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PROJECT COMMUNICATION, TRUST, COLLABORATION AND SUCCESS: A STRUCTURAL EQUATION MODEL AND THE INFLUENCE OF COMPUTER MEDIATED COMMUNICATION

by

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Declaration

I declare that the thesis, which I hereby submit for the degree Philosophiae Doctor (Project Management) at the University of Pretoria, is my own work and has not been previously submitted by me for a degree at another University.

Taryn Jane Bond-Barnard

Summary

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by

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Thesis Summary

Project success is the goal of every project that is undertaken. Literature supports the fact that project communication in addition to several other 'human-related' factors has an influence on the ultimate success of the project as it is well-known that it is people that deliver projects: not processes or systems. This thesis identifies the main 'human-related' project success factors, the variables that determine them and puts forward a model of the relationship between these factors and project success. Furthermore, the impact of computer-mediated communication (CMC) on the quality of project communication is also explored. This thesis answers the main research question: *How does project communication influence the perceived success of the project?*

This question is answered through two related studies. The first study, a sample of 151 international self-selected respondents (project/programme managers, project team members, project sponsors/clients and other project stakeholders) working on medium size projects in various public and private sector organisations, were surveyed. The collected data was analysed by applying structural equation modelling (SEM) techniques.

The second study surveyed the project teams (consultant, contractor and client sub-groups) involved with 196 active Government Repair and Maintenance Programme (RAMP) projects in South Africa. The collected data were analysed by utilising general linear modelling techniques to determine the relationship between the model variables proposed in the study.

The studies determined that the main human-related factors that influence the perceived success of a project include the quality of communication, the level of trust and degree of collaboration experienced in the project.

From literature it was deducted that the determining variables for quality of project communication are:

- the existence of a communications plan,
- access to and the utilisation of technology,
- the frequency of interaction,
- the communication content,
- a balance between different types of communication,
- the number of project communication channels and
- the project audience.

It was empirically confirmed that the determining variables for level of trust include:

- project team expectations,
- knowledge exchange and
- the degree of imported trust.

The degree of risk present in the project was found to have no significant link with the level of trust experienced in the project. This alters the widely accepted view that the relationship between risk and trust is reciprocal; and that an acceptable degree of risk is responsible for an increase in the level of trust in a project (Daim et al., 2012).

Similarly, it was confirmed that the determining variables for the degree of collaboration are:

- team physical proximity,
- commitment,
- the absence of conflict,
- the degree of coordination,
- the strength of team relationships and
- a balance of intrinsic and extrinsic incentives.

The study determines, using structural equation modelling, that project success is positively influenced by the degree of collaboration and indirectly by the level of trust between team members based on a foundation of quality communication.

Moreover, project and programme performance can be achieved by communication that is facilitated by a programme call centre. A call centre can provide the correct combination of informal and formal communication to increase the communication, collaboration and trust between principals and agents in a project. The programme benefits of a call centre include improved team communication, project deliverables, service delivery and customer satisfaction.

Lastly, it was determined that the CMC mediums, instant messaging and video conferencing, impact positively on the variables that determine the quality of communication in a project, as they lead to more appropriate project communication and improve the quality of communication in virtual teams.

The findings and recommendations of this study assist project managers to achieve more successful projects by pursuing quality communication, a high level of trust and

a high degree of collaboration in their projects. Furthermore, the thesis provides insight into the implication of using a call centre for project communication and the influence of instant messaging and video conferencing on the variables that determine quality communication in a project.

Keywords

Project communication, trust, collaboration, project success, structural equation modelling, programme call centre, computer mediated communication

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List of Acronyms

ACD	Automated Call Distribution
AGFI	Adjusted Goodness-of-fit Index
AIM	AOL Instant Messenger
AOL	America Online
CCTA	Central Computer and Telecommunications Agency
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMC	Computer Mediated Communication
CRM	Customer Relationship Management
DPW	Department of Public Works
ERM	Enterprise Resource Management
GFI	Goodness-of-fit Index
GOF	Goodness-of-fit
GVT	Global Virtual Team
IBM	International Business Machines
IJPM	International Journal of Project Management
IM	Instant Messaging
IRC	Infrastructure Report Card
ISI	International Scientific Indexing
IT	Information Technology
ML	Maximum Likelihood
MoP	Management of Projects
MXit	Message Xchange it
NFI	Normed Fit Index
OGC	the Office of Government Commerce
OLS	Ordinary Least Squares
PMBOK	Project Management Body Of Knowledge
PMI	Project Management Institute
PMJ	Project Management Journal
R&D	Research and Development
RAMP	Repair and Maintenance Programme

RFI	Relative Fit Index
RSS	Rich Site Summary
SAICE	South African Institution of Civil Engineering
SEM	Structural Equation Modelling
SMS	Short Message Service
SRMR	Standardised Root Mean Residual
TLI	Tucker-Lewis Index
U.S.	United States
ULS	Unweighted Least Squares
VC	Video Conferencing

Chapter 1

Introduction

1.1. Setting the stage

The constituents of project success have been widely researched in literature (Andersen et al., 2006; Baker et al., 1988; Cooke-Davies, 2002; Fortune and White, 2006; Lechler, 1998; Pinto and Slevin, 1988). The overall objectives of a project consist of both traditional project management objectives of performance against cost, time and quality and the stakeholders' perception of project success (Cooke-Davies, 2002; de Wit, 1988; Koelmans, 2004) which is discussed in more detail in Chapter 2. The implication of this is that, if the stakeholders do not perceive the project to be a success, then it is not a success even if all cost, time and quality objectives were met. A stakeholder's perception of success is influenced by 'human factors' such as communication, trust and collaboration which are often being ignored in project management but which are an important topic for investigation (see Chapter 2).

The majority of the research that has been done on project success focuses on what people and teams do rather than on the quality of their human interactions, motivations and/or decision-making practices (Cooke-Davies, 2002). Furthermore, there are human dimensions to nearly all the success factors that have been identified in the literature (Cooke-Davies, 2002). To achieve project success it is imperative that the implications of communication, trust and collaboration on project success be understood so as to achieve the overarching goal of a project.

From previous studies, no clear model of the relationship between project communication, trust, collaboration and success can be established. The intent of this thesis is to provide a clear understanding of which variables influence the quality of communication, level of trust and degree of collaboration and to model the relationship between these factors.

To provide an introduction to the thesis the theoretical relationship between project communication and success is discussed in Section 1.2. Based on this discussion it will become apparent that the relationship between project communication and success is mediated by other human-related factors such as the level of trust and the degree of collaboration experienced in the project. Based on the identification of these main human-related factors that determine project success, Section 1.3 will develop the main research question of this study and propose a relational model as its theoretical basis. The main research question is broken down into several sub-questions in Section 1.4. This section will also address how each of the following chapters in the thesis relate to each sub-question. In this way, the coherence of this thesis will become clear. In the last section of this chapter, a discussion about the research contribution will be presented to show how this thesis is practically and scientifically relevant.

1.2. The relationship between project communication and project success

1.2.1. The evolution of project success frameworks

Approaches to project success have changed continuously over the past few decades from definitions of success and critical success factors to a more strategic, holistic view (Jugdev and Müller, 2005). However, the evolution of project success frameworks alone cannot guarantee the successful implementation of project objectives. Several studies report that in spite of developments related to the theory of project success, quite a large number of projects fail (Cserháti and Szabó, 2014; KPMG International, 2008; The Standish Group, 1994; Flyvbjerg et al., 2003).

The reason for this is thought to be two-fold. Firstly, project context varies. Not all success frameworks are created equal as they are usually not applicable to all types of projects (Cserháti and Szabó, 2014). Secondly, practitioners and researchers place a great deal of emphasis on achieving the objectives of the 'iron triangle' of project success (Turner and Cochrane, 1993; Agarwal and Rathod, 2006; Fortune and White, 2006) and focus less on the human aspect of projects

which are woven into the very fabric of all the success factors that have been identified in literature (Cooke-Davies, 2002). It is people who deliver projects, not processes and systems (Cooke-Davies, 2002). A discussion of the human aspects of the project success framework is important as it can be applied in most project contexts because it is intertwined with the traditional project success factors.

1.2.2. Project communication success

Communication is an essential contributor to project success (determined in Chapters 2 and 3) as the lack of quality communication has been identified as a primary cause of project failures (Dainty et al., 2006; Pinto and Pinto, 1990; Souder, 1981; OGC in Webber, 2008). One of the reasons for this is that frequent communication improves stakeholder satisfaction (Shao et al., 2010) and project communication improves team member collaboration and trust (Müller, 2003b). It has also been determined that the interplay of situation-appropriate teamwork, communication, synchronicity and coordination increases collaboration in the project which is an indicator of team performance (Chiocchio et al., 2011; Kozlowski and Bell, 2003; LePine et al., 2008). Likewise, trust affects project performance through the activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio et al., 2011).

For this reason it is deduced from literature that project communication has an influence on project performance/success directly and through its influence on the trust and collaboration experienced in the project. For the remainder of this thesis project communication, trust and collaboration will be referred to as the main human-related project success factors as per the literature, which is summarised in sections 1.2.2.1 through 1.2.2.4 and the findings of Chapter 2. The literature reviewed below emphasizes the importance of communication, trust and collaboration in order to achieve project success. It also identifies the variables that together promote quality communication, high levels of trust and collaboration in a project, based on theory and existing empirical research.

1.2.2.1. Quality of communication

Communication can be compared to a metaphorical 'pipeline' along which information is transferred between individuals or groups (Axley, 1984) through a common system of symbols, signs, or behaviour (Merriam-Webster Dictionary, 2011). Thus the communication process involves a person or entity sending out a message and another receiving and successful understanding the message in response (Torrington and Hall, 1998). It stands to reason then, that the quality of communication between the message initiator and the correct message receiver(s) in a project is determined by how timeously and accurately a message (with appropriate content) is conveyed using the most suitable communication medium available, while being aligned with the project communications plan. This definition for quality communication was formulated based on the variables identified in the literature viz. frequency of interaction, content, type, technology, communication channels, audience and communications plan that were all identified as variables that determine the quality of communication. These variables are discussed in more detail in Chapter 2. 'Culture' and 'leadership' factors also influence the quality of communication but are beyond the scope of this study.

Because communication is crucial for the facilitation of almost all activities in a project, literature states that communication must be viewed as the essential prerequisite to successful project-based management (Dainty et al., 2006). For this reason, communication is frequently identified as a major determinant for project success or failure (Müller, 2003a, Hartman in Müller, 2003b). The following sections allude to communication's theoretical role in achieving project success through its influence on the other human-related success factors identified in literature.

1.2.2.2. Level of trust

Trust can be defined as a function of the predictability and expectations of others' behaviours or a belief in others' competencies, which affects performance through activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio

et al., 2011). When there is trust, people ask for help, speak openly and honestly, take risks, accept new challenges and carry out their activities with less anxiety and stress (Carvalho, 2008; Fox, 2001). The literature states that communication improves project member trust and collaboration (Chapter 4; Müller, 2001). This is because communication reduces the mistrust and conflict of interest between the project principal and the agent, which improves project performance (Turner and Müller, 2004). However, factors other than communication also influence trust namely: the degree of knowledge exchange, imported trust (trust imported from other familiar settings), taking risks or dealing with uncertainty and meeting team members' expectations. A discussion of the literature relating to these variables is provided in Chapter 2. Based on this short summation of literature and the findings of Chapter 2, the level of trust in a project is identified as one of the main human-related factors which determines project success through its positive influence on the degree of collaboration in the project and the influence which communication has on it.

1.2.2.3. Degree of collaboration

Collaboration and cooperation are interchangeable terms which are defined as a recursive process where people or organisations work together in an intersection of common goals by sharing knowledge, learning, and building consensus (Dietrich et al., 2010). Collaboration can occur between individuals, between organisations or between an organisation and its customers. Only interpersonal collaboration is considered in this study. To better understand how one can promote interpersonal collaboration in a project team it is important that one is aware of the influence that various factors have on the degree of collaboration (Dodgson, Hoegl et al. in Dietrich et al., 2010; Jap, 1999; Mohr and Spekman, 1994).

According to Tyler (2003) trust affects performance through activation of cooperation or other collaborative processes. Trusting teams enhance cooperative and collaborative processes, which assists them to better manage the interdependencies between their respective areas of expertise. At an individual

and team level collaborative work predicts task and team performance respectively (Chiocchio et al., 2011).

Based on this literature and the findings of Chapter 2 the degree of collaboration was also identified as one of the main human-related factors that determine project success as it is influenced by the trust and communication in the project. The other determining variables for collaboration that are identified in the literature include relationships, coordination, proximity, commitment, conflict and incentives are discussed in more detail in Chapter 2.

1.2.2.4. Project success

Success can mean different things to different people (Freeman and Beale in Jugdev and Müller, 2005). The requirements of each project stakeholder will differ and therefore their perceptions of what constitutes success will vary. The stakeholder's satisfaction with the project is determined as the difference between his perception of the project's success versus his expectations thereof (Koelmans, 2004; Maylor, 2003). A stakeholder's perception of success can be influenced by issues such as the responsiveness of the team to stakeholder requests, project communication, degree of collaboration and/or trust in the team, etc.

Project success is measured by *'things-related'* criteria such as the budget, schedule and quality of the project deliverable (which will hereafter be collectively referred to as project performance) and *'people-related'* criteria such as communication, trust and collaboration which determine the team morale and stakeholder satisfaction in the project, amongst others (Koelmans, 2004). Furthermore, literature states that there is an additional construct, knowledge integration and innovation, that influences project success by bridging the gap between the 'things-related' and 'people-related' factors. Both project performance and knowledge integration and innovation are discussed in more detail in Chapter 2. Several factors that are beyond the scope of this study can also influence project success. These include for example the level of risk accepted, the match

between organisational capabilities and project requirements and several aspects of the planning process.

It is proposed in this thesis that the main 'people-related' or human-related factors that determine project success are the quality of communication, level of trust and degree of collaboration in the project, which are derived from the literature in the sections above and in Chapter 2. The identification of these main factors and the relationships between them (as per the literature) culminated in the development of a theoretical model for project success which shows that project success is influenced by the degree of collaboration and indirectly by the level of trust in the project based on foundation of quality communication. It is the aim of this study to investigate the validity of this model in practice and the influence of project communication trends such as CMC and a programme call centre on the foundational role that communication plays in this model.

1.3. Research goal and main research question

Project success has been widely researched however the influence of 'human-related' factors such as communication, trust and collaboration, which is required for the achievement of all the traditional success factors, is often ignored. Furthermore, the influence of a programme call centre and other computer mediated communication technologies on the quality of project communication has not been investigated, which is crucial for a better understanding of project communication in the 21st century. In the past researchers identified the human-related success factors and discussed their individual impact on project success. This research reviews the literature relating to human-related project success factors and proposes a model of the relationship between the identified factors and project success (details in Chapter 2 of this thesis). Furthermore, this research investigates how computer mediated communication and a programme call centre influence project communication and the latter's role in the model. The question that forms the main research question in the study is:

How does project communication influence the perceived success of the project?

With this main research question in mind, the research goal is to propose a theoretical model of the relationship between project communication and success and test the model empirically. The model that is proposed in Chapter 2 can be seen in Figure 1.

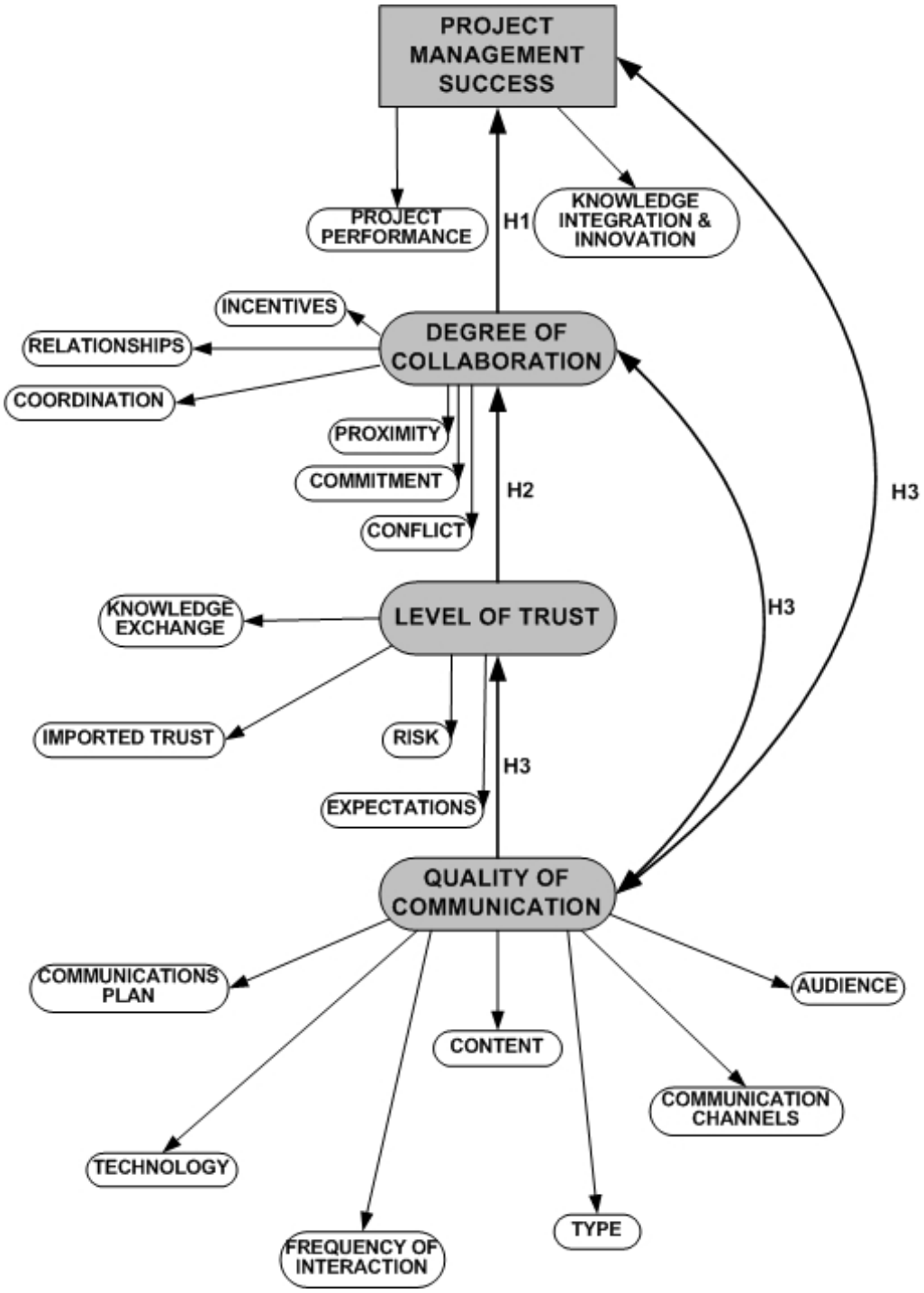

Figure 1. Proposed model of the relationship between project communication, trust, collaboration and success

1.4. Research sub-questions and the layout of the thesis

Project success is the goal of every project that is undertaken. Literature supports the fact that project communication in addition to several other 'human-related' factors has an influence on the ultimate success of the project as it is well-known that it is people that deliver projects: not processes or systems. This thesis aims to identify the main 'human-related' project success factors (see section 1.2.2 for a brief overview of the main factors), identify the variables that determine them and put forward a model of the relationship between these factors and project success as this has not yet been addressed in literature. Furthermore, the impact of computer-mediated communication on the quality of project communication is also explored.

The main research question: *How does project communication influence the perceived success of the project?* is broken down into several sub-questions. The chapters that follow are aimed at answering these sub-questions. Chapter 2 is a theoretical study that focuses the research by giving a theoretical overview of the human-related factors that influence project success and the variables that determine these factors, using a structural equation modelling perspective. The main argument developed is that project communication influences the perceived success of a project directly and indirectly through its influence on various other human-related factors. A model is proposed to summarise the findings of Chapter 2. Therefore, this chapter answers the theoretical sub-question:

Which human factors in conjunction with project communication influence the perceived success of a project?

Using the theoretical framework developed in Chapter 2, Chapters 3 and 4 refine and provide confirmation of the model by answering two empirical sub-questions. Chapter 3 is a descriptive and empirical study that aims to answer the question:

How is project success influenced by the quality of communication, level of trust and degree of collaboration between project team members?

In order to answer this question, Chapter 3 determines the significance of the factor variables that were identified in Chapter 2 and uses these measurable variables to determine the measure of association between the factors: quality of communication, level of trust and degree of collaboration in determining project success. Therefore, this part of study refines and empirically confirms the model that was proposed in Chapter 2. By employing the structural equation modelling technique, the results of this chapter include eleven variables that are empirically verified across three confirmatory factors namely, level of trust, degree of collaboration and project success.

Communication in business environments has increasingly become mediated by electronic systems and the effect of the current electronic media on project communication is therefore relevant. Keeping the results found in Chapter 3 in mind, the next empirical sub-question is raised:

What is the impact of a call centre on communication in a programme and its projects?

The above question is answered empirically in Chapter 4 by taking a sample of the project participants involved in projects which form part of a national Repair and Maintenance Programme in South Africa. This chapter focuses on the impact of communication facilitation structures such as a programme call centre on the quality of the communication experienced in the projects. The factor quality of communication is investigated in more detail in this chapter as it forms the basis of the model that is put forward in this thesis. The author thought it important to understand how different constructs (frequently used in modern day projects) such as a call centre or computer mediated communication (see Chapter 6) influence the quality of communication in a project which could have implications for the rest of the model. The findings in this chapter included an empirically verified model to illustrate the relationship between call centre communication and project performance as well as other findings regarding the effectiveness of the communication facilitated by a call centre and its influence on the principal-agency relationship found in projects.

Chapter 4 shows that communication structures such as a call centre have a positive influence on the communication experienced in a project. This finding inspired the following empirical sub-question:

What are the programme benefits of improving team communication in its projects using a contact centre?

Chapter 5 is an empirical study that takes the same sample of project participants as in Chapter 4 to determine the programme benefits. The results of this part of the study show that by using a call/contact centre to improve the communication between team members in the project, the project team's perception of communication effectiveness, quality of project deliverables, service delivery and customer satisfaction of the programme dramatically increases.

In a similar vein to Chapters 4 and 5, Chapter 6 investigates the following empirical sub-question:

What is the impact of instant messaging and video conferencing on the quality of project communication?

The above question is answered empirically in Chapter 6 by taking the same sample of project participants as in Chapter 3 and firstly determining how, why and for what purposes instant messaging and video conferencing are used in projects. Secondly, a survey is done to determine how these communication media relate to the variables that promote quality communication in a project (as per the findings of Chapters 2 and 3) namely, the communication channels, communications plan, audience, content, frequency of interaction, technology, and communication type. The findings of this study show that both CMC mediums, instant messaging and video conferencing, lead to more appropriate project communication and improve the quality of communication of geographically dispersed (virtual) teams (for detailed study findings please refer to Chapter 6 and section 7.3.4).

Therefore, in summary the main research question to be answered is:

How does project communication influence the perceived success of the project?

To answer this over-arching research question, five sub-questions were formulated and are addressed in Chapters 2 to 6:

- Chapter 2 answers theoretical sub-question 1: *Which human factors in conjunction with project communication influence the perceived success of a project?*
- Chapter 3 answers empirical sub-question 2: *How is project success influenced by the quality of communication, level of trust and degree of collaboration between project team members?*
- Chapter 4 answers empirical sub-question 3: *What is the impact of a call centre on communication in a programme and its projects?*
- Chapter 5 answers empirical sub-question 4: *What are the programme benefits of improving team communication in its projects using a contact centre?*
- Chapter 6 answers empirical sub-question 5: *What is the impact of instant messaging and video conferencing on the quality of project communication?*

Figure 2 maps the research questions to the chapters that follow with the main research question as the guiding principle. In addition, Appendix 1 shows the variables identified in Chapter 2 and how these variables will be empirically examined in Chapters 3 to 6 (which are published or submitted as journal papers). This appendix provides a more detailed mapping of the research for each chapter.

The last chapter, Chapter 7, is a concluding chapter that summarises the findings in Chapters 2 to 6 and proposes an answer to the main research question. The implications of the findings, the limitation of the study, and recommendations for future research will be addressed in this concluding chapter.

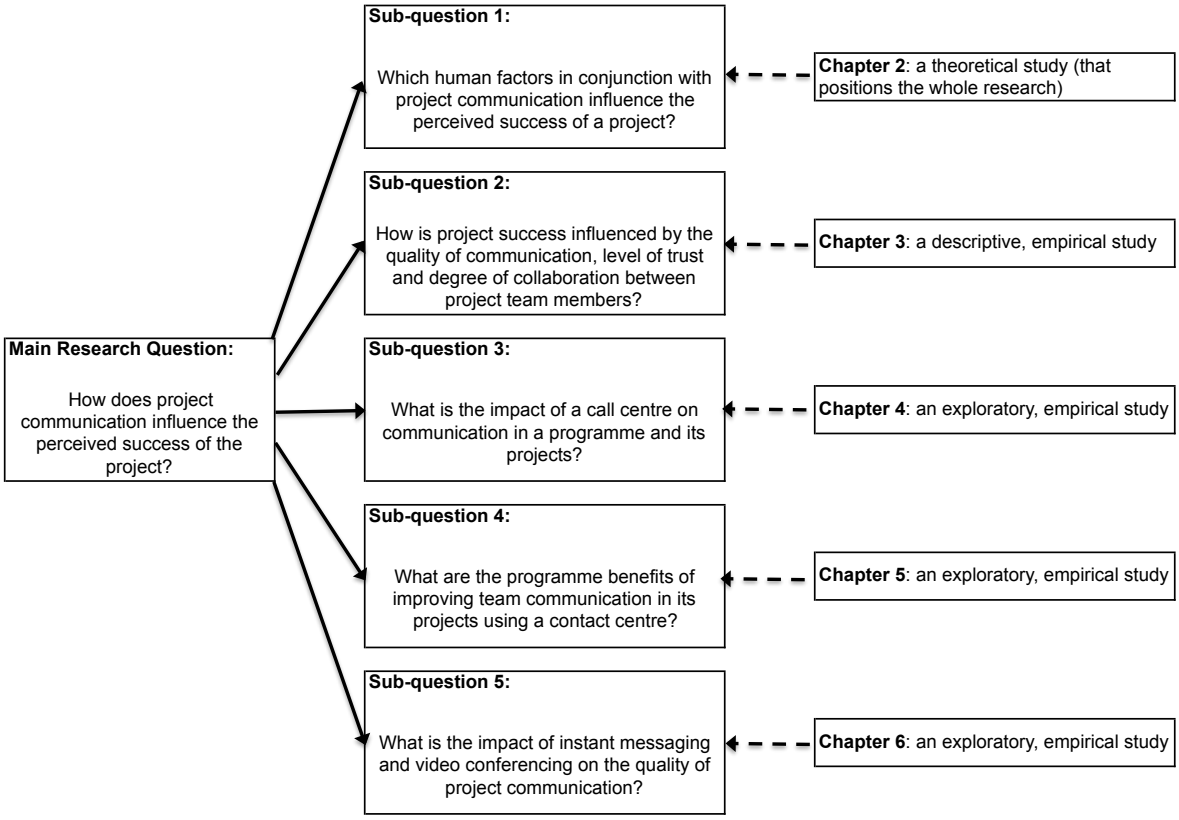

Figure 2. Research questions mapped to chapters

1.5. Research contributions

At the end of each chapter there is a description of how that specific chapter contributes to the research. However, the overall practical relevance of this study is that it educates project managers as to the influence of programme call centres and computer mediated communication (which are widely used) on the quality of communication in a project as an entry point to understanding how communication, trust and collaboration lead to a more successful project.

