projects. |
| Participant 5             | Information Security & Governance Specialist | The participant is involved on a consultation basis; from a governance perspective.                                                                                                                                                                 |
| Participant 6             | Group Head: Infrastructure Architecture      | The participant is involved more on the strategic planning (e.g. define road maps and technology directions) of ICT projects.                                                                                                                       |

### 5.3.2 Section 2: Understanding of ‘risks’

There are ongoing debates on whether risks are inherently negative or if they can be both negative and positive (Section 3.2.1). So, it was important that the participants’ perceived meaning of risks be understood. In this section, participants were asked to explain their understanding of the term ‘risk’. The answers to this question are shown in Table 5.3.

Table 5.3: Participants’ understanding of ‘risks’.

| Participant Number | Understanding of ‘risk’                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participant 1      | “An uncertain event or condition that might have negative effects on a project”.                                                                                                        |
| Participant 2      | “Uncertain event that we normally register; that we foresee that it might or there is a possibility that it might happen in future.”                                                    |
| Participant 3      | “Uncertain event (there has to be uncertainty there) that might have negative or positive effects on the project outcome. It is the known-knowns, unknown-knowns and unknown-unknowns.” |
| Participant 4      | “Any occurrence that will subject the project a failure. The failure can be not meeting timelines or not at the right quality.”                                                         |
| Participant 5      | “The possibility of certain threats materialising and hindering the success of the project.”                                                                                            |
| Participant 6      | “Factors that can hinder the success of a project.”                                                                                                                                     |

From Table 5.3, it is evident that 83% of the participants (5 out of 6 participants) consider risks as uncertain events that may negatively affect ICT projects. The results are in accordance with March and Shapira’s (1987) study findings that more than 80% of the project team members consider risks as the negative effects. The participants’ definition of a risk is the same as the one adopted for this study, which

is: *uncertain events or conditions that might have negative effects on ICT projects* (Section 3.2).

Participant 3 has a different definition of a ‘risk’; according to the participant, a risk is an uncertain future event that might have negative or positive effects on the project outcome. The participant notes that “people tend to use the term risk very loosely”, and that “anything is defined as a risk”, even issues that are currently happening are defined as risks. The participant further reasons that when defining and classifying risks, there must be “known-knowns”, “unknown-knowns” and “unknown-unknowns”. This statement relates to the scope of ICT risk management (Section 3.2.2.2).

Below are the extracts from participant 3’s explanation of a ‘risk’:

- “The uncertainty is very important in identifying and managing the risk.”
- “I believe that you will have known-knowns; unknown-knowns and unknown-unknowns.”
- “So, it is very important to me as risk management specialist, to say what we are quantifying? Is it an uncertain future event? What is the level of uncertainty is involved? That will determine whether it is a risk or an issue.”
- “We do risk management to prevent things from happening.”
- “I think this is very true when you look at the risk strategy; whether you are doing ‘quick ‘operational risks that have the capability of moving onto issues very quickly or whether you are doing long term strategic risks.”

### **5.3.3 Section 3: Most common ICT project risk factors**

In this section, participants were asked to identify risk factors that they perceive to be commonly affecting ICT projects in the organisation. The results of each interview are presented in Table 5.4 to Table 5.9.

Most of the risk factors identified by participant 1 relates to ineffective project management practices. The participants firmly believe that in order to justify ICT investments, ICT project managers should ensure that projects are not done for technology’s sake and that the benefits of each ICT project (as defined in the benefits plan) are tracked, measured and realised.

Table 5.4: ICT project risk factors identified by participant 1.

| ICT project risk factors                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Not following project governance                     | <ul style="list-style-type: none"> <li>The benefits of investing in an ICT project are not tracked and reported to business managers. As a result, ICT is seen as failing to deliver value for money and wasting company money.</li> </ul>                                                                                                                                                                                                                                                                                                               |
| 2. ICT projects are capital intensive                   | <ul style="list-style-type: none"> <li>ICT projects are capital intensive; technology comes at a high cost, and as a result organisation sees ICT departments as cost centres.</li> <li>The business managers do get shocked by high ICT project costs and they decide to continue operating the way they have been operating (without ICT enablement) or go ahead with the project but implement a generic and cheaper solution. A cheaper solution can compromise on quality.</li> </ul>                                                               |
| 3. ICT projects are not based on a proper business case | <ul style="list-style-type: none"> <li>ICT projects are done for technology's sake and not to address specific problems in the business (for example: to enable business processes and bring about efficiency into those processes). Management and users do not buy into ICT projects because they do not derive any value from them.</li> </ul>                                                                                                                                                                                                        |
| 4. Lack of support from the business                    | <ul style="list-style-type: none"> <li>Executive managers do not support ICT projects if they do not understand why it is been executed and how it will benefit them.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                         |
| 5. Not managing change properly                         | <ul style="list-style-type: none"> <li>Users are not sufficiently trained on the new system before it is deployed.</li> <li>Not properly selling the solution to the users or not offering new technology introduction result in less buy-in from the users.</li> </ul>                                                                                                                                                                                                                                                                                  |
| 6. Poor stakeholder involvement                         | <ul style="list-style-type: none"> <li>Major ICT projects normally have stakeholders from different business units or departments, and they are usually divided into different phases. The problem arises when each stakeholder believes their requirements are a priority and should be addressed first (in first phase).</li> <li>The project will fail if the project manager does not have a strategy of managing and prioritising different stakeholders' requirements.</li> <li>Multi-vendor dependencies contribute to project delays.</li> </ul> |

Table 5.4: ICT project risk factors identified by participant 1.

|                                          |                                                                                                                                                                  |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7. The speed of execution of the project | <ul style="list-style-type: none"> <li>ICT projects take too long to complete; sometimes technology is outdated by the time the project is completed.</li> </ul> |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Four themes were identified from interview with participant 1:

- Not following project governance.
- ICT projects are not based on a proper business case.
- Not managing change properly.
- Poor stakeholder involvement.

Table 5.5 presents a list of common ICT risk factors, as identified by participant 2.

Table 5.5: ICT project risk factors identified by participant 2.

| ICT project risk factors        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Poor stakeholder involvement | <ul style="list-style-type: none"> <li>Enterprise architects are not involved in ICT project implementations or they are involved late in the project and they cannot determine if it feasible to go ahead with implementing the proposed solution or not. This may result in an obsolete technology being implemented.</li> <li>At that late stage of a project, enterprise architects cannot check if the organisational infrastructure (business processes, tools and workforce) can handle the implementation of the proposed solution. The result of this may be that after some time, it becomes evident that the business cannot cope with the new solution, and it needs to be decommissioned.</li> <li>Risk management specialists are not adequately involved in ICT projects.</li> <li>Only senior managers are involved in evaluating quotes from service providers; the actual users of the system are not involved.</li> <li>Senior managers only consider the financial impact of the system; they do not consider other factors. This results in 'quick wins' being implemented and phased out later because they do not address the business requirements.</li> </ul> |

Table 5.5: ICT project risk factors identified by participant 2.

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. Not managing change properly                            | <ul style="list-style-type: none"> <li>• There is a misalignment/gap between the project team and the support team in planning for transition from project to 'business as usual'.</li> <li>• ICT support teams are not notified about the new solutions before they are implemented. As a result, the support team cannot plan for support service take on.</li> </ul>                                                                                                                                                                            |
| 3. Not following project governance                        | <ul style="list-style-type: none"> <li>• Benefits-tracking is not done because there is often a lag in benefits accumulation after the implementation (i.e. a time gap between initial investment and payoff). It happens that after this period, everyone has forgotten about the project or the project team have resigned; and it is difficult for someone who was not part of the original project team to do the benefits-tracking.</li> </ul>                                                                                                |
| 4. ICT projects are not based on a proper business case    | <ul style="list-style-type: none"> <li>• "A lot of time in the past we have been involved in project just for technology sake".</li> <li>• Business throws many requests of these 'quick fixes' at ICT department and this results in having many projects in the pipeline, with no portfolio management execution plan in place.</li> </ul>                                                                                                                                                                                                       |
| 5. Requirements management issues                          | <ul style="list-style-type: none"> <li>• The business managers wait until a few months before the financial year end, and then they approach ICT with many project requests that must be completed before financial year end.</li> <li>• It happens that there are not enough people to implement the solutions during such a short period of time, or the existing ICT infrastructure cannot handle the requirements at that point in time.</li> <li>• Nonetheless, the business managers still expect ICT to deliver on the projects.</li> </ul> |
| 6. Project teams do not have the required knowledge/skills | <ul style="list-style-type: none"> <li>• ICT project teams are cross-functional; project team members are expected to take on more than one role in a project.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          |
| 7. Lack of funding due to economic crisis                  | <ul style="list-style-type: none"> <li>• Funding for ICT projects is a big factor. Due to the economic crisis, ICT management are faced with the dilemma of having ICT costs cut or ICT projects being cancelled because there are no funds.</li> </ul>                                                                                                                                                                                                                                                                                            |
| 8. Risk assessments are not done                           | <ul style="list-style-type: none"> <li>• Project managers do not know the most common risk factors that might affect their projects and they do not know what</li> </ul>                                                                                                                                                                                                                                                                                                                                                                           |