Recommendations for project managers are discussed at the end of the empirical studies (Chapters 3 to 6) so that they are informed of the application of the findings in a project. As for the scientific relevance, this research explores the influence of computer mediated communication as used in a programme call centre and the impact of other CMC (instant messaging and video conferencing) on the quality of communication in a project and how this factor in addition to the level of trust and degree of collaboration experienced in a project influences the

perceived project success. Furthermore, the relationship between project communication, trust, collaboration and success is determined theoretically and empirically in the form a structural equation model (details in Chapters 2, 3 and 4).

The main contribution of this study is to explain how project communication influences the perceived success of a project both theoretically and empirically. Moreover, this study provides many practical applications and insights as to the findings of the study for better communication management, and enhances existing knowledge of project communication, trust, collaboration and project success.

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Chapter 2

The specification of a structural equation (SEM) model for project communication, trust, collaboration and success[1]

To ensure success, project managers spend much time communicating with team members and other stakeholders. The importance of 'human factors' such as communication, trust and collaboration amongst the project team members to ensure project success, is emphasized in literature. But how does the project manager know if he is communicating effectively, building collaboration and trust in his team and if this will ultimately have an effect on the success of the project? This paper seeks to obtain greater insight and expand on the theory underlying project communication management. Few studies have determined and theoretically modelled the interdependencies between these constructs nor have the defining elements of each construct been identified. As the first phase of a project to model these interdependencies this paper reviews current literature and presents a conceptual model that explains these constructs, their interdependencies and the elements that influence them. The second phase will be to verify this proposition empirically using a survey instrument and structural equation modelling (SEM). The results of this empirical work will be reported in a sequel to this paper. A casual model of factors related to communication and success confirms repeatability of existing theory and would extend the theory of project communication beyond conventional notions.

2.1. Introduction

Since the late 1960's project management researchers have been trying to determine which factors lead to project success (Andersen et al., 2006; Baker,

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Murphy, and Fisher, 1988; Cooke-Davies, 2002; Fortune and White, 2006; Lechler, 1998; J. Pinto and Slevin, 1988). Despite much discussion, decades of individual and collective project management experience, an increase in project work and an increase in the number of project management practitioners, project results continue to disappoint stakeholders (O'Connor and Standish Group in Cooke-Davies, 2002; Wateridge in Ika, 2009). The magnitude of a project's success is determined by the degree to which the objectives of the project are achieved. The overall objectives of a project consist of both traditional project management objectives of performance against cost, time and quality and the stakeholders' perception of project success (Cooke-Davies, 2002; A De Wit, 1988; Koelmans, 2004).

The stakeholders' perception of project success is defined as their satisfaction with the project (Kerzner, 2009). Satisfaction is determined by the difference between how the project is perceived or viewed by a stakeholder and how they expect the project to perform (Maylor, 2003). Why then, if it is known that the success of a project can be achieved by ensuring stakeholder satisfaction and adherence to cost, schedule and quality parameters, are we not seeing many more successful projects?

One reason for this might be that the complex interactions between 'human factors' in project management are being ignored. The majority of the research that has been done on project success focuses on what people and teams do rather than on the quality of their human interactions, motivations and/or decision-making practices (Cooke-Davies, 2002). Furthermore, there are human dimensions to nearly all the success factors that have been identified in the literature (Cooke-Davies, 2002). There are few reported studies that identify and model how project success can be achieved by focusing on the project's human success factors. This paper aims to address this gap by confirming the theoretical framework put forward for project communication in Bond-Barnard et al (2013a).
This paper identifies (i) the main 'human success factors' or constructs that play a role in determining project success, (ii) establishes, from literature, what elements or variables influence them and (iii) specifies a 'human factors' Structural Equation

Model (SEM) for achieving project success by building on existing theory. It is proposed that project communication influences project success directly and also indirectly through its influence on project trust and project collaboration. The theoretical model developed in this paper contributes towards a theory of project communication which will, in a subsequent paper, be measured using a survey instrument and tested using Confirmatory Factor Analysis (CFA) to assess the factoral validity of the constructs.

2.1.1. 'Human success factors' in projects

It is not always the case that by achieving the traditional factors for project success identified in the literature, one will automatically also achieve the human success factors that are said to be 'woven into the very fabric' of the traditional success factors (Cooke-Davies, 2002). The project's human success factors must be identified and pursued like any other project success factor. Communication is an essential contributor to project and programme success (Bond-Barnard et al., 2013a and 2013b) as the lack of quality communication has been identified as a primary cause of project failures (Dainty et al., 2006; M. B. Pinto and Pinto, 1990; Souder, 1981; OGC in Webber, 2008). Shao et al. (2010) found that frequent communication improves stakeholder satisfaction. Furthermore, Müller (2003a) established that it improves project member collaboration and trust. It has also been determined that the interplay of situation-appropriate teamwork, communication, synchronicity and coordination increases collaboration in the project which is a predictor of team performance (Chiocchio et al., 2011; Kozlowski and Bell, 2003; LePine et al., 2008). Likewise, trust affects project performance through the activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio et al., 2011).

The literature reviewed below emphasizes the importance of communication, trust and collaboration in order to achieve project success. It also identifies the elements that together promote quality communication, high levels of trust and collaboration in a project, based on theory and existing empirical research. The above constructs and elements were derived from the model by Bond-Barnard et

al. (2013a) and refined based an extensive literature study. This provides a basis for discussing the elements that comprise project success in Section 2.3. The specification of the SEM model in Section 2.4 summarises the relationships of the human success factor constructs and elements that are identified in Sections 2.2 and 2.3. For the rest of Sections 2.2, 2.3 and 2.4 the reader is referred to Figure 3. The paper concludes with a brief summary and recommendations for further research.

2.2. Literature review

2.2.1. Quality of communication

The role of the project management function is to manage the systems that relate to the features of uniqueness, novelty and transience, which define the term 'project'. These systems are namely the scope of work, the project organisation, the quality, cost and the duration of the project. Communication is an essential ingredient of all of these managerial requirements and must be viewed as the essential prerequisite to successful project-based management (Dainty et al., 2006). Bond-Barnard et al. (2013a) found that a balance of frequent informal and formal communication influences the performance of the project, by influencing the degree of collaboration and the level of trust in the project team, which also influences the project's performance. Consequently, communication is frequently identified as a major determinant for project success or failure (Müller, 2003a, Hartman in 2003b).

Communication can be compared to a metaphorical 'pipeline' along which information is transferred between individuals or groups (Axley, 1984) through a common system of symbols, signs, or behaviour (Merriam-Webster Dictionary, 2011). Thus the communication process involves a person or entity sending out a message and another receiving and successful understanding the message in response (Torrington and Hall, 1998). It stands to reason then, that the quality of communication between the message initiator and the correct message receiver(s) in a project is determined by how timeously and accurately a message (with

appropriate content) is conveyed using the most suitable communication medium available, while being aligned with the project communications plan. This definition for quality communication was formulated based on the constructs identified in the literature viz. frequency of interaction, content, type, technology, communication channels, audience and communications plan that were all identified as elements that determine the quality of communication. 'Culture' and 'leadership' factors also influence the quality of communication but are beyond the scope of this paper. The literature that supports the abovementioned quality communication elements are discussed in more detail below.

2.2.1.1. Frequency of interaction

Frequency of interaction refers to the number and timings of project team members' communications with the stakeholders and each other (Turner and Müller, 2004). The literature classifies frequencies of interaction as being either calendar or event driven. Becerra and Gupta (2003) determined that the effect of both trustor, as well as trustee characteristics on the level of perceived trustworthiness, is moderated by the frequency of communication between the two parties. While project management methodologies often recommend monthly and milestone reports, many authors recommend more frequent, but less formal communication, through frequent phone calls or by continuously updating project related internet web-sites (Müller, 2001). There is however, a fine line between keeping the project members and the stakeholders informed of the project's progress and 'overloading' them with too many details which may encourage the stakeholders to micro-manage the project, undermining the project manager's authority (Müller, 2003a).

Müller (2003a) established that project members and the stakeholders differentiate between three communication frequencies namely:

- Continuous communication (daily or weekly) - this is the most preferred frequency across all projects.
- Fixed interval (bi-weekly or monthly) communication - this frequency is most preferred in high performing projects with high levels of collaboration.

- Variable interval (milestone, phase-end or ad-hoc) communication - this is occasionally preferred in order to reduce communication efforts in projects. It shows a risky decrease in at least one party's interest in the project, and can lead to a decrease in collaboration and subsequent project failure.

This suggests that it is regular, daily or weekly communication that gives project members and the stakeholders the greatest comfort that they are being kept informed of project progress and of the decisions being taken by the project manager on their behalf (Turner and Müller, 2004). The PMBOK Guide by the PMI (2013) states that timely communications are a prerequisite for successful project completion similarly, Bond-Barnard et al. (2013a); Chen, Liang, and Lin (2010); Turner and Müller (2004) and Webber (2008) found that frequent informal and formal communication improves the communication quality, trust and collaboration in project relationships which, in turn, contributes to high project performance. The nature of the project determines the required frequency of interaction. Timely communications are especially important when dealing with project teams from different geographic regions as the frequency of interaction decreases when the project team is not co-located (Dietrich et al., 2010; Van den Bulte and Moenaert, 1998). Likewise, a need for frequent discussions, debates, and extensive communications exists in R&D projects as the project participants are faced by many technological and functional challenges during the project (Daniel and Davis, 2009). The lack of such communication has been cited as a common factor among failing projects (Dalcher, 2009).

2.2.1.2. Content

Communication content refers to the subject matter, message or meaning conveyed in verbal, written or graphical form from content initiator to content receiver. According to Müller (2001) the content of quality project communication falls into one or more of the categories below:

- Status and achievements - status reporting regarding project plan adherence in terms of schedule, budget and scope.

- Changes to the project - agreed upon changes in project scope, plan, risks, quality requirements, etc., which require a re-base lining of the project plan.
- Issues and open items - a continuously maintained list of current issues and 'open items' that need to be resolved for project delivery.
- Next steps in the project - an update for the stakeholders on the near term activities within the project. It is the forward-looking update and complements the backward looking status and achievement reports.
- Quality and progress measures - the agreed upon quality metrics. It also comprises integrated project performance measures, such as earned value management, which integrates scope, schedule and resources for performance measurement.
- Trends in the project - the tendencies within the project detected through analysis of project progress, often calculated from the project's quality and progress measures.

Even if every attempt is made to communicate the correct project information or content to the right people, the content can still become ambiguous or muddled if environment, interpersonal, verbal and/or emotional communication barriers are present (Fox, 2001). Penteado in Carvalho (2008) warns that project communications competencies, which refer to the group's ability to codify, transmit and decode information are necessary but not sufficient prerequisites to the effectiveness of project communication. This means that if the project team is neither able to codify nor decode the communication content correctly then the effectiveness or quality of the project communication may be reduced. Finally, the communication content desired by the project members and stakeholders is also influenced by the predominant type of communication (either informal or formal) occurring in the project.

2.2.1.3. Communication type

For communication to take place there has to be connective thinking i.e. participative communication. Post et al. (2009) state that participative

communication improves the quality of project communication as it is the strongest indicator of innovation effectiveness and patents produced. They add that participation often leads to a better understanding of potential problems which encompasses the concept of connective thinking. The opposite of connective thinking is sequential thinking, which occurs when team members take different, independent approaches to solving a problem. Sequential thinking is characterised by very little communication. Participative communication involves both informal and formal communication, which is hereafter referred to as the communication types.

Formal communication takes place along official channels between the project members and the stakeholders whereby they provide each other with timely information (PMI in Turner and Müller, 2004). It is used to communicate project-related matters concerning the respective organisations (Johnson in Turner and Müller, 2004). Thus formal communication follows an expressed purpose and agenda (Cooper, 2000) and is exemplified by reports, memos and briefings whereas informal communication is typified by e-mails and ad-hoc discussions (PMI, 2013). The former is often referred to as being regimented, deliberate and impersonal in nature as opposed to the latter which is characterized by behavioural spontaneity, casualness and interpersonal familiarity (Morand, 1995). Turner and Müller (2004) found that project stakeholders have a preference for objective project data such as reports if too much informal and infrequent communication is used. Reason being, formal communication content is perceived to be the most credible source of information (Johnson et al., 1994) as a result of its high accuracy (Mullins, 1999).

Informal and formal communication can be facilitated by both oral and written communication. Project managers prefer oral communication over written communication (Mintzberg et al., 1976). Carlsson et al. (2001) and Gorse et al. (1999) add that informal, oral communication is the most effective communication type. The reason for this is that oral communication can transmit both verbal and non-verbal information (i.e. voice inflections and body language) and this is more prevalent in informal situations. However, Daim et al. (2012) advise project

managers to rather make use of formal, written communication if they have many stakeholders involved in the project as the extent to which informal and formal communication is used in projects, is determined by the frequency of interaction and the potential audience (Müller, 2003a). Turner and Müller (2004) established that the communication needs of project participants are best served by a mixture of formal and informal communication, and of written and oral communication as well as audiovisual and electronic (Torrington and Hall, 1998).

It has been shown that frequent informal and formal communication improves communication quality, trust and collaboration in project relationships which is linked to high performance (Bond-Barnard et al., 2013a; Chen et al., 2010; Turner and Müller, 2004; Webber, 2008). Lastly, it is important to note that the way in which people distinguish between what constitutes formal as opposed to informal communication, is formed by their culture, environment and the situation in which the communication occurs (Mead, 1990).

2.2.1.4. Technology

Technology is defined in the Oxford University Press (2013) as the application of scientific knowledge for practical purposes. Within projects, technology plays a significant role e.g. scheduling software, collaboration tools, etc., but most importantly it is central to how we communicate at present e.g. video conferencing, e-mail, global virtual teams, etc. Technology is one of five factors that significantly contribute to the breakdown of communication in a project (Carvalho, 2008; Daim et al., 2012). This is because technology causes physical communication barriers (Ferreira in Carvalho, 2008), which are obstacles that arise when information is transmitted. Researchers stress that the speed necessary to distribute information, the type of technology available, the accessibility and/or availability of supporting technology (e.g. internet, computer, webcam, etc.), the level of security (passwords, privacy clauses, etc.), project duration or size and other project factors that affect the dimensions of the project must be taken into consideration when communicating in a project (Fox, 2001).

One might ask but what type of technology enhances communication? Several theories exist in the literature; Torrington and Hall (1998) found that messages are more successfully conveyed if a variety of media such as verbal, non-verbal, written, audio-visual or electronic are used. Gorse et al. (1999) built on this theory by exploring a range of media from informal face-to-face meetings to formal methods such as letter, fax and e-mail; their results showed that the former was perceived to be the most effective medium of communication. Likewise, Carlsson et al. (2001) found that verbal exchanges in the form of telephone conversations and face-to-face meetings form the cornerstone of interaction within the construction industry. With the event of global virtual teams and tendencies towards continuous communication or updates (e.g. Twitter, RSS feeds) technology plays a key role in enabling communication.

Media symbolism, richness and choice are all important considerations for choosing a communication medium in an organisation (Trevino et al., 1987) however according to Dennis and Kinney (1998) matching media richness to task equivocality does not improve performance for new media (Computer Mediated Communication (CMC) and video conferencing). New media is also influenced by social presence theory (Biocca et al., 2003). Daim et al. (2012) advise that, as the number of communication channels in a project increases, the project team members should move towards more written and formal communication technologies as formal electronic or hard copy reports are perceived by stakeholders as the most credible source of information (Johnson et al., 1994; Turner and Müller, 2004). However, Katainen and Nahar (2008) warn that other than choosing the technology, project managers must define how and when the tools should be used.

2.2.1.5. Communication channels

The PMBOK guide (PMI, 2013) states that one of the two main components of project communication is the knowledge and management of the project's communication channels. Project communication channels are defined as the connections between communicators in a project. The greater the number of

project stakeholders/communicators, the greater the number of channels and the more complex the communication issues become (Daim et al., 2012). The equation to determine how many communication channels there are in a project is as follows:

For 'n' number of communicators, the number of communication channels 'cc' is determined as

$$cc = \frac{n(n-1)}{2}$$

Lesko and Hollingsworth (2010) found that communication channels are becoming increasing complex due to the ease and availability of CMC technologies. Tushman (1978) showed that communication patterns vary “depending on the type of work being conducted and the specific individuals involved.” and that “managing communication patterns should be geared to the direction, rather than the volume, of communications.”

2.2.1.6. Audience

'Audience' in the Oxford University Press (2013) refers to the people giving attention to something, be it in person or by being the receivers of verbal or written communication. The audience/communication recipient(s) plays an important role in determining the quality of project communication. The potential or expected audience determines whether one will be communicating one-to-one or with a group and whether this communication will take place face-to-face (in person) or through voice or text. Once all these determinants have been considered, it is easier to decide if the communication should be informal or formal. The first audience determinant namely one-to-one communication versus communication with a group (one-to-many) is more informal, promotes trust and knowledge building whereas one-to-many communication is more formal, creates mistrust and is controlled (Müller and Turner, 2007; Turner and Müller, 2004).

The second audience determinant namely face-to-face communication versus telephonic or written communication has the following implications:

- Daim et al. (2012) state that face-to-face interaction is the most effective precursor to establishing good communication in a project.
- Face-to-face interaction is invaluable for building trust amongst team members, establishing common goals and resolving project issues.
- Face-to-face interaction is best employed in the project team's formative phases and in an informal setting, so that its positive effects on team building are used to leverage productivity and innovation (Daim et al., 2012; Smith, 2001).

Based on the above theoretical implications of the two types of audience determinants it is important to take note of the audience component of the project communication in order to ensure that the best possible quality of communication is achieved considering the circumstances.

2.2.1.7. Communications plan

The PMBOK guide (PMI, 2013) states that the two main components of project communication are communications planning and communication channels. The project communications plan is used to determine who needs what information, how it will be collected and how it will be transmitted. Typically the communications plan specifies team meetings, reporting requirements, methods for collecting and retrieving information and the timing of communication. Modern communications planning focuses on organising and documenting the process, types and expectations of information dissemination throughout the project lifecycle (Lesko and Hollingsworth, 2010). Carvalho (2008) discovered that there are three main barriers to communication in a project, one being a lack of a project communications plan. Carvalho (2008) adds that it is very important for the project manager to have a project communications plan if he wants to successfully complete the project.

2.2.2. Level of trust

Trust can be defined as a function of the predictability and expectations of others' behaviours or a belief in others' competencies, which affects performance through activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio et al., 2011). When there is trust, people ask for help, speak openly and honestly, take risks, accept new challenges and carry out their activities with less anxiety and stress (Carvalho, 2008; Fox, 2001).

The literature states that communication improves project member trust and collaboration (Bond-Barnard et al., 2013a; Müller, 2001) as communication reduces the mistrust and conflict of interest between the project principal and the agent, which improves project performance (Turner and Müller, 2004). However, factors other than communication also influence trust namely: the degree of knowledge exchange, imported trust, taking risks or dealing with uncertainty and meeting team members' expectations. The literature to support the identified constructs is discussed in more detail below.

2.2.2.1. Knowledge exchange

Knowledge exchange is the push and pull found in the multiple, directional movement of data, information, and knowledge between individuals and groups for mutual benefit (Levesque, 2005). Trust between the project team and the stakeholders or between any two or more stakeholders/team members is earned by doing what one says one will do on a continued, repeated basis. With regards to the knowledge exchange/information distribution process, trust comes from repeatedly receiving and sending project information across various formal and informal channels of communication which infers a level of reliability in the modality as well (Lesko and Hollingsworth, 2010).

For initial knowledge exchange to take place, some trust must exist between the team members so that information can flow along the agreed upon and appropriate lines of communication (Lesko and Hollingsworth, 2010). For this

reason Daim et al. (2012) state that it is important that the project manager promotes knowledge exchange by leading by example. He can do so by importing trust in the team at the inception of the project through team member introductions that are positive and explain an individual's role and importance to the team. Knowledge exchange is a process that builds trust between the individuals or groups that are exchanging knowledge. In so doing the level of trust in the project and in project relationships continues to grow.

2.2.2.2. Imported trust

Imported trust or swift trust theory refers to the situation whereby members of a team import trust from other familiar settings. Members initially employ category-driven information processing in forming stereotypical impressions of others. Thereafter trust is maintained by a high level of action within the teams. High levels of action promote members' confidence that the team is able to manage uncertainties, risk and vulnerabilities. Therefore, imported trust is initially based on categorical social structures, and later, on high levels of action (Daim et al., 2012). As a result, the maximum amount of imported trust is usually achieved at the project's inception. Inconsistent role behaviour and blurring of roles can erode imported trust. However, imported trust can be strengthened by clearly identifying the project managers/leaders at the inception of the project (Daim et al., 2012).

To understand imported trust better Jarvenpaa and Leidner (1998) conducted a study to determine the factors that resulted in high initial and high final trust. They discovered that ‘high initial and high final trust’ teams were actively engaged in social introductions at project inception and were marked by a higher frequency of online communications which strengthened the group's identity later on in the project. The study indicated that communication behaviours that facilitate trust early in a group are social communication and communication of enthusiasm. Members can also maintain this trust by coping with technical uncertainties and taking initiative in the project. Communication behaviours that maintain trust in a group are predictable communication and substantial and timely responses (Daim et al., 2012).

2.2.2.3. Expectations

A factor in promoting trust and cooperation is the anticipation of future association (Daim et al., 2012). Trust is earned in a relationship when one continuously meets the other person's expectations. Expectation is said to be a strong belief that something will happen or a belief that someone will or should achieve something (Oxford University Press, 2013). The realisation of expectations is important for the development of trust (Chiocchio et al., 2011; Tyler, 2003). For example, broken promises on likely availability of design information is an important issue in the construction industry which leads to the breakdown of trust (Lesko and Hollingsworth, 2010; Rounce, 1998). This is because trust between project stakeholders is earned by doing what one says one will do on a continued, repeated basis (Lesko and Hollingsworth, 2010).

2.2.2.4. Risk

Risk is an uncertain event or condition that, if it occurs, may have a positive or negative effect on a project's deliverables (PMI, 2013). As the relationship between risk and trust is reciprocal; an acceptable degree of risk is responsible for an increase in the level of trust in a project. In the literature, one of the major reasons for the failure of global virtual teams (GVT) is related to building trust. Trust is crucial in any GVT as it allows people to engage in risk-associated activities that they cannot control or monitor (Daim et al., 2012). Similarly, risk can facilitate the development of high initial and final trust in a team if the members successfully cope with technical uncertainties and take initiative in the project (Daim et al., 2012). For this reason risk can either positively or negatively influence the level of trust in a project team.

2.2.3. Degree of collaboration

Collaboration and cooperation are interchangeable terms which are defined as a recursive process where people or organisations work together in an intersection of common goals by sharing knowledge, learning, and building consensus

(Dietrich et al., 2010). Collaboration can occur between individuals between organisations or between an organisation and its customers. Only interpersonal collaboration, is considered here. To better understand how one can promote interpersonal collaboration in a project team it is important that one is aware of the influence that various factors have on the degree of collaboration (Dodgson, Hoegl et al. in Dietrich et al., 2010; Jap, 1999; Mohr and Spekman, 1994).

According to Tyler (2003) trust affects performance through activation of cooperation or other collaborative processes. Trusting teams enhance cooperative and collaborative processes, which assists them to better manage the interdependencies between their respective areas of expertise. At an individual and team level collaborative work predicts task and team performance respectively (Chiocchico et al., 2012). Other constructs that have been identified in the literature include relationships, coordination, cohesion, proximity, commitment, conflict and incentives. Each of these constructs or ingredients for a high degree of project collaboration is discussed in more detail below.

2.2.3.1. Relationships

The Oxford University Press (2013) refers to a relationship as the way in which two or more people or things are connected, or the state of being connected. Relationships are important in projects mainly because they form the basis for collaboration in the team which ultimately leads to project performance. Research on the relations between project actors and their effect on project performance is widely researched (Ahola, 2009; Artto et al., 2008; Dietrich et al., 2010). Most of the literature however, focuses only on collaboration in customer-supplier relationships specifically in the construction industry (Bresnen, 2007; Dietrich et al., 2010; Errasti et al., 2007).

Collaboration processes improve the relationships between individuals or organisations. However, the nature of these relationships may vary depending on their strength (Granovetter in Dietrich et al., 2010). Successful collaboration induces hope and expectation within the team members for future collaborations

which provides motivation in partnering relationships (Bresnen and Marshall, 2000; Dietrich et al., 2010). There are several challenges involved in establishing organisational project relationships:

- Discontinuity of demand i.e. infrequent projects lead to difficulty increasing the level of trust and commitment in the project team (Eloranta, 2007).
- Dependent on success of a single project (Hadjikhani in Dietrich et al., 2010).
- Uniqueness of project transactions.
- Complexity of actor network (Dietrich et al., 2010; Skaatesa and Tikkanen, 2003).

To encourage the development of relationships or social capital in projects it is important to promote collaborative practises which involve the exchange of knowledge between team members (Dietrich et al., 2010). Uzzi in Dietrich et al. (2010) describe relationships in which organisations operate in a truly collaborative mode to achieve a common goal or gain mutual benefits, as embedded relations which are generally characterized by trust and commitment.

2.2.3.2. Coordination

High-quality coordination is defined by Hoegl and Gemuenden (2001) as the shared understanding of mutual goals, related activities, interdependencies between the activities, and the status of member contributions. Coordination is one of the factors that determine the quality of collaboration (Bedwell et al., 2012; Chiocchio et al., 2011; Dietrich et al., 2010; Hoegl and Gemuenden, 2001; LePine et al., 2008). High-quality coordination is a prerequisite for fluent interactions in collaborative settings and ensures harmonized and synchronized co-action (Dietrich et al., 2010). Coordination in projects is mainly used to align the team with the project goal, coordination can take place without there necessarily being collaboration therefore coordination is not a synonym for collaboration. Congruent or collaborative goals weaken conflicts and increase the quality of collaboration

(O'Leary-Kelly et al., 1994; M. B. Pinto et al., 1993) as well as increasing the exchange of knowledge between members (Tjosvold in Dietrich et al., 2010).

Coordination is often perceived to be a way in which the project team and the project outcomes can be controlled to meet expectations. Costa (2003) adds that trust facilitates coordination among individuals because a high level of trust is an indication that there is collaboration and sharing of information between project members, which in turn is expected to lead to higher performance (Lesko and Hollingsworth, 2010). Martín-Rodríguez et al. (2005) add that communication and coordination mechanisms, policies, protocols and standardized documentation may benefit collaborative processes. For example M. B. Pinto et al. (1993) examined inter-unit collaboration in projects and found that team rules improve the collaboration. Similarly, the results of Silén-Lipponen et al. (2002) show that rules and procedures represent an important role in coordination and collaboration between professionals. Norms regarding the rules and procedures that must be followed in a project increase the predictability of collaborative actor behaviour. High quality collaboration requires each participant to accept and respect required effort norms (Dietrich et al., 2010). When the team collaborates by coordinating their efforts, the cost of controlling and the probability of failure is reduced (Ahola, 2009; Dubois and Gadde, 2000; Ingram and Baum, 2001).

2.2.3.3. Cohesion

High-quality collaboration in projects is characterized by cohesion which is defined as the collaborative spirit between actors (Dietrich et al., 2010; Hoegl and Gemuenden, 2001) and the resultant of all forces acting upon members to remain in the group (Festinger in Lin and Peng, 2010). Cohen and Bailey (1997) found that cohesion is one of the key issues that determine the individual's willingness to engage in collaboration. Moreover, cohesion creates the feeling of togetherness, strengthens the nature of the collaborative relationship, and nurtures open sharing of information and knowledge. Dietrich et al. (2010) state that trust improves cohesion between project members which subsequently improves the quality of collaboration.

2.2.3.4. Proximity

Project-team based collaboration often spans across national borders and between organisations. It is challenging for several reasons, amongst others the temporary nature of alliances that are formed to deliver new outputs together (Dietrich et al., 2010) and the fact that the actors belong to different communities of practice (Lave and Wenger in Dietrich et al., 2010) is challenging. Studies have shown the positive effects of physical proximity on collaborative behaviour (Dietrich et al., 2010).

Physical proximity is defined as nearness in space and in the context of projects, proximity refers to the perceived physical distance between project team members. Van den Bulte and Moenaert (1998) examined R&D team co-location and found a positive relationship between co-location and the frequency of communication. Other empirical studies have shown that co-locating people enables informal communication, enhances the creation of shared understanding and increases cohesion between collaborative actors (Kahn and McDonough, 1997; Moodysson and Jonsson, 2007; M. B. Pinto et al., 1993). A study by Arslanian-Engoren in Dietrich et al. (2010) confirm this by stating that physical proximity has a positive effect on collaboration.

2.2.3.5. Commitment

Commitment is defined as the state or quality of being dedicated to a cause or activity (Oxford University Press, 2013). In projects, commitment is one of the key success factors for inter-personal and inter-organisational collaboration (Dietrich et al., 2010; Herscovitch and Meyer, 2002; Mohr and Spekman, 1994). According to Bresnen and Marshall (2000), an actor's commitment to project tasks increases the collaboration quality. Hoegl et al. in Chen et al. (2010) found that commitment also has a positive effect on teamwork quality in product development projects. Empirical studies prove similar results in cross-disciplinary collaboration in a hospital context (Liedtka and Whitten in Dietrich et al., 2010). Furthermore, Vandenberghe et al. (2003) found that commitment has a direct and indirect effect

on job performance through commitment to the supervisor and organisational commitment respectively. Commitment increases a collaborator's genuine interest to participate, engage in mutual support, and sets actors' priorities to favour the collaborative task at hand (Dietrich et al., 2010).

2.2.3.6. Conflict

Some researchers argue that conflicts are 'characteristic' of collaborative projects and should be managed by formal and informal governance mechanisms or coordination to strengthen the relationship between the collaborating actors (Vaaland, 2004). It is important to address conflict in a project as the increased complexity and diversity of the technical workforce in teams will increase workplace tensions (Dietrich et al., 2010; Farris and Cordero, 2002). The relationship between conflict resolution and collaboration has been tested in empirical studies. For example, Tjosvold et al. (2003) showed that a positive attitude to conflict is positively related to collaborative interaction in teams. Some studies have found a negative relationship between conflict and collaboration (Duarte and Davies in Dietrich et al., 2010), while others also emphasize the positive aspects of conflicts (Vaaland and Håkansson, 2003) as task conflict has a beneficial effect on the performance of decision-making teams (O'Neill et al., 2013).

De Dreu and Weingart (2003) executed meta-analysis on the effects of relational and task conflicts on team performance and team member satisfaction and found that both of these conflict types are negatively related to team performance and team member satisfaction. These findings strengthen the notion that resolving conflicts has a direct positive effect on collaboration quality (Dietrich et al., 2010; O'Leary-Kelly et al., 1994; M. B. Pinto et al., 1993).

2.2.3.7. Incentives

Incentives are things that motivate or encourage someone to do something and are often used in projects to boost project team performance and collaboration

(Oxford University Press, 2013). According to Dietrich et al. (2010) the alignment of incentives is one of at least eight interrelated issues that impact directly on the fluency of collaboration between different project actors. To guarantee that each of the collaborating actors support the achievement of the common goal and to ensure that mutual support exists between them, the incentives of the different actors should be aligned. When Faerman et al. (2001) studied public-private collaboration they found that the alignment of incentives served as one of the most important issues that related to success of the collaborative process. Similarly, Dietrich et al. (2010) states that alignment of incentives are an important factor for effective collaboration. A study by Bresnen and Marshall (2000) reveals however that most of the incentive systems used in alliance and partnering projects do not provide expected motivation for collaborating actors. They advise therefore that individual differences, social relations and a balance between extrinsic and intrinsic rewards and incentives must be considered and aligned in order to improve the degree of collaboration experienced in the project team.

2.3. Project success

Success can mean different things to different people (Freeman and Beale in Jugdev and Müller, 2005). The requirements of each project stakeholder will differ and therefore their perception of what constitutes success will vary. Hence, there is a lack of consensus and objectivity as to what constitutes a successful project. Before the constituents of project success are discussed in more detail it is important to distinguish between project success (measured against the overall objectives of the project) and project management success (measured against the widespread and traditional measures of performance against cost, time and quality) (Cooke-Davies, 2002; Anton de Wit, 1988; Jugdev and Müller, 2005).

The second distinction one must make is the difference between success criteria (the measures by which success or failure of a project or business will be judged) and success factors (those inputs to the management system that lead directly or indirectly to the success of the project or business) (Cooke-Davies, 2002). The success of a project is not only dependent on how the project performs in terms of

its success criteria but it is also dependent on the stakeholders' perception of project success. The stakeholders' satisfaction with the project is determined as the difference between his perception of the project's success versus his expectations thereof (Koelmans, 2004; Maylor, 2003). A stakeholders' perception of success can be influenced by issues such as the responsiveness of the team to stakeholder requests, communication or lack thereof, degree of collaboration and/or trust in the team and other people-related issues.

The introduction provided above makes it clear that project success is measured by 'things-related' criteria such as the budget, schedule and quality of the project deliverable (which will hereafter be collectively referred to as project performance) and 'people-related' criteria such as communication, trust and collaboration which determine the team morale and stakeholder satisfaction in the project, amongst others (Koelmans, 2004). Furthermore, literature states that there is an additional construct, knowledge integration and innovation that influences project success by bridging the gap between the 'things-related' and 'people-related' factors. For the purposes of this study project success is self defined.

Both project performance and knowledge integration and innovation are discussed in more detail below. Several factors that are beyond the scope of this paper can also influence project success. These include for example the level of risk accepted, the match between organizational capabilities and project requirements and several aspects of the planning process.

2.3.1. Project performance

Project performance, as mentioned above, is used to collectively refer to both the 'things-related' success criteria and success factors. Project performance is concerned with the attainment and continuous measurement of the project determinants, time, cost and quality to establish the project's relative success. These three project measures are concerned with the internal efficiency of project management tasks (Dalcher, 2009). Project performance is an important determinant of project success, as the effectiveness of projects need to be

considered on a regular basis throughout the course of the project to establish the project's relative success (Dalcher, 2009).

2.3.2. Knowledge integration and innovation

Knowledge integration is a project team or organisation's effective use of the ideas and information available to it (Cambridge University Press, 2013). Innovation involves deliberate application of information, imagination and initiative to derive greater or different values from resources, and includes all processes by which new ideas are generated and converted into useful products (Web Finance Inc., 2013). Knowledge integration and innovation is applicable to any type of project as it addresses the uniqueness which is characteristic and inherent to all projects. Research indicates that collaboration between customer and supplier reduces the costs of controlling, decreases the probability of failure, and creates potential for innovations and learning (Ahola, 2009; Dubois and Gadde, 2000; Ingram and Baum, 2001). Henderson and Cockburn in Dietrich et al. (2010) found that higher project performance was associated with knowledge transfer mechanisms that actively encouraged the exchange of information across organisational units and across organisational boundaries. To achieve project success open channels for knowledge exchange need to be available, which allows new external knowledge to be imported and synthesized with existing internal knowledge so that the knowledge can be integrated into the project (Henderson and Cockburn in Dietrich et al., 2010).

Knowledge integration and innovation was shown to exert significant positive effects on project performance and proper knowledge acquisition and dissemination was found to be crucial for learning by increasing the variability of project performance (J. Yang, 2005). Thus, the acquisition and integration of specialized knowledge, especially tacit, influences the outcome of project success (Leonard-Barton in Brady, 2004; Teece et al. in Smyth et al., 2010). In summary the constructs, elements and relationships discussed in the literature study are modelled in Section 2.4, using SEM principles. The model confirms the relationships identified in Bond-Barnard et al. (2013a).

2.4. Project communication success model

SEM is a multivariate technique for estimating a series of interrelated dependent relationships simultaneously (Hair et al. in J.-B. Yang and Ou, 2008) and is regarded as an extension of standardised regression modelling used to deal with poorly measured exogenous variables. SEM is ideally suited for many research issues in the fields of engineering and management (Molenaar et al., 2000; J.-B. Yang and Ou, 2008) as it is an advanced data analysis tool for exploring data relationships quantitatively (J.-B. Yang and Ou, 2008). SEM is capable of both exploratory (theory building) and confirmatory (theory testing) modelling.

An introduction to confirmatory factor analysis (CFA) follows as the aim is to specify a model for project communication success, which will be tested empirically in a subsequent paper. CFA tests whether a specified set of constructs is influencing responses in a predicted way. Its primary objective is to determine the ability of a predefined factor model to fit an observed set of data (DeCoster, 1998). This paper focuses on the first step of CFA which involves the specification and operationalization (identification of exogenous and endogenous variables) of the model to be estimated, as only then can the relations among the variables to be analysed (Hoyle, 1995). The paper also confirms that the findings of Bond-Barnard et al. (2013a), specifically that:

- There is a correlation between quality of communication and the degree of collaboration in a project.
- Quality communication improves the perceived performance of the project by increasing trust and collaboration amongst the team members.

Based on literature and the model presented by Bond-Barnard et al. (2013a), the quality of communication in the project team triggers and sustains the process for achieving project success in terms of the human success factors, trust and collaboration. Communication sustains the process as it is the only factor identified in the literature that is required as a direct input/predictor of the Level of Trust, Degree of Collaboration and Success achieved. The Quality of Communication is

predicted by; Communications Plan, Technology, Frequency of Interaction, Content, Communication Type, Communication Channels and Audience. From literature it is proposed that Quality of Communication influences the Degree of Collaboration by influencing the Level of Trust and directly (see Figure 3). The authors also acknowledge that there is a correlation between the Quality of Communication and the Degree of Collaboration in a project. Furthermore, the Quality of Communication influences Project Success through Level of Trust and Degree of Collaboration but there is also a correlation between Quality of Communication and Project Success. Similarly, based on the literature, the Degree of Collaboration is shown in the model to be predicted by the Level of Trust and Quality of Communication in the project.

The predictors for Trust and Collaboration are Knowledge Exchange, Imported Trust, Risk, Expectations and Relationships, Cohesion, Proximity, Commitment, Conflict, Incentives, respectively. The proposed CFA model terminates with the Degree of Collaboration, Project Performance, Quality of Communication and Knowledge Integration and Innovation predicting Project Success. A second paper will test the model using CFA to verify the established constructs that were measured in a survey. The measurement part of the model was developed as part of the survey instrument and CFA will be used to assess the factoral validity of the constructs/latent variables. The survey instrument comprises of different items that measure the constructs Quality of Communication, Level of Trust, Degree of Collaboration and Project Success.

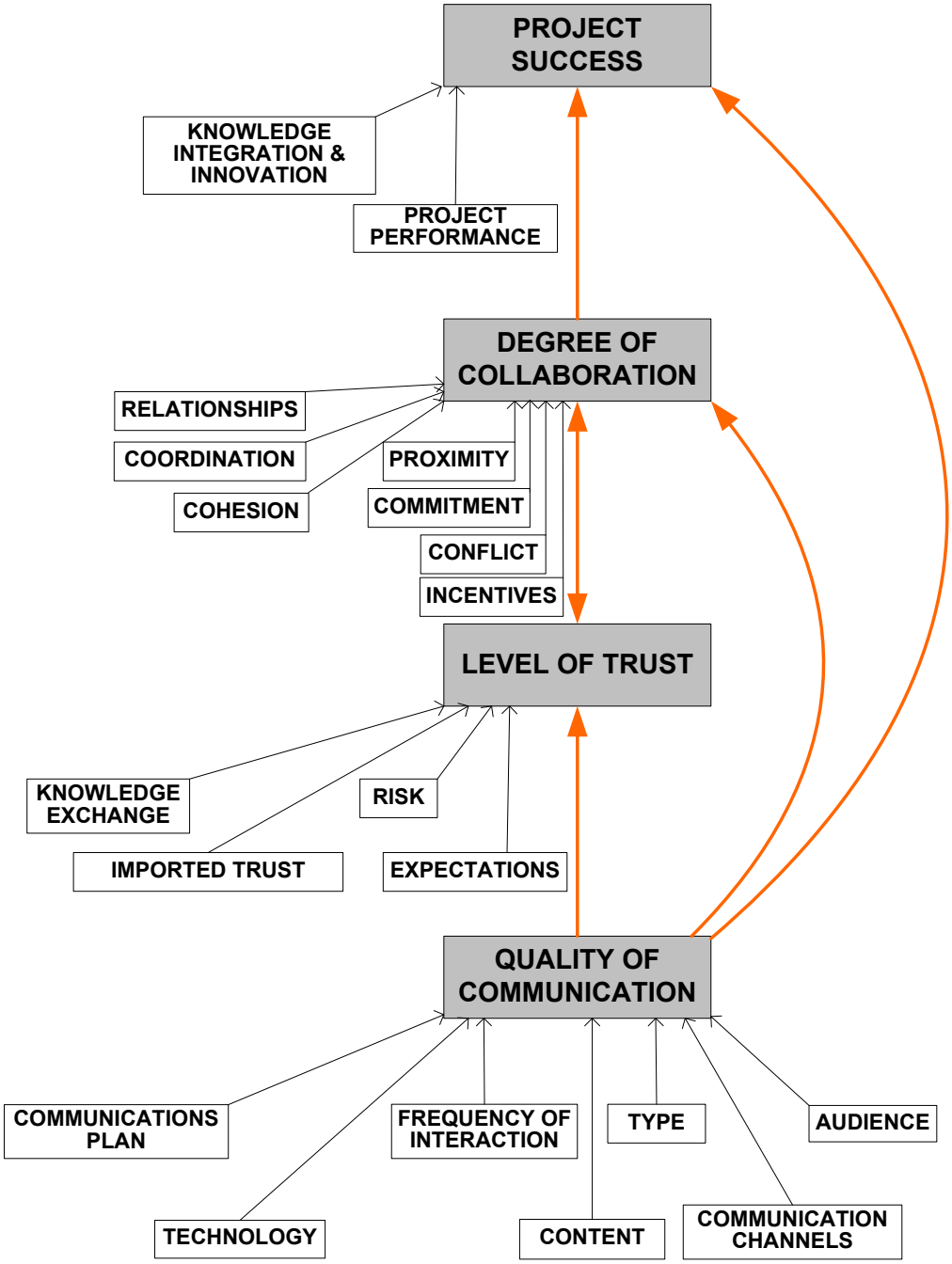

Figure 3. Project communication success model (adapted from Chapter 4)

2.5. Conclusions and recommendations

The paper confirms that the findings of Bond-Barnard et al. (2013a) can theoretically be replicated. The paper also establishes the role that the quality of communication, level of trust and degree of collaboration must play in the project

amongst the team members, in order to achieve project success in terms of the 'human-related' success criteria. The 'human-related' success factors and criteria are but one of the three legs that together ensure project success; the other two legs are (a) project performance and (b) knowledge integration and innovation. The objectives set out in the introduction of the paper were to:

- Identify the main 'human success factors' or constructs that play a role in determining project success.
- Establish which elements/variables determine the main 'human success factors'.
- Specify a ‘human factors’ model for achieving project success.

Each of these objectives is addressed. Quality communication, a high level of trust and a high degree of collaboration amongst the project team members, are the key 'human success factors' which ensure project success.

The paper further establishes that the quality of communication in a project is determined by:

- whether there is a communications plan in place,
- access to and the way in which technology is utilised for communication,
- the frequency of interaction,
- the communication content,
- a balance between different types of communication,
- the number of communication channels in the project and
- the way in which information is communicated to the project audience.

The level of trust in the project is determined by:

- the degree of knowledge exchange taking place in the project,
- whether imported trust is present in the project or not,
- how risks are addressed and whether the project team meets each other's expectations and/or that of the stakeholder.

The elements that determine the degree of collaboration include:

- The nature and strength of project relationships,
- coordination and cohesion amongst the team members,

- the proximity of team members to each other,
- the nature and alignment of member incentives,
- team member commitment to the project objectives and degree of conflict resolution.

In conclusion, the paper presents a model of project communication success (Figure 3) which shows how quality communication influences (either directly or indirectly) all the other 'human-related' success factors which together with knowledge integration, innovation and project performance achieve project success. A number of recommendations for further research flow from this. It is suggested that further research is needed to:

- Empirically verify the project communication success model be using confirmatory factor analysis.
- Determine what type or level of communication, trust and collaboration is required in each phase of the project life cycle in order to achieve project success at the end.
- Determine the role of the project manager and various other stakeholders would play in terms of the project communication success model.

Such further work should contribute to the theory of project communication management.

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Chapter 3

Structural equation model for assessing impacts of communication, trust, collaboration on project success[2]

The quality of communication, level of trust and degree of collaboration experienced in a project play a significant role in promoting performance and improve the stakeholders' perception of project success. While it is understood that the stakeholders' satisfaction with the project determines whether it is a success or not, a clear understanding of how communication, trust and collaboration influence their perception of success is critical. In an attempt to understand these human-oriented factors and how they link to the perceived success of the project a hierarchical structural equation model is established. By employing the structural equation modelling technique, eleven variables are empirically verified across three confirmatory factors namely, level of trust, degree of collaboration and project success, which were identified and discussed in a previous paper. Survey data was collected from international respondents working on medium size projects. The results indicate that project success is positively influenced by the degree of collaboration and indirectly by the level of trust between project members, based on a foundation of quality communication. The significance of these factors in increasing the perception of project success contributes to the development of better communication management in projects and enhances existing knowledge of project communication, trust, collaboration and project success.

[2] This chapter has been submitted in a slightly different format as Bond-Barnard, T.J., Fletcher, L and Steyn, H, (submitted). Structural equation model for assessing impacts of communication, trust and collaboration on project success*, International Journal of Project Management*.

3.1. Introduction

The constituents of project success have been widely researched in literature (Andersen et al., 2006; Baker et al., 1988; Cooke-Davies, 2002; Fortune and White, 2006; Lechler, 1998; Pinto and Slevin, 1988). The overall objectives of a project consist of both traditional project management objectives of performance against cost, time and quality and the stakeholders' perception of project success (Bond-Barnard et al., 2014b; Cooke-Davies, 2002; de Wit, 1988; Koelmans, 2004). The implication of this is that if the stakeholders do not perceive the project to be a success then it is not a success even if all cost, time and quality objectives were met. A stakeholders' perception of success is influenced by 'human factors' such as communication, trust and collaboration which are often being ignored in project management (Bond-Barnard et al., 2014b) but which are an important topic for investigation.

The majority of the research that has been done on project success focuses on what people and teams do rather than on the quality of their human interactions, motivations and/or decision-making practices (Cooke-Davies in Bond-Barnard et al., 2014b). Furthermore, there are human dimensions to nearly all the success factors that have been identified in the literature (Cooke-Davies in Bond-Barnard et al., 2014b). To achieve project success it is imperative that the implications of communication, trust and collaboration on project success be understood so as to achieve the overarching goal of a project.

Bond-Barnard et al. (2014b) found theoretical support for the proposition that project communication influences project success directly and also indirectly through its influence on project trust and project collaboration. The intent of this research is to provide a clear understanding of which variables influence the quality of communication, level of trust and degree of collaboration incorporating the points of view of clients, project managers, team members and other stakeholders. Verification of the variables, proposed by Bond-Barnard et al. (2014b), and their relationships to the project constructs should help project managers in achieving successful project outcomes.

This study aims to examine the extent to which the variables identified in Bond-Barnard et al. (2014b) influence the constructs of quality of communication, level of trust and degree of collaboration and to assess the factorial validity of the constructs as they relate to project success. Based on previous studies (Bond-Barnard et al., 2014b, 2013), three critical 'human-oriented factors' associated with project success have been identified for confirmatory analysis. A Structural Equation Model (SEM) has been developed highlighting the theoretical relational links between the 'human' project success factors/constructs and the overall project success. By analysing and interpreting the coefficients among the factors in the SEM model, the research attempts to create a better understanding of the variables determining the quality of project communication, level of trust and degree of collaboration, and the relationship between these constructs and project success.

The outcome of the model is particularly important for all the stakeholders (specifically project managers and team members) to prioritise the factors and underlying variables in terms of their criticality for promoting communication, trust and collaboration in order to improve stakeholder satisfaction and to increase the chance of achieving project success.

3.2. The human aspects of project success

Approaches to project success have changed continuously over the past several decades from definitions of success and critical success factors to a more strategic, holistic view (Jugdev and Müller, 2005). However, the evolution of project success frameworks alone cannot guarantee the successful implementation of project objectives. Several studies report that despite improvements in terms of project success, quite a large number of projects fail (Cserháti and Szabó, 2014; Flyvbjerg et al., 2003; KPMG International, 2008; The Standish Group, 1994).

It is proposed that the reason for this is two-fold. Firstly, project context varies. Not all success frameworks are created equal as they are usually not applicable to all

types of projects (Cserháti and Szabó, 2014). Secondly, practitioners and researchers place a great deal of emphasis on achieving the objectives of the 'iron triangle' of project success (Agarwal and Rathod, 2006; Fortune and White, 2006; Turner and Cochrane, 1993) and focus less on the human aspect of projects which are woven into the very fabric of all the success factors that have been identified in literature (Cooke-Davies, 2002).

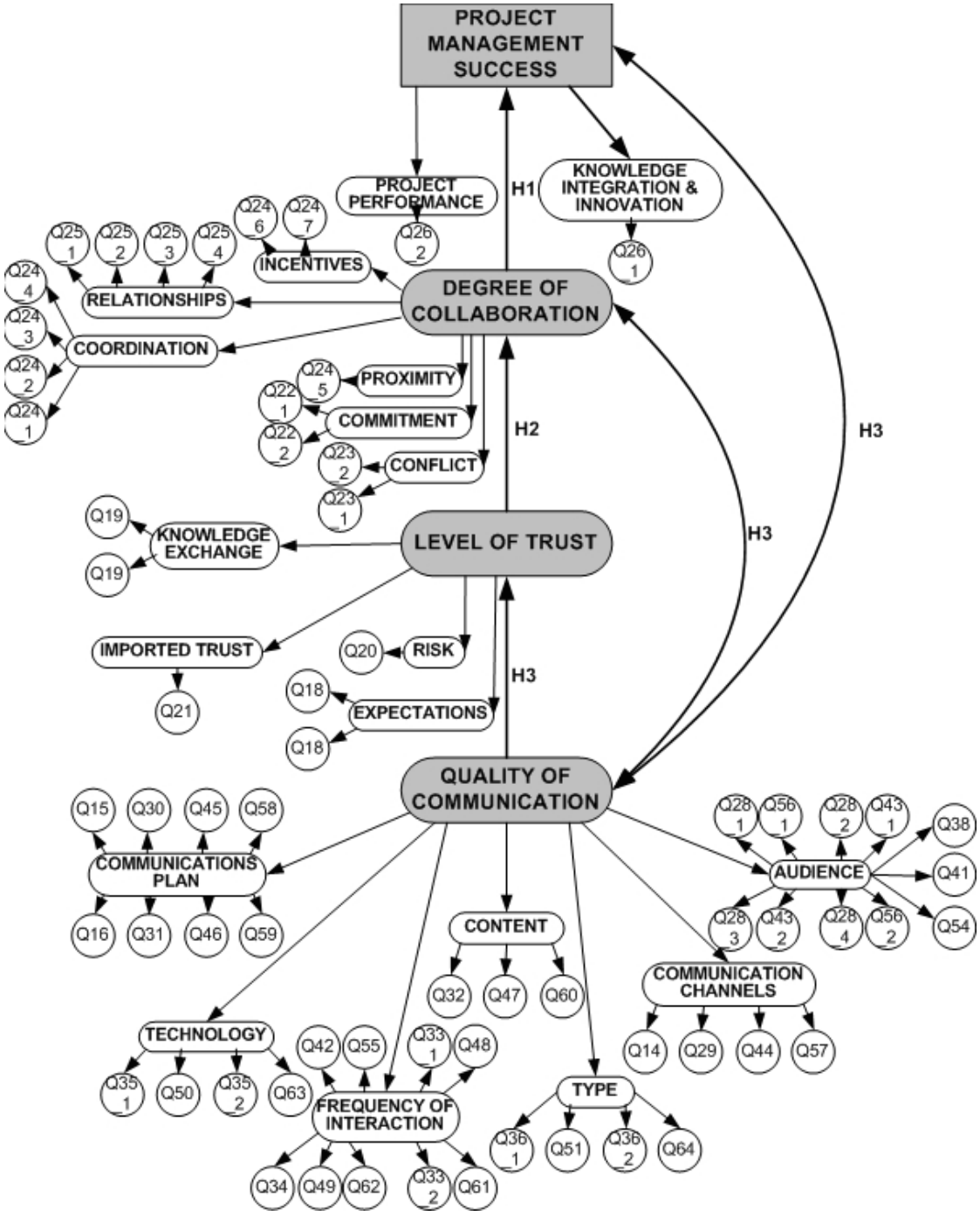
It is people who deliver projects, not processes and systems (Cooke-Davies, 2002). The discussion of the human aspects of the project success framework is important as it can be applied in most project contexts because it focuses on the universal human project success factors. In the following section, we summarise the theory which supports the human aspects of project success framework and review the variables that determines the framework's constructs. This provides support for the SEM analysis of the model that is discussed in sections 3.4 through 3.7 in this paper.

3.2.1. Framework of human aspects influencing project success

Communication is an essential contributor to project success (Bond-Barnard et al., 2014b, 2013) as the lack of quality communication has been identified as a primary cause of project failures (Dainty et al., 2006; Pinto and Pinto, 1990; Souder, 1981; OGC in Webber, 2008). Shao et al. (2010) found that frequent communication improves stakeholder satisfaction. Furthermore, (Müller, 2003a) established that it improves project member collaboration and trust. It has also been determined that the interplay of situation-appropriate teamwork, communication, synchronicity and coordination increases collaboration in the project which is an indicator of team performance (Chiocchio et al., 2011; Kozlowski and Bell, 2003; LePine et al., 2008). Likewise, trust affects project performance through the activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio et al., 2011).