Table 5.5: ICT project risk factors identified by participant 2.

|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                             | <p>the suitable mitigation strategies to address the risks are, should they occur.</p> <ul style="list-style-type: none"> <li>• Normally, project managers would know the basics about risk management; things like how to do a risk management or how to complete a risk matrix document. But they can only be able to perform these basic risk management activities if they are allocated to the project at early stages of the project lifecycle.</li> <li>• Some ICT professionals (including project managers) cannot differentiate between a risk and an issue. Because of this misunderstanding, a lot of 'garbage' is recorded in the risk registers and risk logs.</li> <li>• Because of the confusion between risk, problems, and issues, project team members end up not doing risk management.</li> </ul> |
| 9. Outsourcing of project team members                      | <ul style="list-style-type: none"> <li>• There are no plans to ensure business continuity when it comes to personnel movements.</li> <li>• Staff movement (internal or external) like bringing in a new team member halfway through a project may lead to increased costs and/or delays on project delivery.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 10. Global IM project management methodology not rolled out | <ul style="list-style-type: none"> <li>• There is no global ICT project management methodology in place.</li> <li>• The existing organisation-wide project management methodology was specifically designed for big plants' project implementations, it is not a 'perfect suit' for ICT projects.</li> <li>• Different countries have varying legislative requirements, skills, ICT infrastructure, project management and technology adoption maturity levels.</li> <li>• Currently there are no streamlined processes to cater for these differences. As a result, it is difficult to implement global projects.</li> </ul>                                                                                                                                                                                          |
| 11. Lack of clear roles and responsibilities                | <ul style="list-style-type: none"> <li>• There is lack of clarity among team members regarding their respective roles and responsibilities.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Participant 2 firmly believes that cross-functioning of skills amongst the project teams (for example: business analysts managing projects) is a huge risk in the organisation, and it can negatively affect the quality of the solution provided.

Participant 2 further explained that project documents prepared by business analyst are of poorer quality than the ones prepared by trained project managers. This is very important to note because of all the participants selected for this study, participant 2 (Service Owner: Global PMO) is the only one who is responsible for measuring and reporting on the quality of ICT projects in the entire organisation.

Five new themes were identified from interview with participant 2:

- Requirements management issues.
- Project teams do not have the required knowledge/skills.
- Risk assessments are not done.
- Outsourcing of project team members.
- Lack of clear roles and responsibilities.

Table 5.6 present a list of common ICT risk factors, as identified by participant 3.

Table 5.6: ICT project risk factors identified by participant 3.

| ICT project risk factors         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Risk assessments are not done | <ul style="list-style-type: none"> <li>• ICT Project managers manage projects with a silo mentality. Their outlook is centred on their projects only.</li> <li>• When managing project risks, ICT project managers only look at the micro environment (their individual projects) and not at the macro environment (outside their project space).</li> <li>• Project managers do not do risk assessments to identify projects that apply pressure to their projects and projects that their projects are applying pressure to, and how their projects might be jeopardised.</li> <li>• ICT Project managers forget that, parallel to their projects, the business is continuing.</li> </ul> |

Table 5.6: ICT project risk factors identified by participant 3.

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. Requirements management issues                       | <ul style="list-style-type: none"> <li>• The business requirements are written based on the assumption that everything will work as planned. There are no contingency plans put in place to handle potential problems.</li> <li>• Project managers are too optimistic about schedule, budget and expected quality.</li> </ul>                                                                                                                                                                                                                                                                                                            |
| 3. Lack of clear roles and responsibilities             | <ul style="list-style-type: none"> <li>• Lack of coordination between multiple projects results in different projects being misaligned or in conflict with each other.</li> <li>• Project managers are risks themselves; because they do not manage risks.</li> <li>• ICT project managers consider risk management as a burden; if you tell them they must do a risk assessment they take it as an insult. They take risk management too personally.</li> <li>• Most project managers cannot see beyond the technicality of the project. They do not think about the ‘what ifs’ and how they will handle potential problems.</li> </ul> |
| 4. ICT projects are not based on a proper business case | <ul style="list-style-type: none"> <li>• Most ICT projects fail because they are done for technology’s sake; IT departments do not check if the business has a real need for the new technology.</li> <li>• This result in a misalignment between the business needs/requirements and what the solution can offer.</li> <li>• For example: the project manager might think that the solution is the best, but later (after money has been spent) realise that the solution needs to be drastically customised.</li> </ul>                                                                                                                |
| 5. Not understanding the meaning of an ICT project risk | <ul style="list-style-type: none"> <li>• ICT project risks are only considered to be factors that contribute to the negative effects of a project.</li> <li>• It gets difficult to identify new emerging risks and their true sources if risks are only seen as threats (negative effects).</li> </ul>                                                                                                                                                                                                                                                                                                                                   |

Table 5.6: ICT project risk factors identified by participant 3.

|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6. Poor stakeholder involvement                             | <ul style="list-style-type: none"> <li>• It is a common practice in the organisation to engage only with the heads of departments. In most cases, ICT project managers fail to engage with the end-users who will be using the system.</li> <li>• The risk in this arrangement is that usually senior managers are not the actual users of the system and as such, they would not know the undocumented processes and undisclosed practises that end users follow on a daily basis to get the job done.</li> <li>• This can result in an impractical solution that does not cater for all requirements being implemented; and it can only be picked up during handover to the end- users.</li> </ul> |
| 7. Not managing change properly                             | <ul style="list-style-type: none"> <li>• Change management, training and handover are not always included as part of the project plan.</li> <li>• ICT rolls out new high technology but the business does not know how to use it.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 8. Outsourcing of project team members                      | <ul style="list-style-type: none"> <li>• ICT project managers are mostly external consultants and they do not understand the business; they do not know the intermittent organisational ways of working. The external project managers recommend and implement the solution based on their own subjective perceptions. As a result, they fail to include appropriate culture change activities as part of the project.</li> <li>• The project plan need to be ramped-up to include time for project managers to have in-depth consultation with the business specialists.</li> </ul>                                                                                                                 |
| 9. Not following project governance                         | <ul style="list-style-type: none"> <li>• ICT project manager do not follow the organisational risk management methodology; despite it being enforced by legislature and governance frameworks.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 10. Project teams do not have the required knowledge/skills | <ul style="list-style-type: none"> <li>• ICT project managers do not realise that it is not enough to have the right solution and budget, they need to have highly skilled and capable team members.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

As presented in Table 5.6, most of the project risk factors identified by participant 3 are related to the lack of risk management practices. The participant specifically mentioned that project team members do not know whether to classify risks as negative or positive effects on ICT projects. The participant defines risks as uncertain event that might have negative or positive effects on the project outcome (Section 5.3.2). However, it is interesting to note that when asked to identify common ICT project risk factors the participant only identified factors that might have negative effects on ICT projects (Table 5.6). It appears as if the participant has accepted the view that risks are inherently factors that might have negative effects on projects. Only one new theme was identified from interview with participant 3, and that is *Not understanding the meaning of an ICT project risk*. Table 5.7 presents a list of common ICT risk factors identified by participant 4.