The literature reviewed below emphasizes the importance of communication, trust and collaboration in order to achieve project success. It also identifies the

variables that together promote quality communication, high levels of trust and collaboration in a project, based on theory and existing empirical research. For the rest of Section 3.2 and for Section 3.3 the reader is referred to Figure 4.



Symbols in circles indicate numbers of items in the survey questionnaire

Figure 4. Hypothetical model for the relationship between quality of communication, level of trust, degree of collaboration and the overall project success

3.2.1.1. Quality of communication

The role of the project management function is to manage the systems that relate to the features of uniqueness, novelty and transience, which define the term 'project'. These systems are namely the scope of work, the project organisation, the quality, cost and the duration of the project. Communication is an essential ingredient of all of these managerial requirements and must be viewed as the essential prerequisite to successful project-based management (Dainty et al., 2006). Bond-Barnard et al. (2013) found that a balance of frequent informal and formal communication influences the performance of the project, by influencing the degree of collaboration and the level of trust in the project team, which also influences the project's performance. Consequently, communication is frequently identified as a major determinant for project success or failure (Müller, 2003a, Hartman in Müller, 2003b).

Communication can be compared to a metaphorical 'pipeline' along which information is transferred between individuals or groups (Axley, 1984) through a common system of symbols, signs, or behaviour (Merriam-Webster Dictionary, 2011). Thus the communication process involves a person or entity sending out a message and another receiving and successful understanding the message in response (Torrington and Hall, 1998). It stands to reason then, that the quality of communication between the message initiator and the correct message receiver(s) in a project is determined by how timeously and accurately a message (with appropriate content) is conveyed using the most suitable communication medium available, while being aligned with the project communications plan. This definition for quality communication was formulated based on the constructs identified in the literature viz. frequency of interaction, content, type, technology, communication channels, audience and communications plan that were all identified as variables that determine the quality of communication. 'Culture' and 'leadership' factors also influence the quality of communication but are beyond the scope of this paper.

3.2.1.2. Level of trust

Trust can be defined as a function of the predictability and expectations of others' behaviours or a belief in others' competencies, which affects performance through activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio et al., 2011). When there is trust, people ask for help, speak openly and honestly, take risks, accept new challenges and carry out their activities with less anxiety and stress (Carvalho, 2008; Fox, 2001). The literature states that communication improves project member trust and collaboration (Bond-Barnard et al., 2013; Müller, 2001) as communication reduces the mistrust and conflict of interest between the project principal and the agent, which improves project performance (Turner and Müller, 2004). However, factors other than communication also influence trust namely: the degree of knowledge exchange, imported trust (trust imported from other familiar settings), taking risks or dealing with uncertainty and meeting team members' expectations.

3.2.1.3. Degree of collaboration

Collaboration and cooperation are interchangeable terms which are defined as a recursive process where people or organisations work together in an intersection of common goals by sharing knowledge, learning, and building consensus (Dietrich et al., 2010). Collaboration can occur between individuals between organisations or between an organisation and its customers. Only interpersonal collaboration is considered here. To better understand how one can promote interpersonal collaboration in a project team it is important that one is aware of the influence that various factors have on the degree of collaboration (Dodgson, Hoegl et al. in Dietrich et al., 2010; Jap, 1999; Mohr and Spekman, 1994). According to Tyler (2003) trust affects performance through activation of cooperation or other collaborative processes. Trusting teams enhance cooperative and collaborative processes, which assists them to better manage the interdependencies between their respective areas of expertise. At an individual and team level collaborative work predicts task and team performance respectively (Chiocchio et al., 2011).

Other constructs that have been identified in the literature include relationships, coordination, proximity, commitment, conflict and incentives.

3.2.1.4. Project success

Success can mean different things to different people (Freeman and Beale in Jugdev and Müller, 2005). The requirements of each project stakeholder will differ and therefore their perception of what constitutes success will vary. The stakeholders' satisfaction with the project is determined as the difference between his perception of the project's success versus his expectations thereof (Koelmans, 2004; Maylor, 2003). A stakeholders' perception of success can be influenced by issues such as the responsiveness of the team to stakeholder requests, project communication, degree of collaboration and/or trust in the team, etc.

Project success is measured by *'things-related'* criteria such as the budget, schedule and quality of the project deliverable (which will hereafter be collectively referred to as project performance) and *'people-related'* criteria such as communication, trust and collaboration which determine the team morale and stakeholder satisfaction in the project, amongst others (Koelmans, 2004). Furthermore, literature states that there is an additional construct, knowledge integration and innovation that influences project success by bridging the gap between the 'things-related' and 'people-related' factors. Both project performance and knowledge integration and innovation are discussed in more detail in section 3.3. Several factors that are beyond the scope of this paper can also influence project success. These include for example the level of risk accepted, the match between organisational capabilities and project requirements and several aspects of the planning process.

3.3. Theoretical framework

3.3.1. Indicators of project communication

The aforementioned literature and especially the model proposed by Bond-Barnard et al. (2014b) provide the theoretical basis to verify the model for this study. It is postulated that the constructs quality of communication, level of trust and degree of collaboration, and project success indicators - project performance and knowledge integration and innovation - collectively determine the overall project success. The quality of communication is defined as a construct involving seven indicators namely communications plan, technology, frequency of interaction, content, type, communication channels and audience (Bond-Barnard et al., 2014b) which are all briefly discussed below.

3.3.1.1. Communications plan

The communications plan is crucial for quality communication because without it there is a barrier to communication in project (Carvalho, 2008). The project communications plan is used to determine who needs what information, how it will be collected and how it will be transmitted. Modern communications planning focuses on organising and documenting the process, types and expectations of information dissemination throughout the project lifecycle (Lesko and Hollingsworth, 2010).

3.3.1.2. Technology

Technology is one of five factors that significantly contribute to the breakdown of communication in a project (Carvalho, 2008; Daim et al., 2012). This is because technology causes physical communication barriers (Ferreira in Carvalho, 2008), which are obstacles that arise when information is transmitted. With the event of global virtual teams and tendencies towards continuous communication or updates (e.g. Twitter, RSS feeds) technology plays a key role in enabling communication and for this reason it determines the quality of communication in 21st century projects.

3.3.1.3. Frequency of interaction

Frequency of interaction refers to the number and timings of project team members' communications with the stakeholders and each other (Turner and Müller, 2004). The PMBOK Guide by the PMI (2013) states that timely communications are a prerequisite for successful project completion. Similarly, Bond-Barnard et al. (2013); Chen et al. (2010); Turner and Müller (2004) and Webber (2008) found that frequent informal and formal communication improves the communication quality, trust and collaboration in project relationships which, in turn, contributes to high project performance. Timely communications are especially important when dealing with project teams from different geographic regions as the frequency of interaction decreases when the project team is not co-located (Dietrich et al., 2010; Van den Bulte and Moenaert, 1998). The lack of timely communication has been cited as a common factor among failing projects (Dalcher, 2009).

3.3.1.4. Content

Communication in a project can only be as good as the content that is being communicated, therefore quality content results in quality communication (Bond-Barnard et al., 2014b, 2013). Müller (2001) found that the content of quality project communication falls into one or more of the categories below:

- Status and achievements
- Project changes
- Issues and open items
- Next steps in the project
- Quality and progress measures
- Project trends

Penteado in Carvalho (2008) warns that project communications competencies, which refer to the group's ability to codify, transmit and decode information, are necessary but not sufficient prerequisites to the effectiveness of project communication. This means that if the project team is neither able to codify nor

decode the communication content correctly, then the effectiveness or quality of the project communication may be reduced.

3.3.1.5. Type of communication

The type of communication that occurs in the project determines quality communication. Post et al. (2009) state that participative communication improves the quality of project communication, as it is the strongest indicator of innovation effectiveness and patents produced. They add that participation often leads to a better understanding of potential problems, which encompasses the concept of connective thinking. Participative communication can either be informal or formal in nature and both forms can be facilitated both orally and in writing. Turner and Müller (2004) established that the communication needs of project participants are best served by a mixture of formal and informal communication, and of written and oral communication as well as audio-visual and electronic (Torrington and Hall, 1998). It has been shown that frequent informal and formal communication improves communication quality, trust and collaboration in project relationships, which is linked to high performance (Bond-Barnard et al., 2013; Chen et al., 2010; Turner and Müller, 2004; Webber, 2008).

3.3.1.6. Communication channels

The PMBOK guide (PMI, 2013) states that one of the two main components of project communication is the knowledge and management of the project's communication channels. Project communication channels are defined as the connections between communicators in a project. The greater the number of project stakeholders/communicators, the greater the number of channels and the more complex the communication issues become (Daim et al., 2012). Since communication channels determine how much communication must take place in a project it also to some extent determines the quality of the project communication.

3.3.1.7. Audience

The audience/communication recipient(s) plays an important role in determining the quality of project communication (Bond-Barnard et al., 2014b, 2013). The potential or expected audience determines whether one will be communicating one-to-one or with a group and whether this communication will take place face-to-face (in person) or through voice or text.

3.3.2. Indicators of level of trust

The level of trust in a project is determined by the degree of knowledge exchange, imported trust, taking risks or dealing with uncertainty and meeting team members' expectations. These variables are briefly discussed below, for more information see (Bond-Barnard et al., 2014b).

3.3.2.1. Knowledge exchange

Knowledge exchange is the push-and-pull found in the multiple, directional movement of data, information, and knowledge between individuals and groups for mutual benefit (Levesque, 2005). Trust develops from repeatedly receiving and sending project information across various formal and informal channels of communication which infers a level of reliability in the modality as well (Lesko and Hollingsworth, 2010).

3.3.2.2. Imported trust

Imported trust or swift trust theory refers to the situation whereby members of a team import trust from other familiar settings. Members initially employ category-driven information processing in forming stereotypical impressions of others. Thereafter trust is maintained by a high level of action within the teams. High levels of action promote members' confidence that the team is able to manage uncertainties, risk and vulnerabilities.

3.3.2.3. Expectations

A factor in promoting trust and cooperation is the anticipation of future association (Daim et al., 2012). Trust between project stakeholders is earned by doing what one says one will do on a continued, repeated basis (Lesko and Hollingsworth, 2010). The realisation of expectations is important for the development of trust (Chiocchio et al., 2011; Tyler, 2003).

3.3.2.4. Risk

Risk is an uncertain event or condition that, if it occurs, may have a positive or negative effect on a project's deliverables (PMI, 2013). As the relationship between risk and trust is reciprocal an acceptable degree of risk is responsible for an increase in the level of trust in a project. In the literature, one of the major reasons for the failure of global virtual teams (GVT) is related to building trust. Trust is crucial in any GVT as it allows people to engage in risk-associated activities that they cannot control or monitor (Daim et al., 2012). Similarly, risk can facilitate the development of high initial and final trust in a team if the members successfully cope with technical uncertainties and take initiative in the project (Daim et al., 2012). For this reason risk can either positively or negatively influence the level of trust in a project team.

3.3.3. Indicators of the degree of collaboration

Collaboration and cooperation are interchangeable terms which are defined as a recursive process where people or organisations work together in an intersection of common goals by sharing knowledge, learning and building consensus (Dietrich et al., 2010). The degree of collaboration in a project is determined by six variables namely relationships, coordination, proximity, commitment, conflict and incentives (Bond-Barnard et al., 2014b, 2013). A brief account of the literature to support these indicators of collaboration is provided below.

3.3.3.1. Relationships

Relationships are important in projects mainly because they form the basis for collaboration in the team which ultimately leads to project performance. Research on the relations between project actors and their effect on project performance is widely researched (Ahola, 2009; Artto et al., 2008; Dietrich et al., 2010). To encourage the development of relationships or social capital in projects it is important to promote collaborative practises which involve the exchange of knowledge between team members (Dietrich et al., 2010). Uzzi in Dietrich et al. (2010) describe relationships in which organisations operate in a truly collaborative mode to achieve a common goal or gain mutual benefits, as embedded relations which are generally characterized by trust and commitment.

3.3.3.2. Coordination

Coordination is defined as fitting together the activities of the organisations members (Argote in Pinto and Pinto, 1990) or a shared mutual understanding on goals that need to be performed (Dietrich et al., 2010). Coordination is one of the factors that determine the quality of collaboration (Bedwell et al., 2012; Chiocchio et al., 2011; Dietrich et al., 2010; Hoegl and Gemuenden, 2001; LePine et al., 2008), therefore coordination is not a synonym for collaboration as coordination can occur without there necessarily being collaboration. High-quality coordination is a prerequisite for fluent interactions in collaborative settings and ensures harmonized and synchronized co-action (Dietrich et al., 2010). Coordination in projects is mainly used to align the team with the project goal. Martín-Rodríguez et al. (2005) add that communication and coordination mechanisms, policies, protocols and standardized documentation may benefit collaborative processes. When the team collaborates by coordinating their efforts, the cost of controlling and the probability of failure is reduced (Ahola, 2009; Dubois and Gadde, 2000; Ingram and Baum, 2001).

3.3.3.3. Proximity

Studies have shown the positive effects of physical proximity on collaborative behaviour (Dietrich et al., 2010). Van den Bulte and Moenaert (1998) examined R&D team co-location and found a positive relationship between co-location and the frequency of communication. Other empirical studies have shown that co-locating people enables informal communication, enhances the creation of shared understanding and increases cohesion between collaborative actors (Kahn and McDonough, 1997; Moodysson and Jonsson, 2007; Pinto et al., 1993). A study by Arslanian-Engoren in Dietrich et al. (2010) confirm this by stating that physical proximity has a positive effect on collaboration. For the purposes of this study the respondent's perceived physical proximity was measured.

3.3.3.4. Commitment

In projects, commitment is one of the key success factors for inter-personal and inter-organisational collaboration (Dietrich et al., 2010; Herscovitch and Meyer, 2002; Mohr and Spekman, 1994). According to Bresnen and Marshall (2000), an actor's commitment to project tasks increases the collaboration quality. Furthermore, Vandenberghe et al. (2004) found that commitment has a direct and indirect effect on job performance through commitment to the supervisor and organisational commitment respectively. Commitment increases a collaborator's genuine interest to participate, engage in mutual support, and sets actors' priorities to favour the collaborative task at hand (Dietrich et al., 2010).

3.3.3.5. Conflict

Some researchers argue that conflicts are 'characteristic' of collaborative projects and should be managed by formal and informal governance mechanisms or coordination to strengthen the relationship between the collaborating actors (Vaaland, 2004). The relationship between conflict resolution and collaboration has been tested in empirical studies. For example, Tjosvold et al. (2003) showed that a positive attitude to conflict is positively related to collaborative interaction in

teams. Some studies have found a negative relationship between conflict and collaboration Duarte and Davies in Dietrich et al. (2010), while others also emphasize the positive aspects of conflicts (Vaaland and Håkansson, 2003) as task conflict has a beneficial effect on the performance of decision-making teams (O'Neill et al., 2013).

De Dreu and Weingart (2003) executed meta-analysis on the effects of relational and task conflicts on team performance and team member satisfaction and found that both of these conflict types are negatively related to team performance and team member satisfaction. These findings strengthen the notion that resolving conflicts has a direct positive effect on collaboration quality (Dietrich et al., 2010; O'Leary-Kelly et al., 1994; Pinto et al., 1993).

3.3.3.6. Incentives

Incentives are things that motivate or encourage someone to do something and are often used in projects to boost project team performance and collaboration (Oxford University Press, 2013). According to Dietrich et al. (2010) the alignment of incentives is one of at least eight interrelated issues that impact directly on the fluency of collaboration between different project actors. When Faerman et al. (2001) studied public-private collaboration they found that the alignment of incentives served as one of the most important issues that related to success of the collaborative process. Similarly, Dietrich et al. (2010) states that alignment of incentives are an important factor for effective collaboration. A study by Bresnen and Marshall (2000) reveals however that most of the incentive systems used in alliance and partnering projects do not provide expected motivation for collaborating actors. They advise therefore that individual differences, social relations and a balance between extrinsic and intrinsic rewards and incentives must be considered and aligned in order to improve the degree of collaboration experienced in the project team.

3.3.4. Indicators of project success

Before one can discuss the constituents of project success in more detail it is important to distinguish between project success (measured against the overall objectives of the project) and project management success (measured against the widespread and traditional measures of performance against cost, time and quality) (Cooke-Davies, 2002; De Wit, 1998). For the purposes of this study project success refers to project management success, is self defined and determined by the indicator project performance which encompasses the 'things-related' factors of project success namely time, cost and quality objectives. The reason for including these three objectives together is to make provision for project management success indicators in the model however the study does not measure these indicators directly therefore they have been grouped together. It is also determined by knowledge integration and innovation that influences project success by bridging the gap between the 'things-related' and 'people-related' factors. Shenhar et al.'s (2001) 'temporality' of success factors is not considered in this study. Both project performance and knowledge integration and innovation are briefly discussed below for more information see Bond-Barnard et al. (2014b).

3.3.4.1. Project performance

Project performance is concerned with the attainment and continuous measurement of the project determinants, time, cost and quality to establish the project's relative success. These three project measures are concerned with the internal efficiency of project management tasks (Dalcher, 2009). Project performance is an important determinant of project success, as the effectiveness of projects need to be considered on a regular basis throughout the course of the project to establish the project's relative success (Dalcher, 2009).

3.3.4.2. Knowledge integration and innovation

Henderson and Cockburn in Dietrich et al. (2010) found that higher project performance was associated with knowledge transfer mechanisms that actively

encouraged the exchange of information across organisational units and across organisational boundaries. To achieve project success open channels for knowledge exchange need to be available, which allows new external knowledge to be imported and synthesized with existing internal knowledge so that the knowledge can be integrated into the project Henderson and Cockburn in Dietrich et al. (2010). Knowledge integration and innovation was shown to exert significant positive effects on project performance and proper knowledge acquisition and dissemination was found to be crucial for learning by increasing the variability of project performance (Yang, 2005). Thus, the acquisition and integration of specialized knowledge, especially tacit, influences the outcome of project success (Leonard-Barton in Brady, 2004;Teece et al. in Smyth et al., 2010). This study only measured the respondent's perception of knowledge integration and innovation and not the temporality of said factors, as is discussed by Shenhar et al. (2001).

Using the project success framework of factors/constructs and their indicators as put forward in Bond-Barnard et al. (2014b); a conceptual diagram of the structural model is presented in Figure 4. The arrow represents the direction of hypothesised influences in the structural model. The corresponding hypotheses are as follows:

Hypothesis 1. Project success becomes better as the degree of collaboration becomes better.

Hypothesis 2. The degree of collaboration increases as the level of trust in the project increases.

Hypothesis 3. The quality of communication in the project has a direct positive effect on the level of trust, degree of collaboration and perception success in the project.

3.4. Research methodology

The survey method was adopted to evaluate the hypotheses proposed in this study. A questionnaire survey was designed for respondents to assess the quality of the communication, the level of trust and the degree of collaboration they had experienced between themselves and the other team members and stakeholders of projects they had participated in. The questions were phrased to ask the

respondents to rate their response, on a 10-point scale, regarding the relevant indicators impacting the constructs and overall success of a project. A sample of the questionnaire is shown in Appendix A. Respondents' profile and project information was also collected in the survey (shown in Table 1).

Before undertaking an industry-wide survey, a pilot study was conducted among a six-member project reference group explaining the research intent and the questions in order to validate the contents for accurate translation of the overall model. Based on the feedback received, the questionnaire was refined and ethics clearance for conducting the survey was obtained from a University Ethics Committee.

Data was collected from a total of 270 international self-selected respondents working on medium size projects in various industries, for both government and private institutions. The target population of the survey in this study was project/programme managers, project team members, project stakeholders (e.g. subcontractor, functional manager, regulatory authority, external party etc.) and project sponsors and/or clients working on projects in all types of industries. Table 1 shows the respondents profile for each of the typical roles in the project in terms of gender, age, field of work and nature of business entity.

The survey was done by means of an online, self-administered questionnaire using Qualtrics. The questionnaire was distributed by means of posting an invitation and link to the survey on five different open and closed project management LinkedIn groups. The questionnaire was also sent to 19 project management experts who were identified from literature and it was also circulated to all the current students and alumni of masters', post-graduate diploma and certificate programmes in the Graduate School of Technology Management at the University of Pretoria. Of the 270 responses received only 151 were valid and complete. Some responses had to be excluded as blocks of information were missing. It is suspected that this was due to a problem with saving information when exiting and returning to a questionnaire in Qualtrics.

Table 1. Summary of respondents profile by typical project role

	Project/ programme manager	Project team member	Project sponsor/ client	Other project stakeholders	Other	Total
Gender of respondents						
Male	53	47	0	8	7	115
Female	16	14	0	1	5	36
Total	69	61	0	9	12	151
Respondent age						
20-29	7	18	0	4	1	30
30-39	32	30	0	3	8	73
40-49	15	8	0	1	2	26
50-59	11	5	0	1	0	17
60+	4	0	0	0	0	4
Total	69	61	0	9	11	150
Principal industry						
Agriculture	1	0	0	0	0	1
Construction	9	10	0	0	1	20
Finance, insurance, real estate	2	1	0	1	0	4
Government	16	8	0	0	2	26
Health care	2	0	0	0	0	2
Information technology	6	7	0	1	1	15
Manufacturing	5	4	0	1	2	12
Mining	5	10	0	1	0	16
Services	7	5	0	0	1	13
Transportation	3	5	0	3	0	11
Communication, utilities	5	2	0	1	2	10
Nonprofit	2	0	0	0	0	2
Other	6	9	0	1	3	19
Total	69	61	0	9	12	151
Business entity						
Sole proprietor	1	2	0	0	0	3
Closed Corporation	0	0	0	0	0	0
Private Company	26	28	0	5	4	63
Public Company	7	6	0	1	3	17
State Owned Company	14	13	0	2	4	33
Personal Liability Company	2	0	0	0	0	2
A not for profit business	1	1	0	0	0	2
Government	17	9	0	1	1	28
Other business entity	1	2	0	0	0	3
Total	69	61	0	9	12	151
Number of stakeholders communicated with in typical project						
1 - 5	7	7	0	2	1	17
6 - 20	32	18	0	3	3	56
21 - 50	12	7	0	0	3	22
51 - 100	1	3	0	0	0	4
101 - 500	1	0	0	0	0	1
500 and over	1	0	0	0	0	1
Total	54	35	0	5	7	101

It is not possible to determine the response rate to the survey as the sample population was not known. The valid dataset was analysed using IBM SPSS Statistics 22 and its structural equation component AMOS.

3.5. Model specification and refinements

Analysing the initial structural equation model (SEM) posited in Figure 4 that is based on theoretical expectations and past empirical findings would be premature. A SEM model consists of two parts – a measurement component and a structural component. A feasible model should be selected based on the recommended goodness-of-fit (GOF) measures of the measurement parts of the model. Only a model that satisfies both theoretical expectations and GOF should be selected for the final SEM analysis that includes the structural regression paths (Doloi et al., 2011; Molenaar et al., 2000). Thus, in this research confirmatory factor analyses (CFA) were firstly performed for each of the constructs separately to determine their relevance to the model before analysing the complete model.

3.5.1. Modelling the constructs

Quality of communication could not be modelled as the sample size for the individual indicators of the construct was too small due to blocks of missing data. The construct quality of communication was therefore excluded from the SEM model. However the results and findings for the indicators of quality of communication as they relate to computer-mediated communication (CMC) are discussed in a separate paper (Bond-Barnard et al., 2014a). Even though it was not possible to model this construct the authors still support their theoretical premise that the model is built on a foundation of quality communication. The authors plan to incorporate quality of communication as part of the model in a subsequent study.

Typically CFA and SEM utilize the method of maximum likelihood to obtain the parameter estimates for the regression weights, the assumptions being that the data are measured on a continuous scale and have a multivariate normal distribution (Byrne, 2010). CFA and SEM estimate a variance-covariance matrix that resembles the sample variance-covariance matrix as closely as possible, however both variances and covariances are sensitive to kurtosis. As data become increasing non-normal the chi-square value for maximum likelihood (ML)

estimation becomes excessively large. This situation encourages researchers to seek further modification of their hypothesised model in an effort to obtain an adequate fit for the data. However, these efforts can lead to inappropriate and nonreplicable modifications to otherwise theoretically adequate models. Secondly, when sample sizes are small (even in the event of multivariate normality) the ML estimators yield chi-square values that are somewhat inflated and a greater proportion of the model fails to converge or results in an improper solution. Thirdly, when data are non-normal, fit indexes such as the Tucker-Lewis index (TLI) (Tucker and Lewis, 1973) and the comparative fit index (CFI) (Bentler, 1990) yield values that are modestly underestimated. Finally, non-normality can lead to low standard errors with moderate to severe underestimation, which causes regression paths and factor/error covariances to be statistically significant although they may not be so in the population (Byrne, 2010).

Tests of normality were hence performed to assess whether the criterion for multivariate kurtosis was met. Byrne (2010) states that rescaled kurtosis values greater than or equal to 7 for the variables indicate early departure from normality. Mardia's normalized estimate greater than 5 is indicative of non-normally distributed data. For the construct level of trust, Mardia's coefficient is 24.5 and for degree of collaboration it is 63.6. Since the data were measured on a Likert scale and the important assumption of multivariate kurtosis is evidently violated, the method of unweighted least squares (ULS) was used to obtain the parameter estimates. Kaplan in Arbuckle (2008) explains that the ULS method is actually a type of ordinary least squares (OLS) estimation that minimizes the sum of squared differences between sample and model-implied covariances. It can generate unbiased estimates across random samples, albeit not as efficiently as ML estimation.

The model for level of trust was identified with a chi-square of 44.33. All the indicators had positive regression weight estimates except for the indicator risk (item 20) that had an estimate of -0.031. It also had a very small squared multiple correlation of 0.01, i.e. it is estimated that the error variance of risk is approximately 99 percent of the variance of itself. Therefore, risk as an indicator of

the level of trust was not relevant. This is an interesting finding as it contradicts Daim et al. (2012) who states that risk can facilitate the development of high initial and final trust in a team if the members successfully cope with technical uncertainties and take initiative in the project. Risk was consequently removed from the second order CFA for level of trust, which resulted in a chi-square of 44.01 and all regression weight estimates were greater than 0. The fit indices, displayed in Table 2, all met the generally accepted criteria (values > 0.95 where 0 indicates no fit and 1 perfect fit).

Before the degree of collaboration was measured indicator item 25_1 in Figure 4 was removed as there were too much missing data. The model for degree of collaboration was also identified with positive regression weight estimates and adequate fit indices (Table 2).

Table 2. GOF measures for trust and collaboration ULS

Goodness-of-fit (GOF) measure	Level of trust	Degree of collaboration
GFI	0.997	0.972
AGFI	0.990	0.960
NFI	0.992	0.945
RFI	0.984	0.931

3.5.2. Estimating the final model

Once it was established that a suitable fit was obtained for level of trust and degree of collaboration using ULS, the next step was to estimate the entire model and to do an assessment for normality. As part of the estimation of the entire model the extent to which the two indicators project performance and knowledge integration and innovation contribute to the latent variable project success was quantified using CFA. The assessment of normality for the model indicated that kurtosis was also a problem, both for individual variables (e.g. value of 7.419 for Q22_1) and multivariately with Mardia's coefficient at 102.6.

The ULS model gave the standardised regression weight estimates in Table 3, which indicate the relative strength of each specific parameter estimate in the model. It is important to point out the strength of the links between the level of trust and the degree of collaboration (value of 0.768) and degree of collaboration and project success (value of 0.792). The squared multiple correlations estimates in Table 4 indicate the strength of association between the parameter and its construct.

Table 3. Standardised regression weights of final SEM model

	Estimate
Collaboration ←Trust	0.768
Success ←Collaboration	0.792
Expectations ←Trust	0.869
Imported Trust ←Trust	0.497
Knowledge Exchange ←Trust	0.814
Conflict ←Collaboration	0.454
Commitment ←Collaboration	0.810
Proximity ←Collaboration	0.432
Coordination ←Collaboration	0.899
Relationships ←Collaboration	0.842
Incentives ←Collaboration	0.392
Knowledge Integration and Innovation (Q26_1) ← Success	0.902
Project Performance (Q26_2) ←Success	0.751

Table 4. Squared multiple correlations of final SEM model

Parameter	Estimate
Expectations	0.756
Imported Trust	0.247
Knowledge Exchange	0.663
Collaboration	0.591
Conflict	0.206
Commitment	0.656
Proximity	0.187
Coordination	0.809
Relationships	0.710
Incentives	0.154
Success	0.628
Knowledge Integration and Innovation (Q26_1)	0.813
Project Performance (Q26_2)	0.564

In this research, by checking for multivariate normality and by employing ULS, the fit indices as shown in Table 5 was obtained (Adapted from Doloi et al., 2011; Molenaar et al., 2000).

Table 5. GOF measures

Goodness-of-fit (GOF) measure	
Goodness-of-fit index (GFI)	0.960
Adjusted goodness-of-fit index (AGFI)	0.949
Normed fit index (NFI)	0.936
Relative fit index (RFI)	0.926
Standardised root mean residual (SRMR)	0.077

By eliminating one of the indicators, risk, from degree of collaboration, the GOF measures of the ULS model achieved the recommended levels, which were then adopted as a final SEM for this research. As seen, the final model fitting for level of trust, degree of collaboration and overall project success based on the essential GOF measures is adequately supported. The GFI index value of 0.96 and the AGFI index value of 0.949 both indicate an acceptable model fit to the data. The standardised root mean residual (SRMR) value is 0.077 which is below the recommended upper limit of 0.08. Furthermore, all the other indices that are routinely reported, namely normed fit index (NFI) and relative fit index (RFI) have values above 0.9 provide strong evidence that the fit between the measurement model and the data is acceptable (Doloi et al., 2011).

The method of ULS does not provide standard errors, hence critical ratios with the corresponding p-values cannot be calculated to assess if parameter estimates differ significantly from zero. In order to evaluate the stability of the parameter estimates, 90% bootstrap confidence intervals were calculated for the model and are provided in Table 6. The procedure of ‘bootstrapping’ is a way to handle multivariate non-normal data (West et al., 1995; Yung and Bentler, 1996; Zhu, 1997). Bootstrapping serves as a resampling procedure by which the original sample is considered to represent the population. Multiple subsamples of the same size as the parent sample are then drawn, randomly with replacement, from this population and provide the data for empirical investigation of the variability of

the parameter. From Table 6 it is clear that all coefficients differ significantly from zero, as zero is not included in any of the confidence intervals.

Table 6. Bootstrap confidence intervals for final SEM model

Parameter	Estimate	Lower	Upper
Collaboration ← Trust	0.823	0.578	1.344
Success ← Collaboration	1.201	0.857	1.855
Q21 (Imported Trust) ← Trust	1.000	1.000	1.000
Expectations ← Trust	1.459	0.925	3.219
Q18_1 ← Expectations	0.691	0.414	0.883
Q18_2 ← Expectations	0.756	0.536	0.957
Q18_3 ← Expectations	1.000	1.000	1.000
Knowledge Exchange ← Trust	1.229	0.775	2.754
Q19_1 ← Knowledge Exchange	1.007	0.661	1.263
Q19_2 ← Knowledge Exchange	1.000	1.000	1.000
Conflict ← Collaboration	0.209	0.069	0.296
Q23_1 ← Conflict	1.073	0.305	2.702
Q23_2 ← Conflict	1.000	1.000	1.000
Commitment ← Collaboration	1.000	1.000	1.000
Q22_1 ← Commitment	0.623	0.395	0.818
Q22_2 ← Commitment	1.000	1.000	1.000
Q24_5 (Proximity) ← Collaboration	0.978	0.558	1.421
Coordination ← Collaboration	1.264	1.016	1.667
Q24_1 ← Coordination	0.757	0.601	0.926
Q24_2 ← Coordination	0.655	0.423	0.951
Q24_3 ← Coordination	0.829	0.696	0.969
Q24_4 ← Coordination	1.000	1.000	1.000
Relationships ← Collaboration	1.058	0.626	1.634
Q25_2 ← Relationships	0.920	0.647	1.689
Q25_3 ← Relationships	0.963	0.733	1.485
Q25_4 ← Relationships	1.000	1.000	1.000
Incentives ← Collaboration	0.935	0.552	1.472
Q24_6 ← Incentives	0.675	0.371	0.915
Q24_7 ← Incentives	1.000	1.000	1.000
Q26_1 (Knowledge Integration and Innovation) ← Success	1.000	1.000	1.000
Q26_2 (Project Performance) ← Success	0.788	0.547	0.944

3.6. Reliability of constructs

In order to evaluate the appropriateness of the measurement model used for the final SEM, the reliability of each construct was established by calculating Cronbach's alphas (Jin et al., 2007). For Cronbach's alpha, a cut-off value of 0.7 is used to indicate an acceptable level of internal consistency. As seen from Table 7

the constructs/variable measuring the latent variables in the final SEM are satisfactory.

Table 7. Reliability test of the final SEM model

Construct/variable	Indicator	Cronbach's alpha (α) value
Level of trust	Expectations Imported trust Knowledge exchange	0.79
Degree of collaboration	Conflict Commitment Proximity Coordination Relationships Incentives	0.84
Project success	Knowledge integration and innovation Project performance	0.80

3.7. Results of SEM analysis and discussion

Figure 5 depicts the final model after deleting the redundant path. As expected, all the path coefficients are positive, confirming the relevance of the measured indicators in the model.

The final SEM results suggest that the level of trust correlates strongly with the degree of collaboration (standardized regression coefficient=0.768). The model as a whole accounts for why the endogenous variables, trust and collaboration, covary with each other, and also with the exogenous variables. (Kline, 2010) explains that during analysis the model is compared with the sample covariances. If the two sets of covariances, predicted and observed, are similar, the model is said to fit the data, otherwise the "explanation" is rejected. The level of trust covaries with the degree of collaboration, as the coefficient from trust to collaboration is statistically significant (i.e. not equal to zero) and its regression weight is relatively large (0.823 and standardized 0.768).

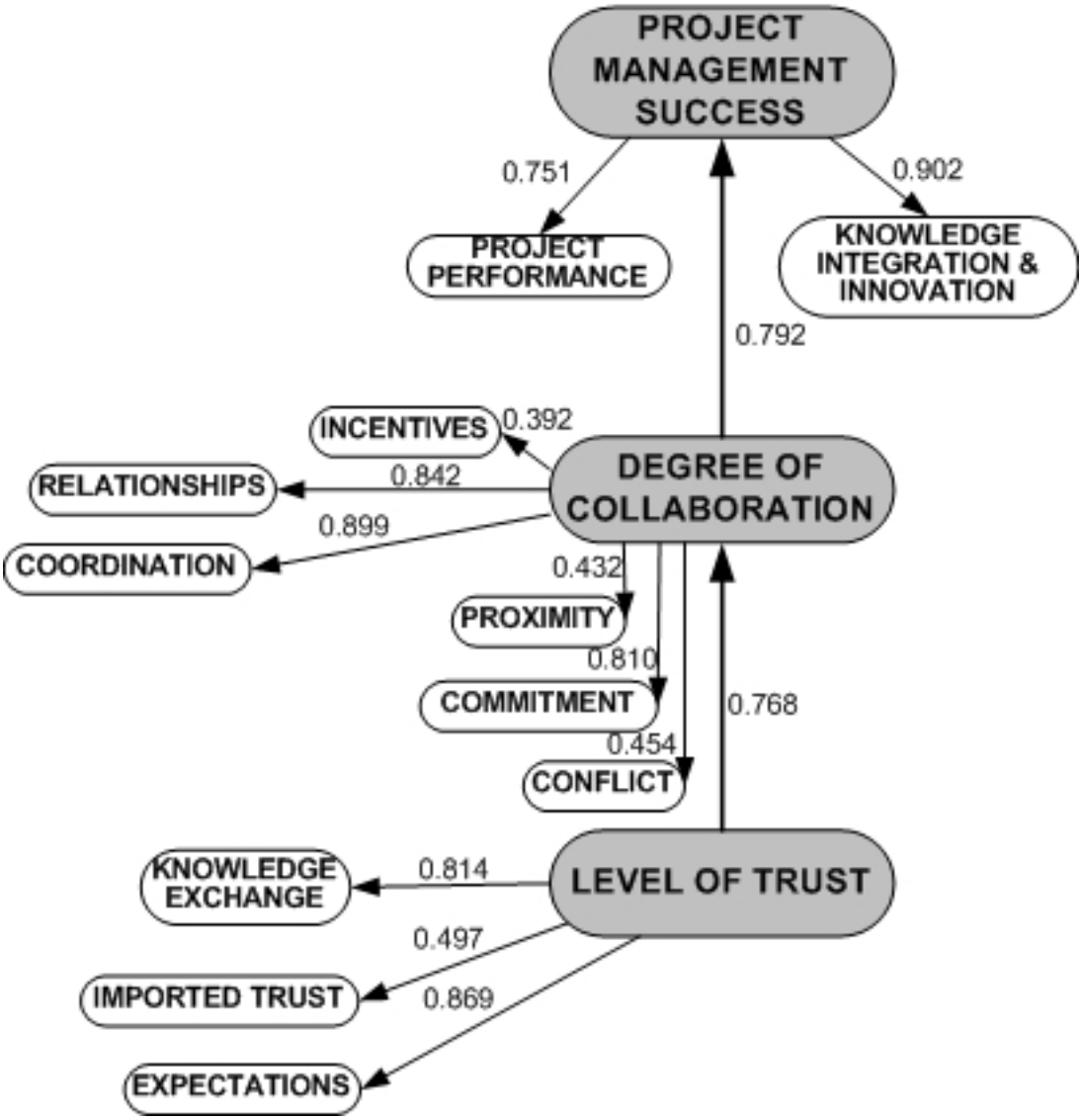


Figure 5. Final model with standardised path coefficients

Furthermore, the degree of collaboration strongly influences project success with a standardized regression coefficient=0.792. Coordination and relationships had the highest and second highest correlation (with a standardized regression coefficient=0.899 and 0.842 respectively) with the degree of collaboration. Expectations was found to have the highest association with the level of trust in a project (standardized regression coefficient=0.869).

Among the six indicators determined by the degree of collaboration, coordination (with a standardized regression coefficient=0.899) had the most influence and incentives (with a standardized regression coefficient=0.392) had the least

influence. Expectations (with a standardized regression coefficient=0.869) had the most influence in determining the level of trust in a project and imported trust (with a standardized regression coefficient=0.497) had the least influence. The fact that the indicator risk was removed since it was inconsequential in determining the level of trust in a project alters the widely accepted view that the relationship between risk and trust is reciprocal; an acceptable degree of risk is responsible for an increase in the level of trust in a project (Bond-Barnard et al., 2014b; Daim et al., 2012).

One of the unexpected findings from the study was the high measure of association between two indicators of collaboration namely proximity and incentives. The reason for this relationship could be that physical proximity to colleagues serves as an incentive for project team members. Physical proximity promotes collaboration (Arslanian-Engoren in Dietrich et al., 2010) therefore when the project team is able to work is close proximity to each other they collaborate more which also incentivises them.

The results in Table 3 and Table 6, support the relationships between level of trust, degree of collaboration and success in a project, which validates both hypotheses 1 and 2 well. Unfortunately hypothesis 3 could not be evaluated due to the small sample size and a lack of data for the construct quality of communication. This study has however confirmed the hypothesis that the level of trust predicts the degree of collaboration, which in turn predicts the success of the project.

When project managers promote trust and collaboration in a project using quality communication as a basis then it is more likely that the project will be a success in terms of time, cost and quality objectives but more specifically that it will be perceived to be a success by all the stakeholders involved. It has been revealed that the expectations that project stakeholders have of each other as well as the exchange of knowledge between them is integral in determining the level of trust in a project. Moreover coordination and the relationship between stakeholders are crucial for collaboration, which together with trust leads to project success. All of

this can only take place if there is quality communication between the project stakeholders. Therefore projects that experience a lack of trust and collaboration, caused most likely by bad communication, are less likely to achieve success. This finding is in line with previous findings that quality communication promotes trust which leads to collaboration and success in projects (Bond-Barnard et al., 2014b, 2013).

3.8. Conclusions

This paper confirms that the theoretical propositions of Bond-Barnard et al. (2014b) can be empirically verified. The model, in spite of a relatively small sample size, produced good results which are commensurate with similar studies (Doloi et al., 2011). Empirical evidence is provided that indicates that project success is positively influenced by the degree of collaboration and indirectly by the level of trust between project team members based on a foundation of quality of communication. It was however not possible to model the influence of the quality of communication on the other constructs and on the success of the project due to insufficient data. In this respect, further research is currently being undertaken by the authors to model the quality of communication with a larger sample size. It is however fair to assume that the quality of communication in a project is nevertheless still essential in a project to provide the foundation on which trust and collaboration flourish. It was determined that the level of trust in a project is influenced by:

- the expectations that the project team have of each other,
- the knowledge exchange that takes place between them and
- the degree of trust that is imported from other familiar settings (imported trust).

The degree of risk present in the project was found to have no significant link with the level of trust experienced in the project. This alters the widely accepted view that the relationship between risk and trust is reciprocal; and in contrast to the results published by Daim et al. (2012) which contended that an acceptable degree of risk is responsible for an increase in the level of trust in a project.

This study similarly found that the degree of collaboration in a project is influenced by:

- the physical proximity between its team members,
- the commitment the team members have towards the project,
- conflict between the team members where less conflict improves the collaboration,
- the degree of coordination in the project team,
- the strength of the relationships between team members and other stakeholders and
- a balance of intrinsic and extrinsic incentives.

The overall review of the key findings has provided an interesting insight into the concept of human-oriented success factors in projects. However a case study based analysis on a number of successful and failed projects where the focus is on the extent of communication, trust and collaboration in the project may further validate the findings from a practical perspective. The contrast between the successful and failed projects will be an important determination to highlight any distinctions between the factors impacting on success. Similar research conducted elsewhere with a large sample size would be more appropriate for realistic estimations of impacts and accuracy of results asserted in SEM analysis.

Appendix A. Sample questionnaire associated with the construct Commitment

Excerpt of the sample questionnaire	Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent) **1 2 3 4 5 6 7 8 9 10**
To what extent are you committed to achieving the project goals? To what extent are the other team members committed to achieving the project goals?	

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Chapter 4

The impact of a call centre on communication in a programme and its projects[3]

Call centres are increasingly being utilised in public sector programmes to facilitate and manage communication between numerous stakeholders. Yet, the impact of call centres on projects has not been investigated. This paper reports on a survey with 92 respondents that assessed the impact of a call centre for a repair and maintenance programme. An empirically verified model is presented to illustrate the relationship between call centre communication and project performance. A balance of frequent informal and formal communication is shown to reduce mistrust and conflict of interest resulting from each party trying to maximise his respective economic position in the principal–agency relationship. The data provides evidence that a call centre improves the communication, collaboration and trust in project principal–agency relationships which, in turn, is perceived to contribute to project performance.

4.1. Introduction

It is clear that programme management has the potential to make a significant contribution to integrated service delivery by the South African government; programmes may act as an ideal vehicle through which various government departments could coordinate their efforts (de Coning and Günther, 2009). However de Coning and Günther (2009) state that a number of organisational, human resources, financial and system challenges exist for officials from different departments to act on the same programme teams across organisational boundaries. These challenges can be narrowed down to a need for effective

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project communication across organisational boundaries and a greater focus on stakeholder satisfaction.

Literature confirms that communication is an essential prerequisite to successful project-based management (Dainty et al., 2006). However (Dainty et al., 2006; Lehmann, 2009) agree that communication is paid scant attention in project management even though there was an increased interest in project communication and information management research from 1960 to 1999 (Crawford et al., 2006; Kloppenborg and Opfer, 2002). The lack of communication literature in project management has resulted in communication being cited as a primary cause of project failures on numerous occasions (Dainty et al., 2006; Pinto and Pinto, 1990; OGC in Shehu and Akintoye, 2010; Souder, 1981).

It has already been established in literature that frequent communication improves stakeholder satisfaction (Shao and Müller, 2011) and project member collaboration and trust (Müller, 2003a). Communication has also been identified as one of the most important contributors to project success. Therefore it is essential that communication in the project management body of knowledge be expanded to include ‘how’ to communicate effectively in projects and programmes rather than just stating ‘why’ communication is important.

A project usually involves a number of stakeholders including; the project owner/client, project manager, contractor and beneficiaries. The project manager acts on behalf of the client and manages the project delivery on a day-to-day basis (Turner and Müller, 2004). Furthermore, the contractor is often instructed to act on behalf of the project manager and carry out the project work.

As in other delegated tasks, the client and project manager are in a principal–agency relationship (Bergen et al., 1992; Jensen, 2000). Similarly the project manager and any sub-contractor are also in a principal–agency relationship. If the aim of both parties is to maximise their respective economic positions, then it is possible that the agent will not always act in the best interests of the principal. Thus principal–agency theory explains the potential for a conflict of interest to

arise between the principal and the agent because, as Jensen (2000) states, people will not act in the best interest of others (their principals) to the exclusion of their own preferences.

However, (Turner and Müller, 2004) state that communication between principal and agent reduces the mistrust and conflict of interest between them and thus improve project performance. Furthermore, it has been established that the communication needs of project principals and agents are best met by a mixture of formal and informal communication, and of written and verbal communication (Turner and Müller, 2004).

Literature advises project managers to be aware that project stakeholders rely on several communication channels, which includes not only face-to-face and written media, but also telephonic/verbal communication (Müller, 2003a). Project managers on the other hand have a strong preference for verbal communication over other forms (Mintzberg et al., 1976). These communication type preferences and the fact that the project or programme manager is at the centre of the project delivery process is a real communication management challenge. He or she must maintain a range of complex communication channels with different types of organisations (Dainty et al., 2006); while still facilitating and managing frequent communication with the project members and stakeholders, to ensure project success.

As a result of principal–agency theory it is common for project members to manipulate information in their favour if unexpected problems occur (Loosemore, 2000). The manipulation of information in closed communication systems erodes the trust which is necessary for effective teamwork (Dainty et al., 2006).

Based on the numerous communication channels present in a project and the possibility of manipulation of information in project principal–agency relationships; it stands to reason that the utilisation of a programme call centre can mitigate these issues. The programme call centre which was investigated for the purposes of this paper acts as an objective third party communication hub responsible for

facilitating and managing the communication of project issues to all stakeholders on behalf of the project manager. This paper addresses the following questions:

- Does a programme call centre improve the frequency of communication and collaboration in the principal–agent relationships present in a project?
- Does the project communication provided by the call centre reduce project 'surprises/issues' and subsequently improve project team trust?
- Does a programme call centre improve the management of project communication and the perceived performance of the project?

Furthermore, some of Turner and Müller's (2004) findings regarding the frequency, type and effect of communication on the level of trust in principal–agency relationships are tested in this paper. This was done by incorporating said findings into a proposed model of call centre facilitated communication and project performance. The model therefore illustrates the role that a programme call centre can play in improving communication, collaboration and trust in a project which is perceived to contribute to improved project and programme performance. This model is then tested by means of a survey to determine the impact of a call centre on communication in a programme and its projects.

4.1.1. National Repair and Maintenance Programme (RAMP)

Shehu and Akintoye (2010) define programme management as an integrated, structured-framework to co-ordinate, align, and allocate resources, as well as plan, execute and manage a portfolio of construction projects simultaneously to achieve optimum benefits that would not have been realised had the projects been managed separately. In line with this definition, the South African Department of Public Works (DPW) repair and maintenance programme aims to alleviate the repair and maintenance backlog at approximately 600 national government facilities. Communication regarding reactive maintenance (or 'breakdowns') at these facilities which is facilitated, monitored and managed by a central call centre, is the focus of this paper.

The DPW is tasked with promoting commercial attitudes within the public sector regarding the efficiency of service delivery programmes and facilitating the service delivery of other national government departments through the provision and management of public sector infrastructure. DPW implemented the programme in 2000, with the aim of repairing public sector infrastructure to a functional condition and maintaining such infrastructure so that it could be used by the other departments for its intended purpose (Department of Public Works and Phillips, 2004). It was decided that a call centre would facilitate and manage the communication, documentation and performance reporting of all reactive breakdown repair and maintenance work for all projects involved, to improve the service delivery to user department representatives. The call centre communicates with the various project teams on a regular basis. The project team referred to in this study consists of:

- The client, DPW, and the user department representatives at the facility;
- The project manager who oversees several projects, usually at different facilities;
- The consulting engineer (consultant) who manages the project on a day-to-day basis and instructs the contractor;
- The contractor responsible for performing maintenance and attending to breakdown repairs at the facility.

The call centre process commences when the client at the facility phones a specific number to log a breakdown, which could be anything from interrupted water supply at a prison to damage of a section of fencing at a border post. The call centre logs the details of the breakdown and provides the caller with a unique reference number. The breakdown is reported to the consulting engineer, firstly by telephone (to confirm the priority of the breakdown) and secondly by fax/email. Upon the consultant's consent the fax/email is also sent to the contractor. Hereafter, it remains the duty of the consultant to verbally notify the contractor of the breakdown.

Once the contractor has attended to the breakdown, he notifies the consultant. Provided that the consultant is satisfied with the quality of the contractor's repair work or response to the breakdown, the consultant notifies the call centre that the breakdown has been attended to. The call centre then follows up the resolved breakdown by contacting the party who originally logged the breakdown and enquires whether the issue was satisfactorily resolved.

4.1.2. Objectives

The call centre is responsible for facilitating and managing the reactive breakdown repair and maintenance communication between all project participants (including both principal–agency relationships). The aim of this paper is to verify if call centre communication negates the effects of principal–agency theory in a repair and maintenance programme and its projects. Furthermore, this paper investigates whether an increase in project communication (facilitated by a call centre) improves the communication, collaboration and trust between principals and agents and consequently their perception of the project's performance (quality of project deliverables and customer satisfaction) on a set of 196 of the projects. The impact of a call centre on project communication management is therefore empirically established.

This aim was achieved by investigating the following propositions for the projects under consideration:

- The convenience of a call centre improves the frequency of formal and informal communication between the principals and the agents in a project;
- An increase in principal–agent communication increases the parties' perception of collaboration between them;
- An increase in call centre communication increases the avoidance of surprises, and leads to improvement in the trust between the principal and the agent;
- The call centre significantly improves the management of communication in the projects;

- The project communication facilitated and managed by the call centre improves the perceived performance of the projects and service delivery of the national programme.

4.2. Literature review

Communication can be viewed as a metaphorical 'pipeline' along which information is transferred from one person to another (Axley, 1984). Thus the purpose of communication is the transfer of information between people, involving a person or entity sending out a message and another receiving and successful understanding the message in response (Torrington and Hall, 1998).

Consequently, many communication theorists have drawn upon the simple analogy between the human communication process and the electronic telecommunications process where information is sent from transmitter to receiver through a channel medium, which is mediated by noise and controlled by a feedback loop (Baguley, 1994; dans Bougnoux, 1993; Emmitt and Gorse, 2003; Shannon, 1948; Torrington et al., 1995; Weaver and Shannon, 1949). More recently the social and psychological perspectives of the late twentieth century have also contributed to communication theory, however there is no coherent body of knowledge but rather a set of fairly disparate areas and subfields (Dainty et al., 2006).

The role of the project management function is to manage the systems that relate to the features of uniqueness, novelty and transience which define the term 'project'. These systems are namely the scope of work, the project organisation, the quality, the cost and the duration of the project. Communication is an essential ingredient of all of these managerial requirements and must be viewed as the essential prerequisite to successful project-based management (Dainty et al., 2006).

The development of literature relating to communication in project management has virtually ignored the "new communication" proposals put forward by

researchers such as Bateson, Birdwhistell, Goffman, Hall, Jackson or Watzlawick (1954 to the present) cited in Lehmann (2009). As a result, the most current variations on project communication contain elements of systematic communication (Mucchielli cited in Lehmann, 2009), translator communication (Callon and Latour, 1981) or network communication (Stohl, 1995) to quote but a few. Lehmann (2009) and Dainty et al. (2006) agree that communication is paid scant attention in project management. Historically, research into project management has emphasised efficiency rather than behavioural or interpersonal factors (Munns and Bjeirmi, 1996).

Studies have been conducted on the state of current project management research in an attempt to determine trends and predictions for the future. Findings indicated that since the 1990's there has been an increasing interest in research related to communication (Crawford et al., 2006; Kloppenborg and Opfer, 2002). Kloppenborg and Opfer (2002) indicated that government project management trends from 1960 through 1990 included an increased emphasis on stakeholder identification and management, and an increased emphasis on communications and communications planning.

An investigation of trends in project management journals (Crawford et al., 2006) also revealed that there was a growing interest in relationship management topics. Topics relating to information and communication management, reporting, benefits management, document management, teambuilding and development were all mentioned as popular topics in the International Journal of Project Management (IJPM) from 1994 through 1998 and in the Project Management Journal (PMJ) from 1999 through 2003. Relationship management is consistently reported as either being of significance or increasingly significant from 1983 through 2003 in both the IJPM and the PMJ. It can be deducted from these findings that there should be an increased focus on communications planning, particularly as it relates to stakeholder management and communications (Kloppenborg and Opfer, 2002). This need serves as a motivation to investigate whether a call centre can be used to improve the project communication in projects and programmes.

4.2.1. Communication, collaboration and trust

How does one go about communicating effectively in a project or programme? Torrington and Hall (1998) found that messages are more successfully conveyed if a variety of media such as verbal, non-verbal, written, audio–visual or electronic are used. Gorse et al. (1999) built on this 'notion' by exploring a range of media from informal face-to-face meetings to formal methods such as letter, fax and email; their results showed that the former was perceived to be the most effective medium of communication. Gorse et al. (1999) findings are supported by Carlsson et al. (2001) who added that verbal exchanges in the form of telephone conversations or meetings form the cornerstone of interaction within the construction industry. Moreover it had already been established by Mintzberg et al. (1976) that project managers have a strong preference for verbal communication over other forms.