Table 5.7: ICT project risk factors identified by participant 4.

| ICT project risk factors               | Description                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Requirements management issues      | <ul style="list-style-type: none"> <li>Not all requirements are gathered before the project is started</li> <li>The project will fail if the end-product is not what the users expected.</li> </ul>                                                                                                                                                                                                                        |
| 2. Risk assessments are not done       | <ul style="list-style-type: none"> <li>The current operating model and project management processes focus only on completing projects on time, but do not focus on ensuring that a good quality solution is provided.</li> <li>No risk assessments or impact analysis is done to ensure that there will be no issues once the system is operational, and that the system can be easily repaired and maintained.</li> </ul> |
| 3. Poor stakeholder involvement        | <ul style="list-style-type: none"> <li>Current processes do not make it compulsory for service owners to be part of project teams, as a result operational teams do not have an input on the project whilst in development.</li> </ul>                                                                                                                                                                                     |
| 4. Outsourcing of project team members | <ul style="list-style-type: none"> <li>The project teams responsible for deploying big ICT projects are (mostly) external contractors. This arrangement is risky because these contractors do not understand the organisational culture, policies and ICT operations, and they will not be there to maintain the system post</li> </ul>                                                                                    |

Table 5.7: ICT project risk factors identified by participant 4.

|                                                         |                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | implementation.                                                                                                                                                                                                                                                                                                                                                       |
| 5. ICT projects are not based on a proper business case | <ul style="list-style-type: none"> <li>ICT forces the business to implement new systems or new technologies just because ICT thinks the business needs it. In some cases, ICT just implements systems without checking if there are other solutions that might better meet the project's overall goal.</li> </ul>                                                     |
| 6. Lack of clear roles and responsibilities             | <ul style="list-style-type: none"> <li>The new ICT operating model introduced new roles that must be part of project teams. However, the roles and responsibilities of the new project teams have not been communicated.</li> <li>The lack of clear roles and responsibilities result in confusion, mistakes, omissions and the team not working together.</li> </ul> |
| 7. Not managing change properly                         | <ul style="list-style-type: none"> <li>ICT projects fail on service introduction</li> </ul>                                                                                                                                                                                                                                                                           |

No new themes emerged from the interview with participant 4. However, the participants elaborated more on the importance of involving service owners at the early stages of the project.

Table 5.8 presents a list of common ICT risk factors, as identified by participant 5. No new themes emerged from the interview with participant 5. The participant explained that failing to identify project goals and mission at the beginning of the projects often results in an unusable solution being implemented.

Table 5.8: ICT project risk factors identified by participant 5.

| ICT project risk factors        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Poor stakeholder involvement | <ul style="list-style-type: none"> <li>Information security specialists are involved late in the project, and as a result, information security requirements are missed at the initial stages of the project.</li> <li>Projects will be delayed, as those requirements are properly defined and addressed.</li> <li>Information security specialists are involved late in the project and that results in project governance principles not being followed.</li> </ul> |

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. ICT projects are not based on a proper business case | <ul style="list-style-type: none"> <li>• Service providers occasionally come and sell new ICT solution/products to the ICT management team. If the management team likes the solution, they procure it for the business, even though there will be no business requirements for the new solution.</li> <li>• The business requirements are then 'reverse engineered' to fit the new system's functionality.</li> </ul>                                                                           |
| 3. Not following project governance                     | <ul style="list-style-type: none"> <li>• The implemented solutions have many technology vulnerabilities because security governance processes were not followed.</li> </ul>                                                                                                                                                                                                                                                                                                                      |
| 4. Requirements management issues                       | <ul style="list-style-type: none"> <li>• Project managers fail to ask project sponsors two important questions at the beginning of a project: What exactly are we trying to achieve? and Why do we want to achieve that?</li> <li>• Project goals are not documented and used as starting point for planning and managing users' expectations.</li> <li>• Failure to get project sponsors to sign-off requirements specification can result in an unusable solution being rolled out.</li> </ul> |

Table 5.9 presents a list of common ICT risk factors, as identified by participant 6.

Table 5.9: ICT project risk factors identified by participant 6.

| ICT project risk factors                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Not understanding the meaning of an ICT project risk | <ul style="list-style-type: none"> <li>• There is no proper guidance on risk management, and there is no clear communication of what constitutes a risk in the organisation. As a result, risks assessments are not done.</li> </ul>                                                                                                                                                                                                                                                                                                                                                   |
| 2. Requirements management issues                       | <ul style="list-style-type: none"> <li>• The business sends project requests to ICT and specifies the time they are expecting the project to be completed. The business enforces the delivery dates on ICT without considering that ICT still needs to order the equipment to fulfil project requirements.</li> <li>• The business does not communicate their ICT requirements on time.</li> <li>• ICT does not communicate their strategic roadmap or projects goals to the business in time, so that the business can put the ICT projects in the business tactical plan.</li> </ul> |

Table 5.9: ICT project risk factors identified by participant 6.

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3. ICT projects are not based on a proper business case    | <ul style="list-style-type: none"> <li>• ICT departments have their own plans and aspirations of what they want to achieve to improve their position in the business; business units also have their own plans and aspirations of what they want to achieve at a specific time. There is no alignment between business and ICT priorities/ strategies</li> <li>• The misalignment can be in terms of future plans or choice of solution to be implemented. For example, ICT may offer a good stable solution and support to the business unit, but the business unit refuses to implement the recommended solution because it is costly (reason may be because business priorities at the time are to save costs).</li> </ul> |
| 4. Poor stakeholder involvement                            | <ul style="list-style-type: none"> <li>• Failure to establish project leadership structure can hinder project success.</li> <li>• There is a confusion of who is responsible for making ICT projects successful; is it ICT project or project sponsors, or both?</li> <li>• Who is the rightful owner of ICT projects?</li> <li>• Who decide on the direction that projects must take?</li> </ul>                                                                                                                                                                                                                                                                                                                             |
| 5. Project teams do not have the required knowledge/skills | <ul style="list-style-type: none"> <li>• The team lacks the subject matter expertise required to successfully complete the project</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

As presented in Table 5.9, no new themes emerged from the interview with participant 6. The participants alluded to the fact that the misinterpretation of what is considered as a risk often results in risks assessments not being done.

From Table 5.4 to Table 5.9, it is evident that participants have identified different dimensions of ICT project risk. This shows that ICT project team members have different satisfaction criteria (Section 3.2.1). The ICT project risk factors identified by participants are further analysed and discussed in Section 5.5.

## 5.4 ANALYSIS OF THE COMMON ICT PROJECT RISK FACTORS

This section provides an analysis of the project risk factors as presented in Section 5.3.3. A combined list of the risk factors will be discussed in Section 5.4.1, followed by the presentation of the top ten risk factors in Section 5.4.2. In section 5.4.3, the top ten ICT project risk factors will be compared to previous top ten ICT project risk factor lists from the literature (Section 3.5.6).

### 5.4.1 Combined list

After each interview, data was analysed and emerging themes identified. A total of 44 risk factors were identified in this study. Table 5.10 presents a combined list of the most common ICT project risk factors and the number of times they were identified.

### 5.4.2 Top ten ICT project risk factors

As discussed in Section 3.2.1, ICT project risk factors can be classified according to six categories: team risks, organisational environment risks, user risks, complexity risks, requirements risks, planning and control risks.

Table 5.11 presents the top ten ICT project risk factors. These are risk factors that were identified by two or more participants. Table 5.11 also indicates the number of times each risk factor was identified as well as the dimension that each risk factors fall under. The list is sorted according to the highest ranking (the number of times the risk factor was identified).

From Table 5.11, it is evident that *Poor stakeholder involvement* and *ICT projects are not based on a proper business case* are perceived to be the most common risk factors affecting ICT projects in the organisation. The two risk factors received the highest ranking as they were identified by all participants. *Risk assessments are not done* and *Requirements management issues* risk factors were identified five times, followed by *Project teams do not have the required knowledge/skills* and *Outsourcing of project team members* which were identified by three participants.

Two participants indicated that *ICT project team members do not understand what a risk is*. It is interesting to note that the risk factor was identified by a global PMO service and risk management specialist; these are two participants who have an organisational view of factors that contribute to ICT project failure. *Lack of clear roles and responsibilities* was also identified by two out of six participants.

Table 5.11 shows that the top three most mentioned dimensions are planning and control, requirements and team risks.

Table 5.10: Combined list of the most common ICT project risk factors identified in this study.

| ICT project risk factors                                | Frequency |
|---------------------------------------------------------|-----------|
| Poor stakeholder involvement                            | 6         |
| ICT projects are not based on a proper business case    | 6         |
| Risk assessments are not done                           | 5         |
| Requirements management issues                          | 5         |
| Not managing change properly                            | 4         |
| Not following project governance                        | 4         |
| Project teams do not have the required knowledge/skills | 3         |
| Outsourcing of project team members                     | 3         |
| Not understanding the meaning of an ICT project risk    | 2         |
| Lack of clear roles and responsibilities                | 2         |
| The speed of execution of the project                   | 1         |
| Lack of support from the business                       | 1         |
| ICT projects are capital intensive                      | 1         |
| Global IM project management methodology not rolled out | 1         |
| <b>Total</b>                                            | <b>44</b> |

Table 5.11: Top ten ICT project risk factors identified in this study.

| Rank | ICT project risk factors                                | Frequency | Dimension            |
|------|---------------------------------------------------------|-----------|----------------------|
| 1.   | Poor stakeholder involvement                            | 6         | Requirements         |
| 2.   | ICT projects are not based on a proper business case    | 6         | Requirements         |
| 3.   | Risk assessments are not done                           | 5         | Planning and control |
| 4.   | Requirements management issues                          | 5         | Requirements         |
| 5.   | Not managing change properly                            | 4         | Planning and control |
| 6.   | Not following project governance                        | 4         | Planning and control |
| 7.   | Project teams do not have the required knowledge/skills | 3         | Team                 |
| 8.   | Outsourcing of project team members                     | 3         | Planning and control |
| 9.   | Not understanding the meaning of an ICT project risk    | 2         | Planning and control |
| 10.  | Lack of clear roles and responsibilities                | 2         | Planning and control |

In Section 5.4.3, the top ten risk factors presented in Table 5.11 are compared to other top ten ICT project risk factors from the literature (Section 3.5.6).