More recently Lewis (2001); Weiss and Wysock (2000) added that knowing how to use feedback properly and being equipped with a good information system appropriate for the project is also important for communicating "well". It has been determined that the interplay of situation-appropriate teamwork communication, synchronicity and coordination increases collaboration which predicts team performance (Chiocchio et al., 2011; Kozlowski and Bell, 2003; LePine et al., 2008). Furthermore trust can be defined as a function of the predictability and expectations of others' behaviours or a belief in others' competencies, which affects performance through activation of cooperation (Tyler, 2003) or other collaborative processes (Chiocchio et al., 2011). In this paper it is investigated whether the frequent informal and formal communication, facilitated by a call centre, improves the communication, collaboration and trust in the project's principal–agency relationships which, in turn, has been linked to high project performance (Chen et al., 2010; Turner and Müller, 2004; Webber, 2008).

Project management literature frequently outlines the importance of good communication for success in projects. However, most research is focused on the effect of the amount of communication, channels of communication, effective

project networks, forms and purposes for communication (Katz, 1957, 1982; Katz and Tushman, 1979; Pinto and Pinto, 1990). The frequency, content and types of communication as well as communication formality are discussed in greater detail below.

4.2.1.1. The frequency of project communication

Communication frequency refers to the number and timing of the project managers' communication with the client (Turner and Müller, 2004). Müller (2003a) showed that project managers and their clients differentiate between three communication frequencies:

- Continuous communication, daily or at least weekly interaction – this is the most preferred frequency across all projects.
- Fixed interval communication, at bi-weekly or monthly intervals – this frequency is most preferred in high performing projects with high levels of collaboration.
- Variable interval communication, at milestone or project phase end – this is occasionally preferred in order to reduce communication efforts in projects. It can lead to a decrease in collaboration and subsequently project failure.

However, it has been found that regular, daily or weekly communication gives the client the greatest comfort that they are being kept informed of project progress and of the decisions being taken by the project manager on their behalf. It is frequent communication that builds the greatest trust in the project manager (Turner and Müller, 2004).

4.2.1.2. The content of project communication

Project teams use a variety of contents and media for their communication with each other and the client. Müller and Turner (2001) showed that the content of project communication falls into one or more of the categories below:

- Status and achievements;

- Changes to the project;
- Issues and open items;
- Next steps in the project;
- Quality and progress measures;
- Trends in the project.

This paper discusses the utilisation of a call centre to facilitate and manage the communication of issues and open items as well as quality and progress measures relating to projects.

4.2.1.3. Types of project communication

According to Johnson et al. in Turner and Müller (2004) formal reports are perceived by clients as the most credible source of information. In contrast, Turner and Müller (2004) state that authors from industry prefer interactive media over formal written reports even though it has potential legal consequences. Müller (2003a) establishes that communication contents and media are intertwined and cannot be separated. Turner and Müller (2004) distinguish between four different communication modes:

- Personal project reviews: face-to-face meetings with in-depth discussion of all the contents factors listed in 4.2.1.2;
- Project analysis: information on quality metrics and project trends, provided through all media (face-to-face, telephonic/verbal and written);
- Written status reports: written information about current status and achievements, issues, changes, next steps and other items needing communication. These items are potentially followed up through verbal (telephonic) or face-to-face communication;
- Verbal updates: brief and timely verbal updates inform the project manager on status and achievements, issues, changes and next steps.

Turner and Müller (2004) recommend that quick verbal updates be used in conjunction with formal written reports as this type, frequency and formality of

communication is especially appreciated by project clients; they then feel reassured that they have the correct understanding of the formal written reports provided to them. Furthermore, Vaananen and Belt (2010) state that personal relations are the main source for information for personnel who are conducting the actual work on the project. Written reports on their own cause ineffective communication by increasing the gap in the project manager's knowledge and the clients' understanding of the project's performance (Turner and Müller, 2004). Contrarily, frequent face-to-face communication closes this knowledge gap and reassures the clients that they have a true picture of the project's progress; however this is not always possible where the project team is geographically dispersed (Harvey and Griffith in Vaananen and Belt, 2010). In such instances frequent telephonic/verbal updates are the most effective form of communication in a project. In summary, there is need for a balance in formal and informal communication.

4.2.1.4. Communication formality

Formal communication takes place across official channels and provides the project manager and client with the information they require from each other. The PMI (2008) categorises reports and briefings as formal communication and ad-hoc conversations as informal communication. It is generally accepted that formal communication is regimented, deliberate and impersonal in nature as opposed to informal communication which is characterised by behavioural spontaneity, casualness and interpersonal familiarity (Morand, 1995). Furthermore, formal communication is perceived as slow in speed and high in accuracy while informal communication is perceived to be high in speed and low in accuracy (Mullins, 1999).

Müller (2003a) states that the extent to which informal and formal communication is used, is determined by the frequency of interaction and the potential audience of the report. One-to-one communication is more informal, promotes trust and knowledge building whereas one-to-many communication is more formal, creates mistrust and is controlled. If the main form of communication between the client

and principal is infrequent and informal in nature, then the client's fear that the project manager is pursuing his own interests will be expressed as a desire for objective project data. This situation can be resolved by providing the client with reports containing the requested analytical data and also using verbal communication (telephone calls) to check that the client is satisfied with the credibility of the report contents (Müller and Turner, 2007; Turner and Müller, 2004).

4.2.2. Call centres

Call centres are defined as centralised, specialised operations for both inbound and outbound communication handling (Koh et al., 2005). References to call centres are frequently made in literature, yet there appears to be very little information regarding the utilisation of call centres in projects.

Call centres have been in existence for a number of decades, yet little has been reported on customer satisfaction with this mode of service delivery (Koh et al., 2005). Mitchell (1998), in fact argues that call centres might be the hub of successful strategies for client relationship management and could well be the fulcrum of organisations.

The adoption of web-based technologies by clients has received considerable attention in literature but researchers have neglected the field of service quality in call centre operations (Bennington et al., 2000). According to Prabhaker et al. in Bennington et al. (2000), "the modern call has been around for about 50 years yet is as current as tomorrow". Prabhaker's "modern call" refers to the use of call centres as a means to improve a product or company's service quality. It is thus remarkable that, even though concerns have been expressed about customer satisfaction with call centre operations (Crome, 1998), empirical studies have been published only on staff dissatisfaction with call centres, rather than on client satisfaction (Bennington et al., 2000). Moreover, given that the use of call centres has increased by up to 50% per year (Crome in Bennington et al., 2000), and the

world market for call centres is estimated to be $325 billion U.S. (Bennington et al., 2000), there is a significant opportunity for research in this area.

It has been reported that knowledge management effort in call centres is scarce or almost nil. In a study conducted by Koh et al. (2005) knowledge management in call centres can be achieved by managing the five roles of knowledge (knowledge acquisition, knowledge utilisation, knowledge adaptation, knowledge distribution and knowledge generation) effectively. In most call centres, management effort is mainly focused on information management. Literature suggests that call centre operations are especially suited to information delivery, customer services and sales operations (Houlihan in Koh et al., 2005). However, the utilisation of call centres for information management and even knowledge management must still be investigated in the context of a project environment. This study explored the extent to which a call centre improved the communication, information management and customer satisfaction in a project.

4.3. Proposed model

Research shows that the best project performance is obtained when there is high collaboration between the principal and the agent and medium levels of structure (Turner and Müller, 2004). However, because of the principal–agency phenomenon, a high level of collaboration is not always the case. Two significant principal–agent relationships can be identified in the national programme referred to in this paper, namely the relationship between:

- The client (as principal) and the project manager/consultant (as agent) and
- the consultant (as principal) and the contractor (as agent)

Turner and Müller (2004) have shown that communication between the principal and the agent reduces the mistrust and conflict of interest between them and thus improve project performance. Furthermore, it has been established that the communication needs of project principals and agents are best met by a mixture of

formal and informal communication, and of written and verbal communication (Turner and Müller, 2004).

Frequent communication improves the collaboration between the project participants which, in turn, is a key condition for high performance in projects and essential for the development of trust. Turner and Müller (2004) state that frequent communication increases collaboration and leads to the avoidance of projects surprises or issues. The avoidance of project surprises has also been shown to improve collaboration. Research suggests that there is a direct correlation between high collaboration and trust in a project. Moreover, it has been found that trust usually exists where informal communication is used (Turner and Müller, 2004).

The aim of the proposed model was to:

- Determine whether call centres can be used to facilitate effective communication to increase communication, collaboration and trust in a project, for improved project performance.
- Test the validity of the statements that Turner and Müller (2004) made regarding communication as a way of reducing the detrimental effects of principal–agency relationships in projects, by utilising a call centre.

The validity of the model developed from the findings of Turner and Müller (2004) was assessed by studying the perceived impact that the relevant call centre has on the projects where it is used as a communication hub for reactive breakdown repair and maintenance reporting and tracking. An extensive literature survey did not yield a suitable conceptual model for the investigation. Therefore, the model proposed in Figure 6, was developed. The model proposes that various interactions occur as a result of the project communication that is facilitated and managed by a call centre.

Quantitative surveys were developed to address the interactions depicted in Figure 6 as the purpose of the study was to test the validity of propositions formulated in previous qualitative studies rather than to explore new phenomena.

A communication study was required to obtain evidence for the propositions and to establish the causation between the variables proposed by the model. The surveys were used to determine the impact of the call centre communication type and frequency on the communication, collaboration and trust in the client–project manager/consultant and consultant–contractor principal–agent relationships for 196 projects. Three surveys were developed to address the unique interaction which each project member has with the call centre and with the rest of the project team. The surveys were conducted by mail and self-administered means to obtain representative data for the project managers/consultants, contractors and clients, to provide insight into the effectiveness of the programme call centre from three different user perspectives.

4.4. Research methodology

A review of literature indicated that a need existed for the development of new and/or improved theories regarding the utilisation of call centres to facilitate and manage the communication in projects. A better understanding of the effect that call centre communication has on the principal-agency relationships in a project, and more specifically the effectiveness of the call centre in managing the communication of the repair and maintenance programme, was required. The model proposed in Figure 6, summarises Turner and Müller (2004) findings on project communication as a means of reducing the problems associated with the principal–agency theory to achieve better project performance. The model also proposed additional characteristics of communication in projects such as the role of call centre communication in a project, the proposition that frequent call centre communication can improve project performance and that frequent call centre communication increases principal–agent communication. The proposed model provides a basis for the development of the research design and methodology to test the statements made by Turner and Müller (2004) and to determine the validity of the additional propositions regarding communication characteristics and interactions.

The approach for this study was to firstly assess the frequency with which the project team members communicate with the call centre and with each other and their perceived trust in the content of the communication they received from the call centre. Secondly, it was determined whether the project participants perceived an improvement in project team communication, collaboration, surprise avoidance, trust and project performance as a direct result of the frequent communication facilitated by the call centre.

The repair and maintenance program referred to in this study consists of numerous projects where each project consists of a project manager, consultant and contractor. The research population consisted of the individual populations of the project members (i.e. project managers, consultants and contractors) associated with the 196 active projects registered on the programme call centre database. These three designations including that of 'client' were considered to be the units of analysis for the investigation. Furthermore, the project manager, consultant and contractor populations that are associated with the 196 active projects registered with the call centre served as the sample frame for this study. Census sampling was specifically selected for the consultant and contractor populations as the authors had access to these two populations whereas convenient sampling was used for the client group, with an unknown population (this is discussed in more detail below).

Based on observation, it was noted that the consultants often performed the duties of the project manager in addition to their own; therefore it was decided to combine these two groups into one group called 'project manager' for the purposes of the survey. The sub-population for the project manager and contractor groups was reduced to unique samples only, as some participants were involved in more than one project and it was decided not to swamp or overwhelm these participants with surveys which might cause them to decide not answer at all. Consequently, the project manager and contractor populations were determined to be 194 and 134 respectively. The survey was distributed to the entire project manager and contractor population. Convenient sampling was employed for the

client group as the size of the sub-population was unknown, it was cost effective and because the study had severe time constraints.

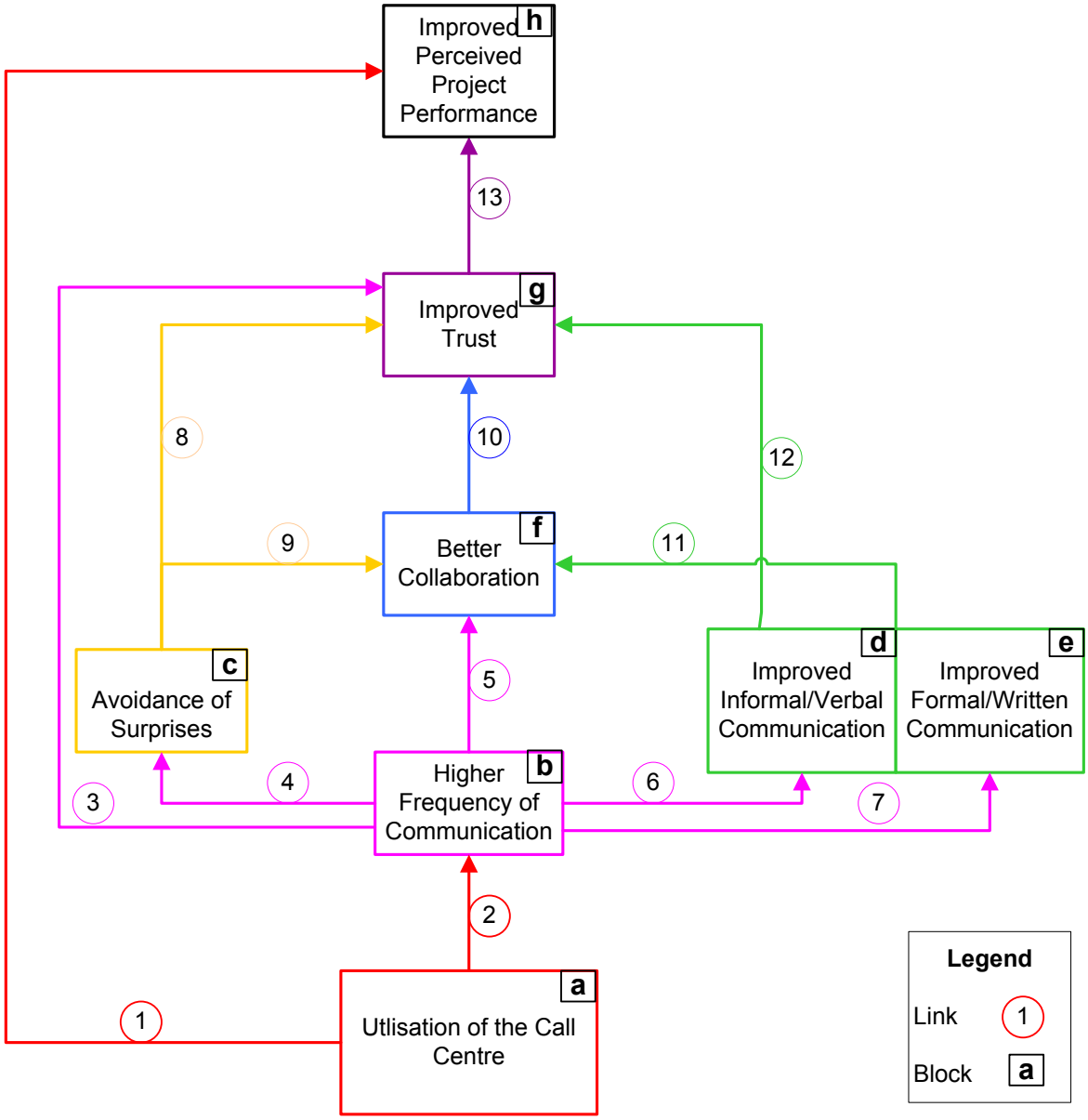

Figure 6. Call centre facilitated communication and project performance model.

Three surveys were formulated to test the characteristics for the three different groups namely (a) clients, (b) the project managers and (c) contractors. The survey questions tested the perceived validity of the statements made by Turner and Müller (2004) regarding the communication and cooperation on projects between the principal and the agent and several questions were posed to all three groups for the purposes of comparison. As previously mentioned, the projects are

characterised by two principal–agent relationships namely between the client and the project manager and between the project manager and the contractor.

A total of 194 project managers and 134 contractors received self-administered surveys whereas 40 clients received the survey by email, fax or in hard copy. The response rates for the various surveys were as follows:

- Project manager survey: 72 responses out of a population of 194, however fourteen responses were identified as incomplete, therefore the response rate was 30%;
- contractor survey: 24 responses out of a population of 134, however 12 responses were incomplete, therefore the response rate was 9%
- client survey: 22 responses out of a sample group of 40. There were no incomplete responses, therefore the response rate was 55%

It is acknowledged that the response rates for the surveys are low due to non-response error and time constraints however; the responses received give a good indication as to the predominant perceptions of the various groups. A follow-up study is underway to investigate the relationships, which were derived from the first study, in greater detail.

Nominal sample data was obtained from the survey furthermore Likert type scales were used to express the participant's degree of agreement with the statements made. Firstly, each question was associated with a block in the proposed model and classified as either an independent or dependent variable. For example, the survey questions which were identified as independent variables for block F ('Better collaboration') in Table 8 were as follows:

Table 8. The survey questions identified as independent variables for Block F 'Better Collaboration'

Group	Independent Variable Question
Project managers	Does the combination of telephone calls and faxes/reports that you receive from the RAMP Call Centre improve the collaboration (teamwork) between you (the project manager) and the contractor?

Group	Independent Variable Question
Contractors	Does a higher frequency of RAMP Call Centre communication lead to better collaboration (teamwork) between you and the other project team members? Does the combination of telephone calls and faxes/reports that you receive from the RAMP Call Centre improve the collaboration between you (the contractor) and the project manager? Does a higher frequency of RAMP Call Centre communication leads to better collaboration (teamwork) between you and the other project team members?
Clients	Does a higher frequency of communication between the RAMP Call Centre and the project team, increase the level of collaboration/teamwork between the project team members?

Secondly, a chi-square test was done on the data collected for each survey question to determine if it was significant to the model or not. Thirdly, general linear models were used in conjunction with F-tests to determine whether an individual or combination of independent variables affected the dependent variables for the interactions proposed by the model. All the independent variables which were significant at at least a significance level of 0.1 were included to provide evidence for the interaction it represented in the model.

4.5. Results

The model in Figure 6 depicts the relationship between project communication, facilitated by a call centre, and project performance. Descriptive statistics in the form of percentages are provided in 4.5 and 4.6 to support the findings of the study.

The survey provided evidence that the communication, facilitated by a call centre, reduced the mistrust and conflict of interest between the client and the project manager and between the project manager and the contractor of a repair and maintenance project. The project team members surveyed provided evidence that the proposed communication model was representative of the principal–agent relationship between the client and project manager and between the project manager and the contractor respectively. The surveys investigated the impact of the breakdown repair and maintenance communication facilitated and managed by a call centre for 196 projects forming part of a national programme in South Africa.

The data was analysed by means of general linear models and F-tests with a significance level of 0.1. A summary of the lowest p value for each of the model interactions (links) is shown near the link it represents in Figure 7. The findings of Turner and Müller (2004) which were supported by the empirical results of this study are summarised in Table 9. The results of this study are not generalised to the entire population but are stated as results from the sample achieved only and provide evidence that the proposed relationship of utilising a call centre to provide frequent effective project communication and improved project performance (model links 1 and 2) was significant for both principal–agent relationships, investigated. The evidence was provided by measuring the participants' perceptions regarding the relationship between the functions performed by the call centre and the performance of the project in which they are involved. Furthermore, the proposition that frequent informal and formal communication facilitated by a call centre contributes to trust in a principal–agency relationship (model link 3) proved to be valid.

A major aspect of project communication is to ensure the avoidance of surprises or issues. Avoidance of surprises improves collaboration and builds trust. Where trust is lost there is a loss of collaboration (Turner and Müller, 2004). The surveys indicated that frequent communication reduced the likelihood of project surprises in both principal–agent relationships but that the avoidance of surprise only contributed to collaboration in the principal–agency relationship between the project manager and the contractor (89.5% of the project managers perceived an increase in collaboration).

The findings of the client survey indicated that the avoidance of surprises/issues improved through frequent call centre communication. However, the avoidance of project surprises was not significant to the development of trust or collaboration between the client and the project manager in their principal–agent relationship. This finding can be attributed to the fact that the client sample group was small and due to the fact that the clients were not specifically asked in the survey whether they perceived such a correlation. The clients report all the breakdowns at

the facility to the call centre; there are no breakdowns/project surprises/issues that they are unaware of.

The credibility of the contents of formal communication is high and that of informal communication is low. Formal reports are perceived by principals as the most credible source of information (Johnson, 1993). This statement by Johnson was confirmed in this study as 80.7% of project managers and 63.6% of the contractors totally agreed with the perception that they could trust the contents of the call centre's formal reports while only 68.6% of the project managers totally agreed with the perception that the contents of the call centre's informal communication could be trusted. This notion was also supported by 68.2% of the clients based on the 22 responses obtained. This finding supports the proposition that a balance of informal and formal communication is most beneficial for effective communication in a project environment.

Where the client seeks through communication to understand what is going on, the project performs better but the concern that drives them to seek the information manifests itself in a lower perception of project performance (Turner and Müller, 2004). 64% of the 22 client respondents (principals) who perceived that the frequent call centre communication improved the project team's communication also perceived an improvement in the project performance. 79.7% of the project managers (principals) who perceived an increase in project communication also felt that the increased communication improved the performance of the project. Therefore, the statement that an increase in client communication leads to a reduced perception of the project performance is disproved by the findings of this study.

The contribution of the call centre to the national repair and maintenance programme was determined by this study and it was found that 67.3% of the project managers, 61.3% of the contractors and 90.5% of the clients totally agreed with the perception that the call centre effectively manages the communication of breakdowns between the project team members. Of the project managers, contractors and clients, 73.8%, 52.9% and 81.3% respectively, totally agreed with

the perception that the functions performed by the call centre improved the performance of the projects. The reason for the contractor's lower perception of improved project performance is due to the financial penalties which are imposed on the contractor for underperformance with regards to the timeous resolution of breakdowns logged with the call centre. Furthermore, the contractors only interaction with the call centre is the emails/faxes they receive for the breakdowns logged against their contract.

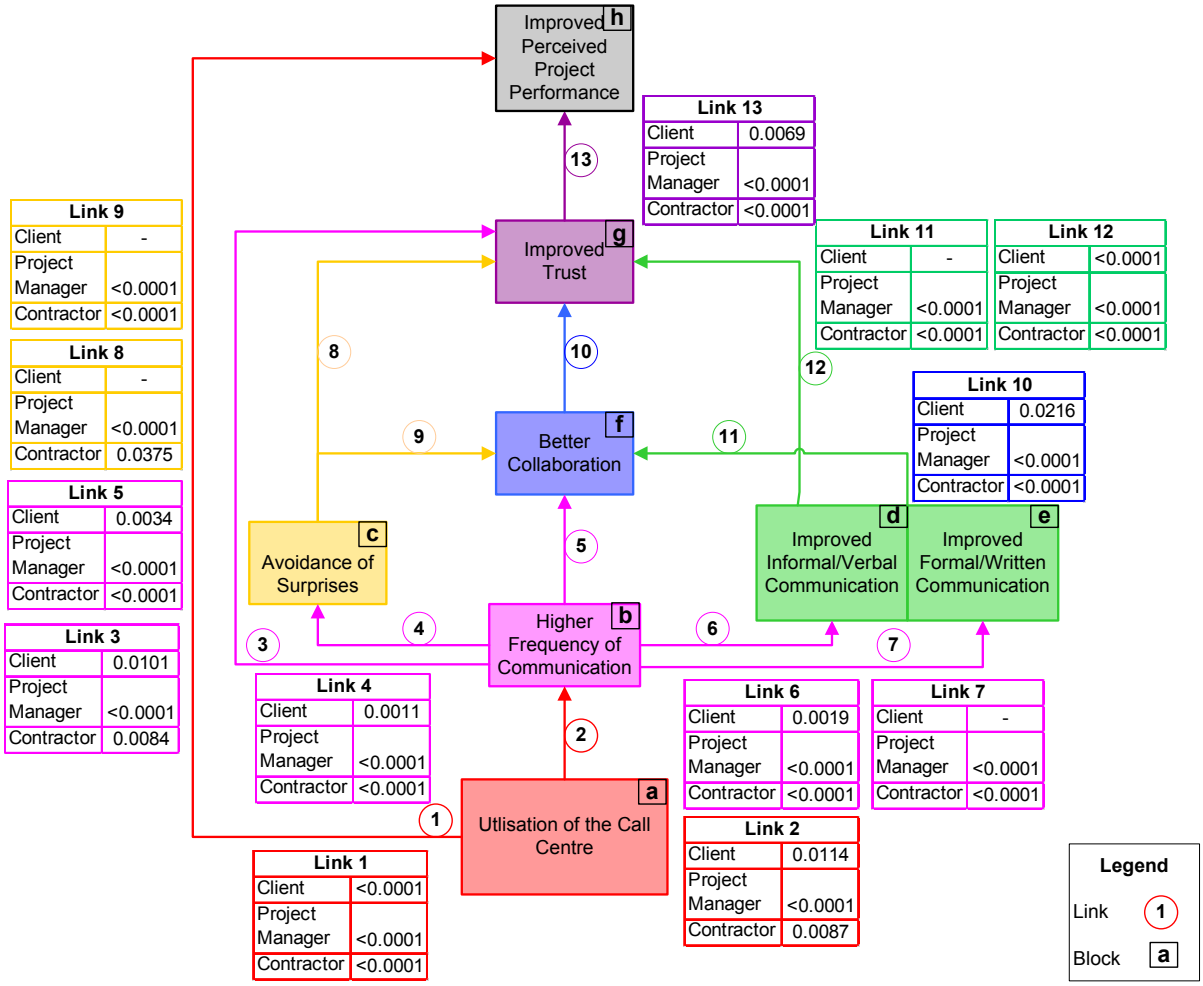

Figure 7. Significance of model interactions

The majority of each group believes that the higher frequency of communication facilitated by the call centre is responsible for an improvement in the quality (project managers 86.4%, contractors 91.7% and clients 90.9%), service delivery (project managers 91.5%, contractors 91.7% and clients 95.5%) and customer satisfaction (project managers 100%, contractors 83.3% and clients 95.5%) of the project.

4.6. Conclusions and recommendations

This study provides some interesting insight into the role that call centres can play in projects. Even though the response rate may be considered low the study provides sufficient evidence of the positive role that a call centre can play in facilitating and managing communication to aid project performance; to warrant further research in the subject.

It is proposed that call centres can provide the correct combination of informal and formal communication to increase the communication, collaboration and trust between principals and agents in a project. Moreover; call centres can improve the client's perception of service delivery and customer satisfaction. The quality of project deliverables and the overall performance of the project can also benefit from the functions performed by a programme call centre. The results support Turner and Müller (2004) research which states that:

1. Trust exists where informal communication is used
2. Frequent informal and formal communication, written and verbal, breed collaboration which increases the trust the principal has in the agent and improves his service delivery experience (Müller, 2003b) and that
3. Collaboration is a key condition for high performance in projects

The questions raised in this paper are answered in that it was established that the functions performed by the call centre increase the frequency of project team communication and contribute to the team's perception of project performance within the RAMP programme. Furthermore, in the study frequent call centre communication leads to the avoidance of project surprises this in turn contributes to collaboration and trust.

Table 9. The validity of Turner and Müller (2004) statements with respect to the findings of this study

Turner and Müller (2004) Finding	Addressed by Model Link No.	Valid for Principal-Agent Relationship Yes/No	
		Client - Project Manager	Project manager - Contractor
The mistrust and conflict of interest which results from the principal-agency relationship can be reduced by communication.	3	Yes	Yes
The communication needs of project participants are best served by a mixture of formal and informal communication and of written and verbal communication.	5	Yes	Yes
Frequent communication improves collaboration.	5	Yes	Yes
A major aspect of communication in to ensure the avoidance of surprises. Avoidance of surprises improves collaboration and builds trust. Where trust is lost there is a loss of collaboration.	4	Yes	Yes
	8	No	Yes
	9	No	Yes
Frequent informal and formal communication, written and verbal, breed collaboration which increases the trust the principal has in the agent and improves his service delivery experience (Müller, 2003b).	5	Yes	Yes
	10	Yes	Yes
	13	Yes	Yes
Regular, daily or weekly communication gives the principal the greatest comfort that they are being kept informed of project progress and of the decisions being taken by the agent on their behalf. It is this that builds the greatest trust in the agent.	5	Yes	Yes
	10	Yes	Yes
Frequent communication can help build trust on a project.	3	Yes	Yes
Trust usually exists where informal communication is used. Müller (2003b) found that trust as a result of the frequent collaboration between client and sponsor, was a topic often viewed as being of the highest importance in the buyer-seller relationship.	12	Yes	Yes
	10	Yes	Yes
	13	Yes	Yes
Collaboration is a key condition for high performance in projects.	10	Yes	Yes
	13	Yes	Yes
Müller (2003b) showed that high performing projects are correlated with high levels of collaboration and medium levels of structure.	10	Yes	Yes
	13	Yes	Yes
Clients want to know that the project is being undertaken in such a way as to deliver the products as agreed, to appropriate functionality and quality and at a time and cost that will let them make a profit.	13	Yes	Yes
Where the client seeks to understand what is going on through communication the project performs better, but the concern that drives them to seek the information manifests itself in a lower perception of project performance.	3	Yes	Yes
	13	Yes	Yes

This study provides evidence that the RAMP Call Centre effectively facilitates and manages the repair and maintenance programme project communication and the perception of 73.8%, 52.9% and 81.3% of the project managers, contractors and clients respectively is that the functions performed by the call centre improves the performance of their RAMP projects.

The study emphasises the practical value of call centres for programmes such as the one described in this study. It is hoped that with the follow-up study it will be possible to make generalisations regarding the population and that the study will provide stronger validation for the model established in this paper. While this study specifically investigated the role of call centres in communication within a programme comprising of small projects, the results seem to provide some substantiation of the validity of the principal–agency theory in projects in general. It would be interesting to investigate whether the findings can be generalised to larger projects and also whether the principal–agency theory equally applies to projects where call centres are not being used.

It is proposed that further research be conducted to determine the mistrust and conflict of interest between a project's principals and agents. Furthermore, the application of call centres to projects and project communication should be investigated, as well as the utilisation of call centres for project knowledge management.

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Chapter 5

The programme benefits of improving team communication in its projects using a contact centre[4]

A contact centre (a.k.a call centre) is used to facilitate and manage communication in a South African national programme to repair government infrastructure. An important question is how the contact centre benefits the programme and its projects. This study discusses the findings from a survey which quantified the realised programme benefits when the communication between team members in a programme was improved by utilising a contact centre. The results show that by using a contact centre to improve the communication between team members in the project, the project team's perception of communication effectiveness, quality of project deliverables, service delivery and customer satisfaction of the programme dramatically increases.

5.1. Introduction

Shao and Müller (2011) explain that programmes arise from a need for an effective project governance mechanism that provides a bridge between projects and organisational strategy. The various definitions for programme management have often created confusion. However all the definitions stress that programme management is an integrated, structured framework to co-ordinate, align and allocate resources as well as plan, execute and manage a set of projects simultaneously to achieve optimum benefits that would not have been realised had the projects been managed separately (Shehu and Akintoye, 2010). Bartlett (2002) sums up the definition nicely by saying that a programme is a collection of vehicles (or projects) for change, designed to achieve a strategic business objective. Similarly a project is seen as the achievement of a specific objective within a set

[4] This chapter has been published in a slightly different format as Bond-Barnard, T.J., Steyn, H, 2013. The programme benefits of improving team communication in its projects using a contact centre, *South African Journal of Industrial Engineering*, 24(2), 127-139.

time frame, which involves a series of activities and tasks which consume resources (Munns and Bjeirmi, 1996).

Programmes have become progressively more popular during recent years, which has led to a tendency in industry and in the project management environment to move from a space of “projectification” to “programmification” (Maylor et al., 2006). However, with the popularity of programmes growing the challenge of successfully managing these complex multi-project endeavours is becoming increasingly more perplexing (Shao and Müller, 2011).

Literature shows that one of the most important, most frequently mentioned challenges to programme management is that of communication between project team members (Bartlett, 2002; Shehu and Akintoye, 2010; Williams and Parr, 2006). Pinto and Pinto (1990) and Pinto and Covin (1989) explain that effective communication between team members is very important in a project as it is this communication which fosters cooperation between the team members which is so vital to project success.

Communication in a programme or project environment is defined as the transfer of information between the programme/project stakeholders; which involves a person or entity transmitting a message and another person or entity receiving and successfully understanding the message in response (Torrington and Hall, 1998). Cross-functional communication in a programme occurs between a group of people with different functional specialities or multidisciplinary skills who are responsible for carry out all the phases of a programme or project from start to finish (BusinessDictionary.com, 2012). For the purposes of this study cross-functional communication refers to the communication between the project team members and not communication between groups of people with different functional specialities.

While frequent formal communication was shown to have no significant effect on the degree of cooperation, Pinto and Pinto (1990) show that frequent informal communication (telephone or casual discussions) leads to greater collaboration

amongst the project team members. This "higher" collaboration between the project team members leads to higher trust levels (Bond-Barnard et al., 2013). Pinto and Pinto (1990) ascribe this to the fact that as "high trusters" are often willing to confront issues, they are less likely to spend time dealing with the issues. A correlation between frequent communication between team members and project performance (Bond-Barnard et al., 2013) as well as between informal communication between team members and project success (Nethathe et al., 2011; Pinto et al., 2009; Pinto and Pinto, 1990) is perceived for both high levels of collaboration between the team members and "high trust" (Bond-Barnard et al., 2013; Pinto and Pinto, 1990).

According to Cooke-Davies (2002) one of the main reasons why effective communication in the project has such an impact on the performance of the project and the overall success of the programme is due to "human success factors". He explains that it is fast becoming accepted wisdom that it is *people* who deliver projects, not processes and systems. Nethathe et al. (2011) concur that "people factors" are the most critical success factors for multiple project success. Turner and Müller (2004) established that the communication needs of project members are best met by a mixture of formal and informal communication and of written and verbal communication. This research investigates whether a contact centre can provide the effective, frequent communication between the team members; that is discussed above and which is essential for the project to achieve project and programme performance.

'Contact centre' is the name given to a traditional call centre that receives queries, processes and supplies information to an existing or potential client base using a variety of communication channels such as SMS, email, social media etc., in addition to traditional telephonic communication. The contact centre which was studied for the purposes of this research is the Repair and Maintenance Programme (RAMP) Contact Centre of the Department of Public Works, which coordinates and manages the communication relating to the repair and maintenance activities for all RAMP projects. At the time of the study there were 196 active RAMP projects.

The purpose of the Department of Public Works (DPW) RAMP programme is to alleviate the repair and maintenance backlog at national government facilities. Many of the RAMP project facilities are in such a state of disrepair that the facility is firstly rebuilt with improvements, before the maintenance phase of the project commences. The maintenance component of the project ensures that the facility does not once again fall into disrepair. As a state funded programme and contact centre that has cost the taxpayer several billion Rand to establish and operate, the need exists to assess the value of the Contact Centre as such a study is in the nation's interest.

This paper investigates to what extent the project team members of the 196 RAMP projects perceive project and programme benefits (such as service delivery, customer satisfaction and quality deliverables) as a direct result of using a centralised contact centre to facilitate and manage all repair, improvement and breakdown maintenance activities. The influence of the RAMP Contact Centre on the success factors of stakeholder expectation/requirements and the performance/quality of deliverables is also determined, as this has a knock-on effect on the perceived project/programme benefits mentioned above. A secondary objective of the study is determine whether the findings support the call centre facilitated communication and project performance model which appears in a paper by Bond-Barnard et al. (2013).The following propositions were investigated:

P1: The RAMP Contact Centre effectively manages the communication of breakdowns between the project members;
P2: The communication between the RAMP Contact Centre and the project team members improves the quality of project deliverables;
P3: The frequent interaction between the RAMP Contact Centre and the project team members improves the service delivery of the RAMP programme;
P4: By allowing the client's beneficiaries to log calls with the RAMP Contact Centre it improves the programme's customer satisfaction.

A description of the national Repair and Maintenance Programme Contact Centre and a review of the pertinent literature follow. The paper then describes the research methodology that was used, and how the data was collected. Following which, the results of a survey done on the national Repair and Maintenance Programme and its Contact Centre are presented. Finally it reviews the results of the survey and concludes with a discussion of the study's findings and suggestions for further research.

5.1.1. Background to the RAMP programme

The RAMP Programme which was initiated in 2001 at a cost of R2 billion a year is primarily responsible for the improvement of government infrastructure. This finding as well as many others regarding the current state of government infrastructure is contained within the South African Institution of Civil Engineering (SAICE) Infrastructure Report Card (*SAICE Infrastructure Report Card for South Africa*, 2011) which analyses and grades the state of engineering infrastructure in South Africa every 5 years. The scorecard consists of 10 sectors such as water, roads, ports etc. with 27 subsectors. The 2011 report card graded South African infrastructure as a C+ which is an improvement from the D- which was awarded in 2006. The Infrastructure Report Card (IRC) team stated in the 2011 report card that the 2001-2007 repair and maintenance project for South African ports, to the value of R440 million, restored all 12 proclaimed harbours to an excellent condition.

One of the key elements to the success of the programme is the RAMP Contact Centre. Before the programme commenced DPW decided that all communication regarding reactive maintenance (or ‘breakdowns’) at the national facilities would be facilitated, monitored and managed by a central ‘contact centre’. The RAMP Contact Centre was also given the responsibility of documenting the breakdown maintenance activities and performance reporting for all the projects that made up the programme. The RAMP Contact Centre communicates with the various project teams on a regular basis. A typical project team consists of:

- The client, DPW, and the user department representatives at the facility;

- The project manager who oversees several projects, usually at different facilities;
- The consulting engineer (consultant) who manages the project on a day-to-day basis and instructs the contractor;
- The contractor responsible for performing maintenance and attending to breakdown repairs at the facility.

The RAMP Contact Centre process (see Figure 8) commences when the client at the facility phones, faxes or emails the Contact Centre to log a breakdown, which could be anything from interrupted water supply at a prison to damage of a section of fencing at a border post. The contact centre logs the details of the breakdown and provides the client with a unique reference number. The breakdown is reported to the consulting engineer or project manager, firstly by telephone (to confirm the priority of the breakdown) and secondly by fax or email. Upon the consultant/project manager's consent the fax is also sent to the contractor. Hereafter, it remains the duty of the consultant to verbally notify the contractor of the breakdown. Once the contractor has attended to the breakdown, he notifies the consultant. Provided that the consultant is satisfied with the quality of the contractor's repair work or response to the breakdown, the consultant notifies the contact centre by telephone/email that the breakdown has been attended to. The contact centre then follows up the resolved breakdown by contacting the party who originally logged the breakdown and enquires whether the issue was satisfactorily resolved.

This clearly defined process for the logging, tracking, reporting and resolution of project issues forms part of the communications plan for the programme and its projects. The weekly and monthly reports which are distributed to the programme manager and the 196 project managers indicate each project's performance and the reports are used as the basis of programme and project progress discussions with the client.

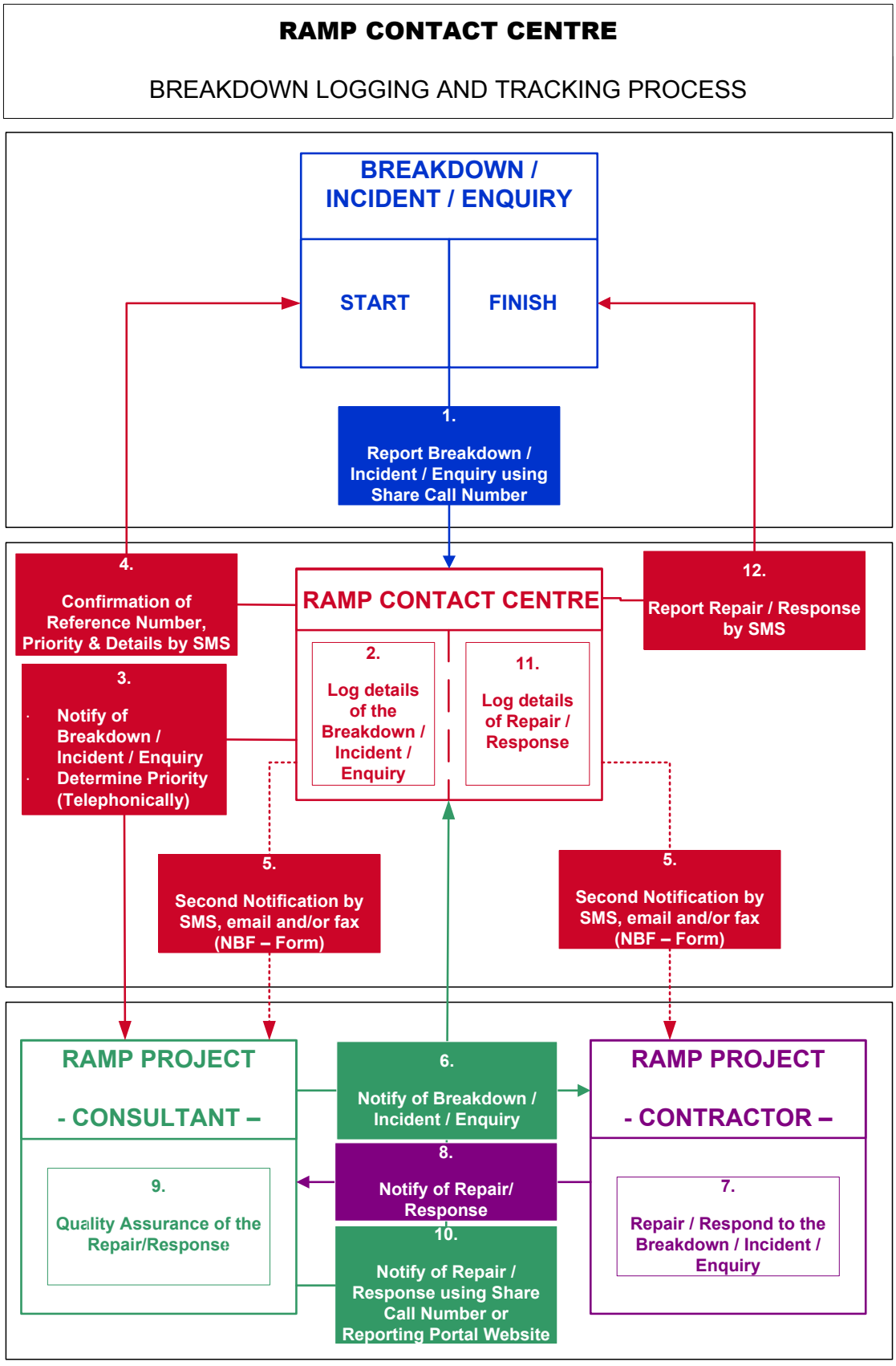

Figure 8. RAMP Contact Centre process

5.2. Literature review

The RAMP Programme and its Contact Centre, which is discussed in 5.1.1 provides the context for this research, which aims to contribute to the programme management body of knowledge by establishing the benefits of using a contact centre to improve the communication between team members in a programme and its projects. It is for this reason that a review of literature will firstly be provided for programmes and programme management in an international and South African context. Thereafter the key contributors to the achievement of benefits in a programme are reviewed and the characteristics of communication between team members are explained in more detail. Finally the literature review will conclude with a brief overview of contact centres and programme contact centres.

5.2.1. Programmes in a South African and international context

Bartlett (2002) emphasized that interest in the subject of programmes and programme management has flourished since the publication of the Central Computer and Telecommunications Agency's (CCTA) 'A Guide to Programme Management' in 1994 (CCTA, 1994). He adds however that programme management research is still in its infancy before it catches up with its related discipline, project management.

Programmes and programme management have grown in popularity since the 1990's when mergers and acquisitions took place on an unprecedented scale, and businesses had to embark on large-scale restructuring following the world wide recessions in the early 1990's (Bartlett, 2002). Programmes have, in recent years, been used as the de-facto approach to facilitate whole organization change such as Year 2000 programmes, preparation for the Euro currency, Customer Relationship Management (CRM) programmes, e-Commerce programmes, mergers and acquisitions, Enterprise Resource Management (ERM) programmes and in South Africa preparation for the 2010 Soccer World Cup. However Bartlett (2002) is of the opinion that programme management will have to become a much

more sophisticated discipline in order to tackle the complexities of the accelerated large-scale business change to come.

Programmes have become the instruments of choice for government service delivery and policy implementation. The popularity of programmes in government stems from the fact that programmes are an effective way of coordinating the project efforts of various government departments to achieve a synergy of benefits that would not have been realised had the projects been managed separately (de Coning and Günther, 2009; Shehu and Akintoye, 2010). The national RAMP programme is no different in that the facilities of 12 national government departments namely Agriculture, Arts and Culture, Land Affairs, Border Control Ports of Entry, Correctional Services, Defence, Home Affairs, Public Works, Justice, Labour, Police Services and all government elevator installations are included in the RAMP programme. The strategic business objective of this programme is to eradicate the facilities and infrastructure repair and maintenance backlog for these government departments. Some of the potential benefits that the Department of Public Works (DPW) foresaw upon the implementation of the programme – with its centralised contact centre – were better performance management especially in terms of the quality of deliverables, more effective programme communication and information management, improved service delivery and customer satisfaction.

5.2.2. Programme benefits

Programme benefits can be accrued throughout the life of a programme and are crucial to the attainment of programme success (Bartlett, 2002). Bartlett (2002) states that programme benefits are:

- the success criteria measurements of cost, time and quality,
- programme design changes,
- performance/quality of deliverables and
- stakeholder expectations/requirements.

Yet the realisation of programme benefits is rarely given the attention it deserves (both in practice and in literature), therefore it is rarely properly understood or undertaken (Bartlett, 2002; Cooke-Davies, 2002). According to Bartlett (2002) benefits are very much a perception of what might be achievable and needs to be properly quantified before they can progress from being mere requirements. The measure for benefit success is their acceptance by the project client or stakeholders against expectations articulated. However, success, like quality, is a perception. A programme must, therefore, establish measurable success criteria for its deliverable elements. It is not enough to only specify the achievable benefits and their success criteria. Several actions that will occur during the life of a programme will affect the nature and quality of the desired benefits (Bartlett, 2002), which de Wit (1988) calls success factors.

Literature states that many of the things that can go wrong in a programme in terms of benefits have to do with expectations management (de Wit, 1988; Fortune and White, 2006; Kloppenborg et al., 2010; Maylor and Johnson, 2010; Maylor et al., 2010, 2006; Yang et al., 2011). Therefore this paper primarily discusses how the RAMP Contact Centre influenced stakeholder expectation/requirements and performance/quality of deliverables success factors which have a knock-on effect, on the stated programme benefits of service delivery, customer satisfaction and quality deliverables.

The programme success factors of communication effectiveness, service delivery, customer satisfaction and quality deliverables were chosen as they could be evaluated by all members of the 196 project teams (including the clients/beneficiaries) which provided better insight on the topic of this paper. The quantification of project member perception of programme benefit achievement was used as the success criteria.

5.2.3. Communication between team members

Literature states that communication between the team members is an essential project success factor that plays a role in determining stakeholder expectations

and the performance/quality of project deliverables which are key success factors for the achievement of project and programme benefits (Bartlett, 2002; Lehmann, 2009). Effective communication is about exchanging, meaningful information between groups of people with the aim of influencing beliefs or actions (Shehu and Akintoye, 2010). Furthermore, timely and effective communication between teams and across organisational boundaries which is termed cross-functional communication is essential to programme/project management performance and success (Belout and Gauvreau, 2004; Bond-Barnard et al., 2013; Pinto and Pinto, 1990).

According to Belout and Gauvreau (2004), Pinto and Pinto (1990), Scott-Young and Samson (2008) communication between team members is also one of the most frequently studied project team success factors. After all, it is communication between the team members which best addresses stakeholder expectations/requirements and it is communication in the project team which is responsible for the successful delivery of project deliverables according to predetermined quality parameters, which in the end results in customer/client satisfaction. Yet a contact centre's role in facilitating communication between the team members in a project and a programme has not yet been investigated.

One may ask "why communication is so important for programme success?" The Office of Government Commerce (OGC) in Shehu and Akintoye (2010) states that communication is critical in any change process. Moreover, the greater the change, the greater the need for clear communication regarding the reasons and rationale for the change, the expected benefits, the plans implemented and its proposed effects (Shehu and Akintoye, 2010). Likewise programme management is aimed at exchanging timely and useful information between and amongst the stakeholders and project team. Bartlett (2002), Blomquist and Müller (2006), CCTA in Shehu and Akintoye (2010), Williams and Parr (2006) concur that a lack of communication between team members is a major challenge to programme management. It is clear from literature that a lack of communication between team members can lead to the late delivery of a project, which will in turn affect the timely delivery of a programme (OGC in Shehu and Akintoye, 2010).

5.2.4. The history of contact centres

'Contact centres' is the name given to traditional call centres that receive queries/information from, process and supply information to an existing or potential client base using a variety of communication channels such as telephone, fax, letter, SMS, email and increasingly instant messaging. Various companies and departments including finance, legal, IT, insurance, marketing and sales make use of contact centres with great success as an integral part of the enterprise's overall CRM.

Contact centres have experienced significant growth and popularity since the advent of the first Automatic Call Distributor (ACD) in the mid-1960's. This growth was spurred on by the technological advances which made call centres indispensable to businesses during the late 1970s and 1980s (Blomquist and Müller, 2006). In the 1990's the number of call centres continued to grow as a result of the rise of the internet. During this time websites became the central point of contact and sales for an ever increasing number of companies and call centres were essential in dealing with customer service and technical support (Pearce, 2011). Nowadays contact centres have replaced the traditional telephonic call centre as call centres started to manage all the client contact for companies through a variety of channels such as telephone, fax, letter, email and increasingly on-line live chat or instant messaging (EWA Bespoke Communications, 2010).

Though literature frequently refers to contact centres, there appears to be very little information regarding the utilisation of contact centres in projects and programmes (Bond-Barnard et al., 2013). If contact centres have proven to be so indispensable for CRM in organisations, why have programme and project managers not shown an interest in using a contact centre to attend to aspects of project and programme stakeholder relationship management and project team coordination? This paper aims to educate programme and project management practitioners on the benefits of utilising a contact centre for programme communication in particular.

5.3. Research methodology

This research examines the extent to which the programme's project team members perceived programme benefits such as communication effectiveness, service delivery, customer satisfaction and quality of deliverables because a contact centre facilitated some of the communication between the team members. The impact of the contact centre on the effectiveness of the team's communication is investigated, as literature states that it is this communication which has been shown to influence programme/project performance and success. These benefits are presented as four propositions which are described in the introduction and tested in this paper.

The predominant appreciation that people have their own perceptions of a phenomenon (i.e. the programme benefits of improving cross functional communication in a project using a contact centre) necessitated a research design that provides the opportunity to gather and interpret user perceptions in a programme context. Survey research, a quantitative research method, was therefore chosen.

This research focuses on the RAMP Contact Centre users, how they communicate with the Contact Centre and in their project team. The scenarios of the theoretical model as presented in and by the propositions in the Introduction, were used to develop a set of statements that concentrated on users' perceptions of the RAMP Contact Centre's contribution to the attainment of different project 'benefits'. Iterative review and refinement resulted in 3 group-specific questionnaires with approximately 30 questions each; for the client, contractor and project manager participants. Four of the questions measured the users' perceptions of the Contact Centre in facilitating and managing project team communication to achieve the stated project benefits of project service delivery, customer satisfaction and quality. Questions were formulated in the first person to provide users the opportunity to reflect on their personal experience/perception. Likert-type scales were used to express the participant's degree of agreement with the statements made. The questionnaire was validated through a process of

discussions and pre-tests which focussed on question application and clarity. Six users assisted with verifying the validity of the questions during the pre-tests and a few minor enhancements were made. The pre-tests indicated that the questionnaire was unambiguous and that it could be completed in less than 10 minutes. An explanatory letter or email was sent to all the participants and the questionnaire was distributed by sending an email with a website link to some of the participants or by sending others the survey by fax/email.

5.3.1. Issues of measurement

The RAMP programme referred to in this research consists of numerous projects where each project consists of a project manager and contractor. The research population consisted of the individual populations of the project members (i.e. project managers and contractors) associated with the 196 active projects registered on the programme contact centre database. These three designations including that of 'client' were considered to be the units of analysis for the investigation. Furthermore, the project manager and contractor populations that are associated with the 196 active projects registered with the contact centre served as the sample frame. Census sampling was specifically selected for the project manager and contractor populations as the authors had access to these two populations whereas convenient sampling was used for the client group, with an unknown population (this is discussed in more detail below).

The sub-population for the project manager and contractor groups was reduced to unique samples only, as some participants were involved in more than one project and it was decided not to swamp or overwhelm these participants with surveys which might cause them to decide not answer at all. Consequently, the project manager and contractor populations were determined to be 194 and 134 respectively. The survey was distributed to the entire project manager and contractor population. Convenient sampling was employed for the client group as the size of the sub-population was unknown, it was cost effective and because the study had severe time constraints.

5.3.2. Data collection

Research data was provided by 73 project managers, 22 contractors and 22 clients who completed the questionnaire. The low response rate for the surveys was due to non-response error and time constraints. The non-response error was caused by the inability of the researcher to get participation from potential respondents. It is presumed that this was caused by a lack of time to participate on the part of the respondent. However, the responses received gave a good indication as to the predominant perceptions of the various groups. Incompleteness caused the rejection of 14 of the project manager and 10 of the contractor questionnaires, resulting in 59 and 12 usable questionnaires respectively, no incomplete questionnaires were received for the client group.

The 59 project manager and 12 contractor questionnaires were completed on-line using Survey Monkey whereas 22 clients completed their questionnaires in hard copy and returned it either by email or fax. The online survey results were exported into Excel from Survey Monkey while the email and fax surveys were manually captured into the same Excel spread sheet, which was then checked for integrity.

The overall study was limited due to a low response rate, time constraints and because the participants were self-selected. Other limitations were that the RAMP Contact Centre only facilitates and manages the breakdown portion of communication in each project.

5.4. Results

The 93 useable questionnaire responses were entered into spread sheets to enable the calculation of the number of occurrences of each of the agreement options (strongly agree, partially agree, neither agree nor disagree, partially disagree and strongly disagree). The results are presented in Table 10 in accordance with the four propositions used to structure the questionnaire and then interpreted and discussed in the next sub section.

5.4.1. RAMP contact centre effectiveness

Eighty six (93%) of the participants were of the opinion that the RAMP Contact Centre effectively manages the communication of breakdowns between the various members of the project team namely; the project manager, contractor and client/beneficiary. However three (two project managers and one contractor) or 3% of the participants perceived the Contact Centre as being ineffective in managing breakdown communication in the project team. A further four participants, consisting of three project managers and one contractor stated that they neither agreed nor disagreed that the Contact Centre was effective in managing breakdown communication between the members of the project team. This sufficiently supports the proposition that the RAMP Contact Centre effectively manages the communication of breakdowns between the project members therefore the null hypothesis of the proposition was rejected.

Table 10. Survey results

			Project Manager (n=59)		Contractor (n=12)		Client (n=22)	
	Proposition	Total Agreeing	Agreeing	Number	Agreeing	Number	Agreeing	Number
1	The RAMP Contact Centre effectively manages the communication of breakdowns between the project members	92%	91.5%	54	91.7%	11	95.5%	21
2	The communication between the RAMP Contact Centre and the project team members improves the quality of project deliverables	88%	86.4%	51	91.7%	11	90.9%	20
3	The frequent interaction between the RAMP Contact Centre and the project team members improves the service delivery of the RAMP programme	92%	91.5%	54	91.7%	11	95.5%	21
4	By allowing the client's beneficiaries to log calls with the RAMP Contact Centre it improves the programme's customer satisfaction	97%	100.0%	59	83.3%	10	95.5%	21

5.4.2. Perceived quality of project deliverables

A perception that a higher frequency of communication between the RAMP Contact Centre and project team members improved the quality of project deliverables was noted by eighty two (88%) of the participants. What was interesting was that none of the contractors (the team members who actually have to carry out the project work) disagreed with this statement, this could mean that they derive the most benefit from the frequent Contact Centre communication in this instance, as it assists them to do work that adheres to the project manager's specifications and which meets the clients' expectations. In total only one project manager and one client partially disagreed with this statement of association. Nine participants neither agreed nor disagreed with the statement. A majority of 88% of the ninety three survey participants supported the second proposition that the communication between the RAMP Contact Centre and the project team members improves the quality of project deliverables.

5.4.3. Perceived service delivery outcomes

The majority, eighty six (93%), of the participants perceived that a higher frequency of interaction between the RAMP Contact Centre and the project team members improved the service delivery of the Repair and Maintenance Programme, whereas two (2%) participants disagreed with this statement. Five participants (5%) neither agreed nor disagreed with the statement.

It was interesting to note again that none of the contractors disagreed that a higher frequency of interaction between the RAMP Contact Centre and the project team members improved the service delivery of the Repair and Maintenance Programme. This is in line with the results for quality of project deliverables above as service delivery is seen as the act or manner in which an article in public demand is supplied which is also fit for purpose (i.e. functional/quality infrastructure, buildings, water supply and sewage removal systems amongst others) (Merriam-Webster Dictionary, 2012). As 93% of the programme participants agreed that the frequent interaction between the RAMP Contact

Centre and the project team members improves the service delivery of the RAMP programme it can be concluded that the proposition was correct.

5.4.4. Customer satisfaction

The most significant finding of the survey was that ninety (97%) participants agreed that by allowing clients/beneficiaries to log calls with the RAMP Contact Centre it improves the programme's customer satisfaction. Seventy three (79%) participants or forty six (78% of stratum) project managers, eight (67% of stratum) contractors and 19 (86% of stratum) clients totally agreed with this statement. Two (2%) participants neither agreed nor disagreed with the statement and one contractor (1%) totally disagreed with the statement. The fact that 97% of the participants agreed that, allowing the client's beneficiaries to log calls with the RAMP Contact Centre, improves the programme's customer satisfaction, supports the proposition. Notably there was not a significant difference in response between the three groups which provides additional validation for this proposition.

The customer satisfaction findings suggest that the RAMP Contact Centre is most successful in keeping the programme's clients and beneficiaries happy by providing them with a 24/7 contact centre that is able to capture, report and follow-up on reported or queried breakdowns. This can be attributed to the fact that they receive information immediately and the breakdown is repaired quickly as there is a formalized communication and resolution process in place, in the project. In the end a programme or project is not a success unless it is perceived to be a success by those who originally commissioned it, namely the client(s) and/or beneficiaries. This proposition together with propositions 1 and 3 also support the model developed by Bond-Barnard et al. (Bond-Barnard et al., 2013). Where by both the model Turner and Müller (2004) state that frequent communication indirectly influences project performance.

5.5. Conclusions and recommendations

The results show that when the contact centre is used in the RAMP programme to facilitate and manage the communication between team members in the projects, several benefits are realised. The study also determines the value that the RAMP Contact Centre adds to the programme. This finding validates the national expenditure for the programme and ensures its continued support. Furthermore support for the call centre facilitated communication and project performance model (Bond-Barnard et al., 2013) is also obtained from this study.

Most notably in the case of RAMP, customer satisfaction is perceived to improve as it provides the numerous clients and beneficiaries of the programme immediate access to communicate their breakdowns (needs for repair) to the rest of the project team by making use of a central contact point a.k.a the RAMP Contact Centre, in this instance. By using the breakdown communication and regular reporting functionalities of the Contact Centre the project teams' communication improves. The project team perceives the Contact Centre to be effective in its task of managing breakdown communication between the project team members and in assisting the project team to improve the quality of project deliverables by keeping the client informed regarding progress and giving him a channel of communication with the project team, should a project issue occur.

Other benefits which occur, as a direct result of the improved communication between the team members, is that the quality of project deliverables improves as a result of the communication between the Contact Centre and the project manager, contractor and client. The improved quality of deliverables also influences the level of service delivery perceived and experienced by the members of the project team, especially the clients. The majority (93%) of the programme participants perceived that service delivery improves due to the frequent interaction between the RAMP Contact Centre and the project team members. In conclusion, the RAMP Contact Centre improves the communication between team members in the project, as well as the project team's perception of the quality of project deliverables, service delivery and customer satisfaction.

Future research possibilities could be to investigate the programme benefits associated with a contact centre that facilitates or manages the bulk of the communication in a programme or to establish the specific project benefits of improving communication between team members.

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Chapter 6

The influence of computer mediated communication (CMC) on project communication, trust, collaboration and success[5]

Growth in the use of computer-mediated communication (CMC) technologies such as instant messaging and video conferencing has led to a requirement to quantify and understand the influence of these tools on the quality of communication in projects. This paper presents the results of a survey of project leaders, team members and other stakeholders from a range of industries across the world. The purpose of this study is a) to determine how, why and for what purposes instant messaging and video conferencing are used in projects; b) to determine how these communication media relate to the factors that promote quality communication in a project namely, the communication channels, communications plan, audience, content, frequency of interaction, technology, and communication type. The results indicate the extent to which instant messaging and video conferencing is used for communication in projects. Furthermore both mediums were found to lead to more appropriate project communication and to improve the quality of communication of geographically dispersed teams.

6.1. Introduction

This study aims to determine the extent to which instant messaging (IM) and video conferencing (VC) have been adopted for project communication and to investigate its effect on the factors that determine quality communication in a project.

Very little attention has been given to communication in project management (Dainty et al., 2006; Lehmann, 2009). The lack of communication literature in

[5] This chapter has been submitted in a slightly different format as Bond-Barnard, T.J., Steyn, H and Fletcher, L, (submitted). The impact of instant messaging and video conferencing on the quality of project communication, *International Journal of Project Management*.

project management has resulted in communication being cited as a primary cause of project failures on numerous occasions (OGC in Shehu and Akintoye, 2010; Dainty et al., 2006; Gilpatrick in M. B. Pinto and J. K. Pinto, 1990; Souder, 1981). Moreover, project teamwork today is increasingly characterised by distributed work as organisations and project teams face the demands of increased competition and improved productivity (Galushkin, 2003; Ruhleder and Jordan, 2001). Team communication is now predominantly informal augmenting face-to-face communication with new media such as video conferencing, instant messaging, email, and SMS (Copy Editor in Galushkin, 2003). Even though computer-mediated communication has infiltrated organisations and project teams (Earon, 2014; Harrin, 2010a, 2010b), limited data from CMC studies is available. Moreover, a survey to determine the use of social media in project environments found that 73% of 246 respondents from 32 countries indicated that social media was a key issue for project managers (Harrin, 2010b). The lack of suitable research hinders full understanding of CMC and its contribution to communication management which highlights the necessity for further investigation (Galushkin, 2003).

Recent literature (Bond-Barnard et al., 2014a, 2014b, 2013; Chiocchio et al., 2011; Daim et al., 2012; Dietrich et al., 2010; LePine et al., 2008) has gone some way in assisting project practitioners to better understand project communication and its effects on project trust, collaboration and success. However, very little is known about the effect of computer-mediated communication methods such as instant messaging and video conferencing on the quality of communication in projects.

Previous studies (Bond-Barnard et al., 2014a, 2014b, 2013; Daim et al., 2012; Müller, 2003a; Turner and Müller, 2004) identified seven critical factors which determine the quality of project communication. The factors include the communication channels, the communications plan, the audience, content, frequency of interaction, technology, and the communication type. This study includes a questionnaire to determine the extent to which instant messaging and video conferencing communication occurs in projects and to investigate how this

communication influences the seven factors that determine the quality of communication in a project.

By analysing the results of the survey the research attempts to understand how, why and what IM and VC is used for in a project and to enable a better understanding of the factors that contribute to quality project communication. The outcome of the research is particularly important for project leaders to understand how IM and VC can be used in a project for maximum benefit and to prioritise the factors that result in quality communication. The research is also important in that it discusses the constituents of quality communication which forms the basis on which trust and collaboration in the project grows and flourishes which determines the ultimate success of the project (Bond-Barnard et al., 2014a; Chiocchio et al., 2011; Dietrich et al., 2010).

6.2. Literature study

6.2.1. Computer-mediated communication in projects

Organisations today face severe competitive and economic pressures. As companies shed extra costs and try to respond more nimbly to customers and competitors they begin to adopt more network-type structures to tighten inter-organisational linkages and improve management practices (Ehsan et al., 2008; Johnston and Lawrence, 1988; Markus, 1994; Miles and Snow, 1986). To support these network-type structures in the organisation, more and more firms, especially those that are large and geographically dispersed are turning to computer mediated communications (Earon, 2014; Ehsan et al., 2008; Markus, 1994). Use of these media for intra-organisational coordination is perceived to increase personal and organisational productivity and efficiency (Earon, 2014; Markus, 1994).

Computer-mediated communication (CMC) is defined by December (2011) as the process by which people create, exchange and perceive information using networked telecommunications systems that facilitate encoding, transmitting and

decoding of messages. Popular forms of CMC include SMS, email, instant messaging, collaboration tools, social networking, blogs, micro-blogs, wiki's and video conferencing, amongst others. For the purposes of this paper only instant messaging and video conferencing will be discussed in more detail as these two mediums are the more popular and well-known CMC tools.

According to Hu (2003) and Osterman Research (2004) instant messaging has evolved from a teenage fad to a valuable communications tool that is central to everyday business. Instant messaging (IM or chat) is a way of sending short text messages to another person through the computer. Examples include *WhatsApp*, *AIM, Windows Live Messenger, eBuddy, ICQ, MXit, Skype, Tecent QQ, Xfire, Yahoo Messenger and gTalk.* It is similar to email but faster and with shorter messages as the person on the other side has indicated that he is available to message (Harrin, 2010a). Some of the perceived advantages of IM are that one can view another person's availability, it is very conversational, in most instances the software is free, spam is not really a problem, one receives instantaneous responses, there is a documentary audit trail and no communication is received when off line (Bilton, 2012). Some disadvantages include having to regularly update one's availability status, it requires discipline to regulate usage, information security may be an issue and status updates can cause one to micro-manage project situations (Harrin, 2010a).

IM is currently used in the vast majority of North American enterprises: as of early 2004, IM systems were in use in 92% of all commercial and non-commercial enterprises. A further, 23% of all enterprise email users employ IM, a figure that Osterman Research estimated would grow to approximately 80% of all email users by 2007. According to (Osterman Research, 2004) the percentage of enterprises that are using IM for business applications has more than doubled in less than three years. The dominant interest in enterprise IM use is for business-to-business communications, not business-to-consumer communications. A large percentage of IM users find that their use of the telephone and email is reduced because of their use of IM. A survey by Harrin (2010b) found that 80% of respondents used

instant messaging for business and/or personal use and it was one of the few tools that everyone had heard of (Harrin, 2011).

Video conferencing on the other hand is defined as hosting a conference among people from remote locations by means of transmitted audio and signals Merriam-Webster Dictionary (2011). Video conferencing enables telecommuting individuals or people in different locations to participate in meetings at very short notice while saving time and money. Examples of VC software include *Skype, SightSpeed, ooVoo, MegaMeeting, iChat, Vbuzzer, Tokbox, Eyejot, Microsoft LiveMeeting.* Some of the advantages of video conferencing are that it increases productivity and efficiency, no traveling is required therefore it is environmentally friendly, convenient and good for building relationships (Earon, 2014; Harrin, 2010a). Some disadvantages are signal latency and that it can cause anxiety (Wolfe, 2007), delegates must work harder to interpret the information presented in the conference (Ferran and Watts, 2008) as well as lack of eye contact and appearance consciousness (Benson-Armer and Hsieh, 1997). Video conferencing is growing in popularity; in 2007 Frost and Sullivan in Paul (2008) estimated it to be a $1.1 billion market which was up by 29% from the year before. Furthermore, according to TeleSpan in Paul (2008), videoconferencing sales have risen from 115,000 systems in 2004 to 176,000 in 2007. The majority of respondents of a survey on social media use in project environments indicated that they use CMC tools for hosting online meetings (Harrin, 2010b).

The growth in CMC technologies such as IM and VC is astounding, however what benefits can an organisation or project gain from using such communication tools? Since 2007, McKinsey and Company has been conducting a yearly survey, with nearly 1700 responses per year, from executives across industries and regions. The surveys are done to determine what value the companies have gained by adopting various CMC's within their organisations, externally in their relations with customers and in their dealings with partners and other stakeholders. Their responses suggest why CMC's remain of high interest: 69% of the respondents responding in 2009, report that their companies have gained measurable business benefits including more innovative products and services, better access to

knowledge, reduced time to market, reduced costs (notably communication costs), increased revenue and customer satisfaction (McKinsey and Company, 2009). In 2010 the measurable benefits from internal use of CMC's were as follows:

- 77% increase in speed to access knowledge;
- 60% reduced communication costs;
- 41% increased employee satisfaction;
- 40% reduced operating cost;
- 29% reduced time to market;
- 18% increased revenue.

The adoption and utilisation of CMC tools such as instant messaging and video conferencing by organisations provides support for the proposition that CMC is used significantly in projects. Some preliminary work has been done by (Harrin, 2011, 2010b) to quantify the utilisation of CMC in project environments however much must still be done to determine the exact extent to which specific tools such as IM and VC are being used in projects and what influence they may be having on the other aspects of project communication.

6.2.2. Quality communication in projects

The role of the project management function is to manage the systems that relate to the features of uniqueness, novelty and transience, inherent to the term 'project'. These systems, include the scope of work, the project organisation, the quality, cost and the duration of the project. Communication is an essential ingredient of all of these managerial requirements and must be viewed as the essential prerequisite to successful project-based management (Dainty et al., 2006). Bond-Barnard et al. (2013) found that a balance of frequent informal and formal communication influences the performance of the project, by influencing the degree of collaboration and the level of trust in the project team, which also influences the project's performance. Consequently, communication is frequently identified as a major determinant for project success or failure (Müller, 2003a, Hartman in 2003b).

Communication can be compared to a metaphorical 'pipeline' along which information is transferred between individuals or groups (Axley, 1984) through a common system of symbols, signs, or behaviour (Merriam-Webster Dictionary, 2012). Thus the communication process involves a person or entity sending out a message and another receiving and successful understanding the message in response (Torrington and Hall, 1998). It stands to reason then, that the quality of communication between the message initiator and the correct message receiver(s) in a project is determined by how timeously and accurately a message (with appropriate content) is conveyed using the most suitable communication medium available, while being aligned with the project communications plan. This definition for quality communication was formulated based on the factors identified in the literature viz. frequency of interaction, content, type, technology, communication channels, audience and communications plan. ‘Culture' and 'leadership' factors also influence the quality of communication but are beyond the scope of this paper. The literature relating to each of the factors listed above are discussed in more detail below.

6.2.2.1. Frequency of interaction

Frequency of interaction refers to the number and timings of project team members' communications with the stakeholders and each other (Turner and Müller, 2004). The PMBOK Guide by the PMI (2013) states that timely communications are a prerequisite for successful project completion. Similarly, Bond-Barnard et al. (2013); Chen et al. (2010); Turner and Müller (2004) and Webber (2008) found that frequent informal and formal communication improves the communication quality, trust and collaboration in project relationships which, in turn, contributes to high project performance. Timely communications are especially important when dealing with project teams from different geographic regions as the frequency of interaction decreases when the project team is not co-located (Dietrich et al., 2010; Van den Bulte and Moenaert, 1998). The lack of timely communication has been cited as a common factor among failing projects (Dalcher, 2009).

6.2.2.2. Content of the message

Communication in a project can only be as good as the content that is being communicated, therefore quality content results in quality communication (Bond-Barnard et al., 2014b, 2013). Müller (2001) found that the content of quality project communication falls into one or more of the categories below:

- Status and achievements;
- Project changes;
- Issues and open items;
- Next steps in the project;
- Quality and progress measures;
- Project trends.

Penteado in Carvalho (2008) warns that project communications competencies, which refer to the group's ability to codify, transmit and decode information, are necessary but not sufficient prerequisites to the effectiveness of project communication. This means that if the project team is neither able to codify nor to decode the communication content correctly then the effectiveness or quality of the project communication may be reduced.

6.2.2.3. Type of communication

Quality communication is also determined by the type of communication that occurs in the project. Post et al. (2009) state that participative communication improves the quality of project communication, as it is the strongest indicator of innovation effectiveness and patents produced. They add that participation often leads to a better understanding of potential problems which encompasses the concept of connective thinking. Participative communication can either be informal or formal in nature and both forms can be facilitated both orally and in writing. Turner and Müller (2004) established that the communication needs of project participants are best served by a mixture of formal and informal communication. Moreover, Torrington and Hall (1998) found that a message is more successfully conveyed if a variety of media; verbal, non-verbal, written, audio-visual or

electronic is used. It has been shown that frequent informal and formal communication improves communication quality, trust and collaboration in project relationships, which is linked to high performance (Bond-Barnard et al., 2013; Chen et al., 2010; Turner and Müller, 2004; Webber, 2008).

6.2.2.4. Technology utilised

Technology is one of five factors that significantly contribute to the breakdown of communication in a project (Carvalho, 2008; Daim et al., 2012). This is because technology causes physical communication barriers (Ferreira in Carvalho, 2008) which are obstacles that arise when information is transmitted. With the advent of global virtual teams and tendencies towards continuous communication or updates (e.g. Twitter, RSS feeds) technology plays a key role in enabling communication and for this reason it determines the quality of communication in 21st century projects.

6.2.2.5. Communication channels

The PMBOK guide (PMI, 2013) states that one of the two main components of project communication is the knowledge and management of the project's communication channels. Project communication channels are defined as the connections between communicators in a project. The greater the number of project stakeholders/communicators, the greater the number of channels and the more complex the communication issues become (Daim et al., 2012). Since communication channels determine how much communication must take place in a project it also to some extent determines the quality of the project communication.

6.2.2.6. Audience

The audience/communication recipient(s) plays an important role in determining the quality of project communication (Bond-Barnard et al., 2014b, 2013). The potential or expected audience determines whether one will be communicating

one-to-one or with a group and whether this communication will take place face-to-face (in person) or through voice or text.

6.2.2.7. Communications plan

The communications plan is crucial for quality communication because the lack of a plan is a barrier to communication in project (Carvalho, 2008). The project communications plan is used to determine who needs what information, how it will be collected and how it will be transmitted. Modern communications planning focuses on organising and documenting the process, types and expectations of information dissemination throughout the project lifecycle (Lesko and Hollingsworth, 2010).

6.3. Research methodology

It has already been shown that the quality of project communication is determined by the frequency of interaction, communication content, type, access to technology, communication channels, audience and whether there is a communications plan (Bond-Barnard et al., 2014b). To this end it is important to determine how each of these predictors of quality communication is influenced by the use of instant messaging and video conferencing.

6.3.1. Research questions

In this study we try to answer the following seven research questions:

1. For what purposes are instant messaging and video conferencing used?
2. If these tools are used in projects, whom are they used to communicate with?
3. To what extent is instant messaging and video conferencing included in the communications plan of the project?
4. How frequently are instant messaging and video conferencing used to communicate with the project members?

5. What project content is communicated using instant messaging and video conferencing?
6. To what extent is the use of instant messaging and video conferencing influenced by access to technology?
7. What effect does instant messaging and video conferencing communication have on the quality of the communication if the team is geographically dispersed?

6.3.2. Survey administration

The survey method was used to investigate the research questions proposed. A questionnaire was designed for respondents to indicate whether they made use of instant messaging and/or video conferencing both personally and/or for business and how these mediums influenced the quality of the communication they had experienced between themselves and the other stakeholders of projects they had participated in. The questions were phrased to ask the respondents to rate their response, on a 10-point scale, in terms of how they perceived instant messaging and/or video conferencing to influence aspects of their project communication. A sample of the questionnaire is shown in Appendix A. Respondents' profiles and project information were also collected in the survey (shown in Table 11).

Before undertaking an industry-wide survey, a pilot study was conducted among a six member project reference group, explaining the research intent and the questions in order to validate the contents for accurate translation of the research intent. Based on the feedback received, the questionnaire was refined.

Data was collected from a total of 270 international self-selected respondents working on medium size projects in various industries, for both government and private institutions. The target population of the survey in this study was project leaders (which included designations such as project manager, programme manager, project coordinator amongst others), project team members (which included designations such as engineer, contracts manager, implementation engineer, construction manager, technician amongst others), project sponsors

and/or clients and other project stakeholders involved in projects in all types of industries in projects of any size. Table 11 shows the respondents profile for each of the typical roles in the project in terms of gender, age, field of work, nature of business entity and number of stakeholders communicated with in a typical project. The survey was done by means of an online, self-administered questionnaire using Qualtrics.

The questionnaire was distributed by means of posting an invitation and link to the survey on five different open and closed project management LinkedIn groups. The questionnaire was also sent to 19 project management experts who were identified from literature and it was also circulated to all the alumni and current students on part-time masters, graduate diploma and certificate courses of a university. Of the 270 responses received only 213 were valid and complete. Some responses had to be excluded as blocks of information were missing. It suspected that this was due to a problem with saving information when exiting and returning to a questionnaire in Qualtrics. It is not possible to determine the response rate to the survey as the sample population was not known. The valid dataset was then analysed using statistical analysis in the AMOS software environment.

6.4. Results and discussion

The survey responses were analysed in SPSS using statistical tools such as histograms, bar graphs, frequency tables, etc. As an introduction to determining the purpose for instant messaging and video conferencing the respondents were asked which of these two mediums they use to communicate. The results (Table 12) indicated that 32% of respondents use both instant messaging and video conferencing to communicate. A further 43% indicated that they only use instant messaging for communication whereas 13% stated that they only use video conferencing to communicate. Twelve percent of respondents indicated that they used neither mediums for communication they mentioned that the tools that they do use for project communication include email, telephone, newsletters, SMS, face-to-face meetings and tele-conferencing.

Table 11. Summary of respondents' profile by typical project role

	Project leader	Project team member	Project sponsor/ client	Other project stakeholder	Total
Gender of respondents n=210					
Male	35,2%	29,5%	3,3%	5,2%	73,3%
Female	12,9%	12,4%	0,5%	1,0%	26,7%
Total	48,1%	41,9%	3,8%	6,2%	100,0%
Respondent age n=210					
20-29	6,7%	11,9%	0,5%	1,9%	21,0%
30-39	22,4%	21,9%	1,0%	3,3%	48,6%
40-49	11,0%	5,2%	2,4%	0,5%	19,0%
50-59	5,2%	2,9%	0,5%	0,5%	9,0%
60+	2,4%	0,0%	0,0%	0,0%	2,4%
Total	47,6%	41,9%	4,3%	6,2%	100,0%
Principal industry n=210					
Agriculture	0,5%	0,0%	0,0%	0,0%	0,5%
Construction	7,6%	6,7%	0,0%	0,0%	14,3%
Finance, insurance, real estate	1,9%	0,5%	0,0%	0,5%	2,9%
Government	8,6%	5,7%	2,4%	0,5%	17,1%
Health care	1,0%	0,0%	0,0%	0,0%	1,0%
Information technology	3,3%	3,3%	0,0%	0,5%	7,1%
Manufacturing	4,3%	3,3%	0,0%	1,0%	8,6%
Mining	4,3%	5,7%	0,0%	0,5%	10,5%
Services	5,2%	4,8%	0,5%	0,0%	10,5%
Transportation	2,4%	2,9%	0,0%	1,4%	6,7%
Communication, utilities	3,8%	1,4%	0,0%	1,0%	6,2%
Nonprofit	1,0%	0,0%	0,0%	0,0%	1,0%
Other	4,3%	7,6%	1,0%	1,0%	13,8%
Total	48,1%	41,9%	3,8%	6,2%	100,0%
Business entity n=210					
Sole Proprietor	0,5%	0,0%	0,0%	0,0%	0,5%
Closed Corporation	0,0%	1,0%	0,0%	0,0%	1,0%
Private Company	20,5%	19,0%	1,0%	2,9%	43,3%
Public Company	5,7%	4,8%	0,5%	1,0%	11,9%
State Owned Company	10,0%	9,5%	0,5%	1,4%	21,4%
Personal Liability Company	1,0%	0,0%	0,0%	0,0%	1,0%
A not for profit business	0,5%	0,5%	0,0%	0,0%	1,0%
Government	9,5%	6,2%	1,9%	1,0%	18,6%
Other business entity	0,5%	1,0%	0,0%	0,0%	1,4%
Total	48,1%	41,9%	3,8%	6,2%	100,0%
Number of stakeholders communicated with in a typical project n=136					
1 - 5	6,6%	8,8%	0,0%	2,2%	17,6%
6 - 20	30,9%	20,6%	1,5%	4,4%	57,4%
21 - 50	12,5%	5,9%	0,0%	0,7%	19,1%
51 - 100	1,5%	2,2%	0,0%	0,0%	3,7%
101 - 500	1,5%	0,0%	0,0%	0,0%	1,5%
500 and over	0,7%	0,0%	0,0%	0,0%	0,7%
Total	53,7%	37,5%	1,5%	7,4%	100,0%

Some of the reasons that the respondents gave for not using IM or VC included that:

- People are not familiar with instant messaging communication such as BBM or WhatsApp;
- Some companies do not permit the use of instant messaging;
- Instant messaging is not perceived to be a mature form of