### 5.4.3 Comparing the top ten ICT project risk factors

In this section, the top ten ICT project risk factors identified in this study are compared to the findings of the studies by Arnuphaptrairong (2011), Smith *et al.* (2006) and Hughes *et al.* (2017). Both studies reviewed and compared the top ten ICT project risk factor lists available in the literature with the aim of identifying top ten ICT project risk factors (Section 3.5).

In the study by Smith *et al.* (2006), ICT project managers from two South African ICT project management organisations were requested to identify risks they felt were important and commonly affecting ICT projects. Thus, it presents the South African context. Hughes *et al.* (2017) present the recent ICT project risk factors.

Table 5.12 presents the comparison between the top ten ICT project risk factors identified in this study and the findings of the Arnuphaptrairong (2011) study.

Table 5.12: Comparison between the top ten ICT project risk factors identified in this study and the findings of the Arnuphaptrairong (2011) study.

| Rank | ICT project risk factors identified in this study      | Identified in Arnuphaptrairong (2011) study? |
|------|--------------------------------------------------------|----------------------------------------------|
| 1.   | Poor stakeholder involvement                           | Yes                                          |
| 2.   | ICT projects are not based on a proper business case   | No                                           |
| 3.   | Risk assessment are not done                           | No                                           |
| 4.   | Requirements management issues                         | Yes                                          |
| 5.   | Not managing change properly                           | Yes                                          |
| 6.   | Not following project governance                       | No                                           |
| 7.   | Project team do not have the required knowledge/skills | Yes                                          |
| 8.   | Outsourcing of project team members                    | No                                           |
| 9.   | Not understanding the meaning of an ICT project risk   | No                                           |
| 10.  | Lack of clear roles and responsibilities               | No                                           |

It is quite interesting to note that all although all the participants for this study identified *ICT projects are not based on a proper business case* as the most common risk factor in the organisation, it was not included in the Arnuphaptrairong (2011) study.

Table 5.13 presents the comparison between the top ten ICT project risk factors identified in this study and the findings of the Smith *et al.* (2006) study.

Table 5.13: Comparison between the top ten ICT project risk factors identified in this study and the findings of the (Smith *et al.*, 2006) study.

| Rank | ICT project risk factors identified in this study       | Identified in Smith <i>et al.</i> (2006) study? |
|------|---------------------------------------------------------|-------------------------------------------------|
| 1.   | Poor stakeholder involvement                            | Yes                                             |
| 2.   | ICT projects are not based on a proper business case    | Yes                                             |
| 3.   | Risk assessments are not done                           | Yes                                             |
| 4.   | Requirements management issues                          | Yes                                             |
| 5.   | Not managing change properly                            | Yes                                             |
| 6.   | Not following project governance                        | Yes                                             |
| 7.   | Project teams do not have the required knowledge/skills | Yes                                             |
| 8.   | Outsourcing of project team members                     | No                                              |
| 9.   | Not understanding the meaning of an ICT project risk    | Yes                                             |
| 10.  | Lack of clear roles and responsibilities                | Yes                                             |

From Table 5.12 and Table 5.13, it is interesting to note that ICT project risk factors ranked number 2, 3, 6, 8, 9 and 10 in this study were not identified in the Arnuphaptrairong (2011) study but were identified in Smith *et al.* (2006) study.

*Outsourcing of project team members* is the only risk that was identified in this study but not in Smith *et al.* (2006) study.

It should be noted that the similarities between the findings of this study and the one by Smith *et al.* (2006) could indicate that the following project risk factors are especially critical for South African ICT projects:

- ICT projects are not based on a proper business case.
- Risk assessments are not done.
- Not following project governance.
- Outsourcing of project team members.
- Not understanding the meaning of an ICT project risk.

- Lack of clear roles and responsibilities.

Table 5.14 presents the comparison between the top ten ICT project risk factors identified in this study and the findings of the Hughes *et al.* (2017) study.

Table 5.14: Comparison between the top ten ICT project risk factors identified in this study and the findings of the Hughes *et al.* (2017) study.

| Rank | ICT project risk factors identified in this study       | Identified in Hughes et al. (2017) study? |
|------|---------------------------------------------------------|-------------------------------------------|
| 11.  | Poor stakeholder involvement                            | Yes                                       |
| 12.  | ICT projects are not based on a proper business case    | Yes                                       |
| 13.  | Risk assessments are not done                           | Yes                                       |
| 14.  | Requirements management issues                          | Yes                                       |
| 15.  | Not managing change properly                            | Yes                                       |
| 16.  | Not following project governance                        | Yes                                       |
| 17.  | Project teams do not have the required knowledge/skills | No                                        |
| 18.  | Outsourcing of project team members                     | Yes                                       |
| 19.  | Not understanding the meaning of an ICT project risk    | No                                        |
| 20.  | Lack of clear roles and responsibilities                | Yes                                       |

Table 5.12, Table 5.13 and Table 5.14 show that the top ten ICT project risk factors identified in this study can be linked to other ICT project risks factors identified in the literature. This indicates that ICT projects share common sources of risks (Section 3.2.1) and that all ICT project risk factors in this organisation are listed in the literature of failed ICT projects.

It is interesting to note that the only risk factor that was identified in this study and not in Smith *et al.* (2006) (*outsourcing of project team members*), was identified in Hughes *et al.* (2017) study.

The similarities between this study and Hughes *et al.* (2017) study might be due to the fact that both studies were concluded in the same era of ‘digital economy’,

whereby most organisations are adopting the adopting service-driven operating model.

As discussed in Section 2.5, the rapid evolution of cloud computing has changed the way ICT project are managed and the kind of skills that ICT project managers must possess to ensure successful implementation of ICT projects. This might be the reason why the *Not following project governance* and *Lack of clear roles and responsibilities* are identified as critical risks affecting ICT projects in both studies. ICT project managers are now expected to acquire expertise on soft skills like resource planning, contract management, data security, governance and compliance issues.

*ICT projects are not based on a proper business case* was also identified in both studies. Although, the introduction of new technologies like cloud computing have shown considerable opportunities to the ICT industry, it is important that organisations assess their readiness to adopt each new technology.

## 5.5 SUMMARY

The failure of ICT systems development projects has been well documented. To ensure that their projects are a success, ICT project managers need to understand the nature of risk factors that might affect their projects. While there are many reasons for these failures, they can typically be categorised according to six dimensions: organisational environment risks, planning and control risks, user risks, requirements risks, project complexity risks, and team risks.

To help one South African organisation overcome these project failures, in-depth semi-structured interviews were conducted. Six ICT professionals who are involved in the execution of ICT projects were asked to identify risk factors that they consider most common in ICT projects. A total of 44 risk factors were identified for this study (Table 5.10). The most frequently mentioned risk factors, with a frequency of more than two out of six participants, are:

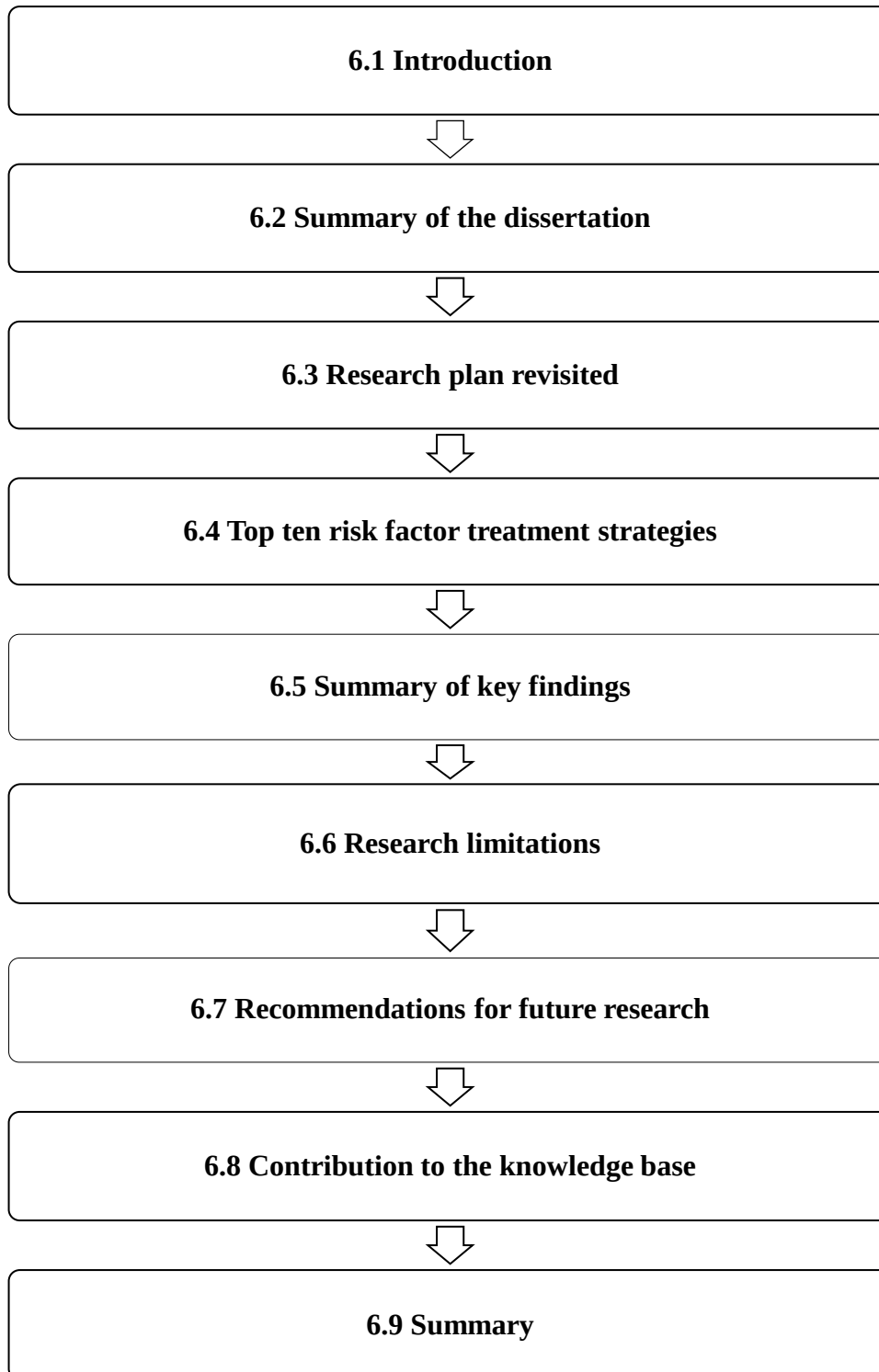
1. Poor stakeholder involvement.
2. ICT projects are not based on a proper business case.
3. Risk assessments are not done.

4. Requirements management issues.
5. Not managing change properly.
6. Not following project governance.
7. Project teams do not have the required knowledge/skills.
8. Outsourcing of project team members.
9. Not understanding the meaning of an ICT project risk.
10. Lack of clear roles and responsibilities.

Risk treatment strategies that can be used to manage the top ten ICT project risk factors are presented in Chapter 6.

## CHAPTER 6

### CONCLUSIONS AND RECOMMENDATIONS



## **6.1 INTRODUCTION**

The successful implementation of ICT projects is very critical since ICT projects can be used to transform the efficiency of business processes. However, the successful implementation of ICT projects has been described as very complex and rare. Many of the complexities in managing ICT projects are caused by the lack of risk management practices. Most of ICT project failures can be avoided if risks are identified, analysed, and controlled throughout the project lifecycle. Therefore, this study was initiated with an objective of identifying top ten risk factors affecting ICT projects in one South African organisation and defining risk treatment strategies that can be used to manage the top ten risks.

The aim of this chapter is to propose risk treatment strategies that can be used to manage the top ten ICT project risks and to conclude this study by reflecting on the research objectives, the research plan and key findings.

A summary of the dissertation is provided in Section 6.2. The research plan is revisited in Section 6.3. In Section 6.4, the proposed risk treatment strategies are presented. Section 6.5 presents key findings of this study. Recommendations for future research are discussed in Section 6.7. Lastly, contributions to the knowledge base are discussed in Section 6.8.

## **6.2 SUMMARY OF THE DISSERTATION**

The chapter layout of this dissertation was presented in Section 1.7. The focus of each chapter is now briefly revisited.

In Chapter 1, a foundation for the dissertation was laid by identifying and discussing the background of this research which is related to the failure of ICT projects to deliver the expected benefits to organisations in Chapter 1. The research problem was formulated as: it is difficult for ICT project team members to identify top ten risk factors affecting ICT projects and define strategies to manage them. The objectives of this research were to identify top ten risk factors affecting ICT projects in one South African organisation and to define strategies that can be used to manage them. A brief description of the research methodology and ethical consideration employed in this study were also provided in this chapter.

Based on the research background provided in Chapter 1, the literature review was conducted and discussed in Chapter 2 and Chapter 3. Chapter 2 explored the literature on project management and ICT project management. Since this study aimed at identifying factors that may contribute to the failure of ICT projects, it was important to establish the link between ICT project management and ICT project risk management. This was done by first providing definitions for ICT projects, ICT project management, ICT projects success, troubled ICT projects, and failed ICT projects. It was also important that the ten project management knowledge areas be discussed as they can be applied to detect and rescue troubled ICT projects. The impact that organisational structures have on the execution of ICT projects were clarified and ICT project lifecycle models were discussed in this chapter. Lastly, factors that contribute to the complexity of managing ICT projects were discussed.

Literature related to project risk management and ICT project risk management was discussed in Chapter 3. This chapter explained definitions of ICT project risks, the six dimensions of ICT project risks and ICT project risk management. The benefits, approaches and processes of ICT project risk management were also explained. The complexities of ICT project risk management were discussed to indicate the need and importance for ICT projects risk factors to be identified and managed. The literature review broadened the researcher's knowledge about ICT project risk management, thus allowing the researcher to be acquainted to the ICT project risk management body of knowledge. The chapter was concluded by reviewing and analysing top ICT project risk factor lists from the literature.

Chapter 4 explained the research methodology in terms of its philosophical assumptions, design, research methods, sampling strategy, data collection and data analysis approach. The research plan followed was explained in Section 4.3. This chapter further outlined the procedures followed to ensure that the findings of this research are valid and reliable. The chapter was concluded by explaining the ethical considerations observed by the researcher.

An explanation of the data analysis approach used in this study was discussed in Chapter 5. Study findings were analysed and discussed in this chapter. The chapter further provided an overview of the participants' background, understanding of the term 'risk' and ICT project risk factors that they perceive to be commonly affecting

ICT projects in the organisation. This chapter presented an answer to the main research question: What are the top ten ICT project risk factors in one South African organisation?

The proposed risk treatment strategies that can be used to manage the identified top ten ICT project risk factors in the organisation are presented in Chapter 6. The research plan is revisited, key findings are summarised, the success of the study is determined and finally, contributions to the knowledge base and recommendations for future studies are stated.

### **6.3 RESEARCH PLAN REVISITED**

The intent to resolve the research problem was initiated by conducting a literature review on the common causes of ICT project failures, after the researcher was exposed to the high failure rate of ICT projects. The literature review indicated that several top ICT project risk factors lists have been compiled since the 1970s (Section 3.5). It was difficult for the researcher to choose any of the lists as they were all compiled at different periods of time, by people from different backgrounds using different research methods. The problem statement for this study is formulated as:

*It is difficult for ICT project team members to identify top ten risk factors affecting ICT projects and define strategies to manage them.*

To address the research problem, two main objectives were defined:

- Research objective 1: To identify the top ten ICT project risks in one South African organisation.
- Research objective 2: To propose risk treatment strategies that can be used to manage the top ten ICT project risks.

To identify the top ten ICT project risks in one South African organisation, two sub-objectives were defined:

- Sub-objective 1.1: To perform a literature review to understand theoretical concepts integral to this study (ICT project management and ICT project risk management).

- Sub-objective 1.2: To perform an exploratory study with the aim of understanding the most common ICT project risk factors from participants' perspective.

To achieve sub-objective 1.1, theoretical concepts regarding ICT project management (Chapter 2) and ICT project risk management were explored (Chapter 3) through the literature review.

To achieve sub-objective 1.2, an exploratory study was conducted in one South African organisation. A total of six participants who are involved in the implementation of ICT projects in the organisation were interviewed and 44 ICT project risk factors were identified. Interview transcripts were qualitatively analysed through a process of familiarisation with the text, identification and clustering of themes. Ten main themes emerged from the analysis, which resembled risk factors that participants considered to be commonly affecting ICT projects in their organisation. The most frequently mentioned risk factors, which were mentioned by two or more participants are:

1. Poor stakeholder involvement.
2. ICT projects are not based on a proper business case.
3. Risk assessments are not done.
4. Requirements management issues.
5. Not managing change properly.
6. Not following project governance.
7. Project teams do not have the required knowledge/skills.
8. Outsourcing of project team members.
9. Not understanding the meaning of an ICT project risk.
10. Lack of clear roles and responsibilities.

This indicates that ICT project managers should be highly sensitive to these risks affecting the success of their projects. The top ten ICT project risk factors were discussed and analysed in Chapter 5.

To achieve research objective 2, risk management strategies that can be used to manage the top ten ICT projects risk factors were proposed based on the researcher's

knowledge and the literature. The risk management strategies are presented and discussed in Section 6.4.

It was concluded that the objectives set forth for this research were successfully achieved.

## **6.4 TOP TEN RISK FACTOR TREATMENT STRATEGIES**

The diverse and complex nature of ICT projects makes it difficult for ICT project managers to proactively identify actions to be taken to manage the risks should they occur. As discussed in Section 3.3.4, the four common risk treatment strategies are risk acceptance, risk avoidance, risk transfer, and risk mitigation. Table 6.1 presents the proposed risk treatment strategies that can be used to manage the top ten ICT project risk factors identified in this study (Section 5.4.2).

In the first row of Table 6.1, the participants' responses (Section 5.3.3) are summarised to provide a brief description of the top ten ICT project risk factors. The second row indicates whether the risk will be accepted, avoided, transferred or mitigated. Then, the proposed risk treatment strategies and related project management knowledge areas are presented.

From Table 6.1, it is evident that there is no single way to manage ICT project risk factors. This is indicated by the fact that more than one approach has been proposed for each ICT project risk factor. ICT project teams (especially ICT project managers) should be aware of all the possible ways of managing the top ten ICT project risk factors.

Table 6.1 also shows that all the proposed top ten ICT project risk factor treatment strategies relate to project management processes and that project management knowledge areas can be used to manage the top ten ICT project risk factors. This support the literature (Section 2.2.3).

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b><u>1. Poor stakeholder involvement</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                     |
| <p>It is a common practice in the organisation to engage only with the functional managers. In most cases, ICT project managers fail to engage with the end-users who are doing the job. Stakeholders from different business units or departments believe their requirements are a priority and should be addressed first. Current processes do not make it compulsory for service owners to be part of project teams, as a result operational teams do not have input on the project whilst in development. Information security specialists and enterprise architects are involved late in the project. Multi-vendor dependencies contribute to project delays.</p> |                                                     |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                     |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Project management knowledge area</b>            |
| Establish steering committee selection processes and operational guidelines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Stakeholder management                              |
| Identify project stakeholders and involve them at the beginning of the project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Stakeholder management/<br>Communication management |
| Get a project sponsor that has top level management span, understand the business and can positively influence other stakeholders.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Stakeholder management                              |
| For enterprise-wide projects, get each business area to dedicate a top-level manager to the project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Stakeholder management                              |
| Integrate project management and service management early in project life-cycle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Integration management                              |
| Provide an online platform for development of status reports and recording of decisions throughout project lifecycle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Stakeholder management/<br>Communication management |

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b><u>2. ICT projects are not based on a proper business case</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
| <p>Service providers often sell new ICT solution/products to the ICT management team. If management likes the solution, they procure it for the business, even though there are no business requirements for the solution. Most ICT projects fail because they are done for technology's sake and not to address specific problems in the business. Management and users do not buy into ICT projects because they do not derive any value from them. There is no alignment between business and ICT priorities/ strategies. Business throws many 'quick fix' requests at ICT department and this results in having many projects in the pipeline, with no portfolio management execution plan in place.</p> |                                          |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Project management knowledge area</b> |
| Develop and articulate a vision and mission for each project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Integration management                   |
| Establish a sound business case for each project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Integration management                   |
| Ensure that project goals are aligned to the business and ICT departmental strategies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Integration management                   |
| Instead of customising off-the-shelf ICT systems to fit in to the existing business processes, attempts should be made to align the existing business processes to the off-the-shelf ICT system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Integration management                   |
| Any business processes adjustments should be done before the system is implemented.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Integration management                   |

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors

| <b>3. <u>Risk assessments are not done</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <p>Project managers do not know the most common risk factors that might affect their projects and they do not know suitable mitigation strategies to address the risks, should they occur. No risk assessments or impact analysis is done to ensure that there will be no issues once the system is operational, and the system can be easily repaired and maintained. Project managers do not do a proper risk assessment and they do not understand (or cannot quantify) what is at stake if a project is not successful. ICT project managers consider risk management as a burden. ICT project managers manage projects with a silo mentality.</p> |                                            |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Project management knowledge area</b>   |
| Entrench risk management culture by ensuring that risk management activities form part of project schedule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Scope management                           |
| Use a list of top ten ICT project risk factors as a checklist of possible project risk factors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Risk management                            |
| Provide an interactive online platform where all stakeholders can identify possible risk factors throughout the project life-cycle and propose possible treatment strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Stakeholder management/<br>Risk management |
| Compile a list of lessons-learnt at the end of each project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Integration management                     |
| Ensure that risks are analysed and that the risk register is kept up to date.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Risk management                            |

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors

| <b><u>4. Requirements management issues</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <p>ICT does not communicate their strategic roadmap or projects goals to the business in time, so that the business can put the ICT projects in the business tactical plan. The business managers do not communicate their ICT requirements on time. Not all requirements are gathered before the project is started. Project goals are not documented and used as a starting point for planning and managing users' expectations. The business requirements are written based on the assumption that everything will work as planned.</p> |                                                     |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                     |
| Proposed risk treatment strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Project management knowledge area                   |
| Document and communicate ICT strategies/roadmaps/tactical plans to the business.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Stakeholder management/<br>Communication management |
| Establish a strategic partnership with each business unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Stakeholder management                              |
| Develop and communicate the ICT demand management processes and operational guidelines.                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Stakeholder management                              |
| Provide an online platform that enable all stakeholders to record projects requirements and automatically sends alerts to ICT demand managers.                                                                                                                                                                                                                                                                                                                                                                                             | Stakeholder management                              |
| Requirements must be clearly defined, documented and signed off before the projects are initiated                                                                                                                                                                                                                                                                                                                                                                                                                                          | Integration management/<br>Quality management       |
| Manage stakeholder expectations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Stakeholder management                              |

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b><u>5. Not managing change properly</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                     |
| <p>Change management, training and handovers are not always included as part of the project plan. ICT support teams are not notified about the new solutions before they are implemented. As a result, the support team cannot plan for support service take on. Users are not sufficiently trained on the new system before it is deployed. Not properly selling the solution to the users or not offering new technology introduction result in less commitment from the users.</p> |                                                     |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                     |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Project management knowledge area</b>            |
| Identify user representatives and engage them in the early stages of the project.                                                                                                                                                                                                                                                                                                                                                                                                     | Stakeholder management                              |
| Establish formal change management and user training processes.                                                                                                                                                                                                                                                                                                                                                                                                                       | Integration management                              |
| Manage changes through the leadership of ICT support service owners.                                                                                                                                                                                                                                                                                                                                                                                                                  | Stakeholder management                              |
| Educate project stakeholders in change management processes                                                                                                                                                                                                                                                                                                                                                                                                                           | Human resource management                           |
| Allocate time for change management, training and system handover activities in the project plan.                                                                                                                                                                                                                                                                                                                                                                                     | Integration management/<br>Time management          |
| Ensure consistent and continuous communication between project teams, support teams and users.                                                                                                                                                                                                                                                                                                                                                                                        | Stakeholder management/<br>Communication management |

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors

|                                                                                                                                                                                                                                                                                                                                        |                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b><u>6. Not following project governance</u></b>                                                                                                                                                                                                                                                                                      |                                                                          |
| <p>ICT project managers do not follow the organisational risk management methodology, despite it being enforced by governance frameworks. The benefits of investing in an ICT project are not tracked and reported to business managers. As a result, ICT is seen as failing to deliver value for money and wasting company money.</p> |                                                                          |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                              |                                                                          |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                              | <b>Project management knowledge area</b>                                 |
| Establish project management office (PMO) that provides central project leadership.                                                                                                                                                                                                                                                    | Quality management/<br>Stakeholder management/<br>Integration management |
| Adopt an effective project management methodology.                                                                                                                                                                                                                                                                                     | Integration management                                                   |
| Implement online project management tracking and reporting tool.                                                                                                                                                                                                                                                                       | Stakeholder management/<br>Communication management                      |
| Define quality management and quality assurance processes.                                                                                                                                                                                                                                                                             | Quality management                                                       |
| Establish an effective benefit management approach.                                                                                                                                                                                                                                                                                    | Integration management                                                   |
| <b><u>7. Project teams do not have the required knowledge/skills</u></b>                                                                                                                                                                                                                                                               |                                                                          |
| <p>Teams lack the subject matter expertise (relevant experience or technical skills) required to successfully complete the project.</p>                                                                                                                                                                                                |                                                                          |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                              |                                                                          |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                              | <b>Project management knowledge area</b>                                 |
| Invest in training and re-skilling internal ICT project teams.                                                                                                                                                                                                                                                                         | Human resource management<br>Procurement management                      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Effective use of external project teams.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Procurement management<br>Stakeholder management                                                   |
| Cross-functioning of skills amongst the project teams                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Human resource management<br>Integration management                                                |
| <p><b><u>8. Outsourcing of project resources</u></b></p> <p>The project teams responsible for deploying big ICT projects are (mostly) external contractors. Contractors do not understand the organisational culture, policies and ICT operations, and they will not be there to maintain the system post implementation.</p> <p>ICT Project managers are mostly external consultants and they do not understand the business; they do not know the intermittent organisational ways of working. The external project managers recommend and implement the solution based on their own subjective perceptions. As a result, they fail to include appropriate cultural change activities as part of the project. The project plan needs to be ramped-up to include time for project managers to have in-depth consultation with the business specialists. Bringing new team members halfway through a project may increase project costs or delays the project.</p> |                                                                                                    |
| <b>Transfer the risk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                    |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Project management knowledge area</b>                                                           |
| The current operating model allows for ICT services to be shared between internal and external project teams. Therefore, the implementation of the control measure for this risk is transferred to the service providers. Service provider's performance to be measured through SLA management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Stakeholder management<br><br>Risk management<br><br>Procurement management<br><br>Cost management |
| Develop recruitment and retention programmes and communicate to service providers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Stakeholder management                                                                             |
| Ensure that external project team members understand the organisational project management related processes/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Stakeholder management/                                                                            |

|                                                                                                                                                                                                                                                                                                                                                                                              |                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| methodologies/practices and that they understand the mission, vision, project requirements and their roles.                                                                                                                                                                                                                                                                                  | Cost management<br>Procurement management  |
| Assign an in-house project leader with essential skills and business knowledge (if external project manager is sourced).                                                                                                                                                                                                                                                                     | Stakeholder management                     |
| <b><u>9. Not understanding the meaning of an ICT project risk</u></b>                                                                                                                                                                                                                                                                                                                        |                                            |
| <p>Some ICT professionals (including project managers) cannot differentiate between a risk and an issue. Because of this misunderstanding, a lot of ‘garbage’ is recorded in the risk registers and project team members end up not doing risk management. It gets difficult to identify new emerging risks and their true sources if risks are only seen as threats (negative effects).</p> |                                            |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                    |                                            |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Project management knowledge area</b>   |
| There must be a clear defined and accepted meaning of ‘ICT project risks’.                                                                                                                                                                                                                                                                                                                   | Risk management                            |
| Provide training on ICT project risk management.                                                                                                                                                                                                                                                                                                                                             | Risk management                            |
| Provide guidance on measures that will be used to determine if a project was successful.                                                                                                                                                                                                                                                                                                     | Risk management/<br>Integration management |
| Involve risk specialists at early stages of the project lifecycle.                                                                                                                                                                                                                                                                                                                           | Stakeholder management                     |

Table 6.1: Proposed risk treatment strategies for the top ten ICT project risk factors

|                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| <b><u>10. Lack of clear roles and responsibilities</u></b>                                                                                                                                                                                                                                                                                                                                                       |                                                             |
| <p>There is a lack of clarity among team members regarding their respective roles and responsibilities. The new ICT operating model introduced new roles that must be part of project teams. However, the roles and responsibilities of the new project teams are not communicated. The lack of clear roles and responsibilities result in confusion, mistakes, omissions and the team not working together.</p> |                                                             |
| <b>Mitigate the risk.</b>                                                                                                                                                                                                                                                                                                                                                                                        |                                                             |
| <b>Proposed risk treatment strategies</b>                                                                                                                                                                                                                                                                                                                                                                        | <b>Project management knowledge area</b>                    |
| <p>Roles and responsibilities must be clearly communicated at the beginning of each project.</p>                                                                                                                                                                                                                                                                                                                 | <p>Human resource management<br/>Stakeholder management</p> |
| <p>The project manager should constantly remind the project stakeholders about how they can individually contribute to achieving the project goals.</p>                                                                                                                                                                                                                                                          | <p>Communication management/<br/>Stakeholder management</p> |

Table 6.1 indicates that:

- Risk acceptance strategy was not proposed to manage any of the top ICT project risk factors. The reason for this is because the acceptance strategy only applies to minor risks; the risks discussed in Table 6.1 are very critical to project success.
- Risk avoidance strategy was not proposed to manage any of the top ICT project risk factors. The reason for this is because ICT project teams are encouraged to first try to take some proactive actions to reduce the probability or impact of a project risk (mitigate) before they restructure the project to avoid the risk (Abdul-Rahman *et al.*, 2012).
- Risk mitigation strategy is the most used treatment strategy. This supports the literature; reducing the impact of ICT project risks is the main benefit of ICT project risk management (Sections 3.2.2.1.)

- Risk transfer strategy was proposed to manage risks related to the outsourcing of project team members. The reason being that the operating model allows for ICT services to be shared between internal and external project teams. It is proposed that the treatment of this risk be transferred to the service providers since this risk relates specifically to external project team members. It should be noted that although the service providers' assistance is required in managing this risk, the ultimate responsibility of ensuring that the risk is managed lies with the PMO. The PMO should specify controls to manage this risk and ensure that service providers implement those controls. For example, the PMO should ensure that the service providers understand the importance of recruiting and retaining highly skilled project team members that understand the organisational culture and business processes. Service providers should address this need.

## **6.5 SUMMARY OF KEY FINDINGS**

This study's key study findings regarding participants' understanding of the term 'risks', the identification of most common ICT project risk factors and proposed treatment strategies are briefly discussed in sections 6.5.1 to 6.5.3.

### **6.5.1 Understanding of 'risks'**

Eighty-three percent (5 out of 6) of the participants defined risks as uncertain events or conditions that might have negative effects on ICT projects (Section 5.3.2). This is the same meaning of the term that was accepted for this study (Section 3.2.1).

Seventeen percent (1 out of 6) of the participants defined risks as uncertain future events that might have negative or positive effects on the project outcome. However, when asked to identify ICT project risk factors, the participant only identified factors that may negatively affect the project success. This indicates that although the participant is aware of the theoretical definition of 'risks', she has accepted the view that ICT project risk factors refers to uncertain events or conditions that might have negative effects on ICT projects.

Participant 3 is a risk management specialist and therefore have more understanding and in-depth knowledge of what a 'risk' is and what should be considered as ICT

project risks (Section 5.3.2). This participant s' knowledge was more in accordance with the literature (Section 3.2).

### **6.5.2 Identification of most common ICT project risk factors**

The fact that all risk factors affecting ICT projects in one South African organisation can be linked back to ICT project risk factors in the literature shows that ICT projects in this organisation are not unique to the organisation. All the factors that are currently causing ICT projects to fail appear in the literature on failed projects.

Most of the top ten ICT project risk factors fall under planning and control, requirements and team dimensions (Table 5.11).

None of the top ten ICT project risk factors fall under user, complexity and organisational environment dimensions.

*Poor stakeholder involvement* and *ICT projects are not based on a proper business case* are perceived to be the most common risk factors affecting ICT projects in the organisation. The two risk factors received the highest ranking as they were identified by all participants.

*Poor stakeholder involvement* has been identified as the number one ICT project risk factor. Since the 1990s *Poor stakeholder involvement* is regarded as the number one ICT project risk factor worldwide (Section 3.5).

Although cross-functioning of skills amongst the project teams can be used to address skills shortages within project teams, the programme manager firmly considers it to be one of the huge risk that negatively affects the quality of ICT solutions.

*Outsourcing of project team members* is the only risk that was identified in this study, but not in Smith et al. (2006) study.

The similarity between the findings of this study and the study by Smith *et al.* (2006) (Table 5.13) indicates that even after ten years, risk factors affecting ICT projects in South African organisations have not changed.

The following risk factors are most common and especially critical to South African ICT projects:

- ICT projects are not based on a proper business case.
- Risk assessments are not done.
- Not following project governance.
- Outsourcing of project team members.
- Not understanding the meaning of an ICT project risk.
- Lack of clear roles and responsibilities.

The only risk factor that was identified in this study and not in Smith *et al.* (2006) (*outsourcing of project team members*), was identified in Hughes *et al.* (2017) study.

The following ICT project risk factors were identified as critical in this study and in Hughes *et al.* (2017) study:

- ICT projects are not based on a proper business case.
- Not following project governance.
- Lack of clear roles and responsibilities.

### **6.5.3 Risk treatment strategies**

All the risk treatment strategies are related to PMBOK knowledge areas (Table 6.1). This supports the literature that most ICT project failures are due to project management process mistakes.

Most of the top ten ICT project risk factors can be addressed through effective human resource management, risk management, communication and stakeholder management processes. This indicates that managing ICT project risks does not require any technical expertise.

It is proposed that the risk management specialist be involved at the early stages of the project to address the *Not understanding the meaning of an ICT project risk* (Table 6.1) as the participant has more understanding and in-depth knowledge of what a 'risk' is and what should be considered as ICT project risks (Section 5.3.2).

Stakeholder management is the most prevailing treatment strategy (Table 6.1). This indicates that managing stakeholders' expectations can improve the chances of ICT project success.

## **6.6 RESEARCH LIMITATIONS**

There are three major limitations affecting the repeatability and transferability of this study:

- This study focused on identifying ICT projects risk factors at one South African organisation. Therefore, the extent to which the findings of this study are generally applicable to other types of projects, contexts or organisations was not included in the study.
- Although the organisation is outsourcing ICT services, only internal project teams were interviewed for this study. It will be possible to include external project teams.
- The point of data saturation might be different for similar research conducted in other contexts.

## **6.7 RECOMMENDATIONS FOR FUTURE RESEARCH**

Four possible areas for further research were identified.

- A wider range of participants should be considered in further research to increase the field where the findings can be applied.
- Further research should focus on the in-depth analysis of ICT projects in the organisation to determine the application of risk management processes.
- Since ICT project risk factors are constantly evolving, researchers are encouraged to conduct similar studies in the future with a focus of identifying common ICT project risk factors and recommending appropriate treatment strategies.
- ICT project managers in other organisations are encouraged to develop their own top ICT project risk factor lists and adopt appropriate risk treatment strategies.

## **6.8 CONTRIBUTION TO THE KNOWLEDGE BASE**

This research contributes to the ongoing efforts of ensuring that ICT projects are implemented successfully and that organisations gain value from ICT projects. The following theoretical and practical contributions were made.

### **6.8.1 Theoretical**

The literature study of this research revealed there are many top ICT project risk factor lists in the literature, but project managers do not know which lists to use as the lists were compiled at different periods of time, by people from different backgrounds, using different research methods. This research contributed to the knowledge base by using qualitative research methods to identify and compile a list of top ten ICT risk factors in one South African organisation and to propose risk treatment strategies that can be used to manage the top ten ICT project risk factors.

This study indicates that the following risk factors are especially important and unique to South African ICT projects:

- ICT projects are not based on a proper business case.
- Risk assessments are not done.
- Not following project governance.
- Outsourcing of project team members.
- Not understanding the meaning of an ICT project risk.
- Lack of clear roles and responsibilities.

### **6.8.2 Practical**

The findings of this study can be applied in the following practical contexts.

The top ten ICT project risk factors can be used as a checklist of the most critical risks that may affect ICT projects in the organisation.

ICT project managers can use the proposed risk treatment strategies to manage the top ten ICT project risk factors.

## **6.9 SUMMARY**

The research findings and summary discussed in this chapter show that the research objectives of this study were achieved. The completion of this study did not only contribute to my personal growth, but to the ICT project management body of knowledge. During my research, I was involved in ICT project management in two South African organisations. The need for and relevance of the study was recognised through personal interaction with ICT project team members from both organisations.

This study fills a gap in the ICT project risk management literature by identifying specific risk factors affecting ICT projects in one South African organisation and proposing risk management strategies that can be used to manage the top ten ICT projects risk factors. ICT project managers can use the identified top ten ICT project risk factors as a checklist of critical risks that might affect their ICT projects. ICT project managers should also take note of other risk factors that were identified in this study, including those that were not considered as most common and critical. The proposed risk treatment strategies can be implemented to manage the top ten ICT projects risk factors.

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## APPENDIX A

### INTERVIEW SCHEDULE

| A. INTRODUCTION                                            |                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Study Background                                        | <ul style="list-style-type: none"> <li>Research objectives: <ul style="list-style-type: none"> <li>To identify the top ten ICT project risks in one South African organisation.</li> <li>To propose risk treatment strategies that can be used to manage the top risks.</li> </ul> </li> </ul> |
| 2. Purpose of the interview.                               | The aim of the interview is for participants (ICT project team members) to identify most common risk factors affecting ICT projects in the organisation.                                                                                                                                       |
| 3. Confidentiality                                         | Read the contents of the consent form and obtain approval from the participant.                                                                                                                                                                                                                |
| 4. Interview Format                                        | <ul style="list-style-type: none"> <li>Semi-structured interview</li> <li>30-45 minutes</li> </ul>                                                                                                                                                                                             |
| B. INTERVIEW                                               |                                                                                                                                                                                                                                                                                                |
| 5. Participants background:                                | <ul style="list-style-type: none"> <li>What is your current job title?</li> <li>Please clarify your current involvement in the execution of ICT projects.</li> </ul>                                                                                                                           |
| 6. Understanding of 'risks'                                | <ul style="list-style-type: none"> <li>What is your understanding of the term risk?</li> </ul>                                                                                                                                                                                                 |
| 7. Identification of most common ICT projects risk factors | <ul style="list-style-type: none"> <li>What are the common risk factors faced by ICT projects in the organisation?</li> </ul>                                                                                                                                                                  |

## APPENDIX B

### SAMPLE PARTICIPANT CONSENT FORM

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NORTH-WEST UNIVERSITY  
YUNIBESITHI YA BOKONE BOPHIRIMA  
NOORDWES-UNIVERSITEIT  
VAAL TRIANGLE CAMPUS

**CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY**

**NAME AND CONTACT DETAILS OF RESEARCHER:** Keneilwe Magwede  
Email address: [REDACTED]  
Contact number: [REDACTED]

**TITLE OF PROJECT:** Proposed risk treatment strategies for information and communications technology projects

**PROJECT INFORMATION:**

This research involves performing an exploratory study with the aim of understanding the most common ICT project risk factors in your organisation. Interviews will be conducted whereby participants will be asked to identify what they consider as most common ICT project risk factors in the organisation.

**PERMISSIONS:**

I therefore request your permission to anonymously report my findings from an analysis of the information you provided in my dissertation and in conference papers and articles.

Do you give permission to the researcher to report the findings in a dissertation, conference papers and articles? Yes ☒ No ☐

**CONFIDENTIALITY:**

This study is anonymous. No information about your identity will be collected or retained.

**PAYMENTS:**

There will be no payment / reimbursement for participating in this study.

**CONSENT:**

Your signature below indicates that you have agreed to be a participant for this study, and that you have read and understood the information provided above. You will be given a signed copy of this form to keep.

Participant name and surname: [REDACTED] Signature: [REDACTED] Date: [REDACTED]

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Informed Consent 1

## APPENDIX C

### SAMPLE CODING AND MARKING OF INTERVIEW TRANSCRIPT

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Participant 1</b>               | “The conflicting priorities or views of different stakeholders. At times, you might have a big ICT project with stakeholders from HR, supply chain and others coming from Finance departments. You (project manager) can decide to break the project into phases. So, the conflict will be when all three stakeholders (HR, Finance and Supply chain) believe their requirements are a priority and should be in phase 1. So, if the project manager has no strategy of ensuring that the priorities are dealt with, it will paralyse the project because they (project managers) will try to please everyone at once, and we know that when you try to chase two rabbits at once they will both escape.” |
| <b>Researcher’s interpretation</b> | Stakeholders from different business units are not identified early in the project to understand and agree on scope of the project and approve the project plan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Code</b>                        | Poor stakeholder involvement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |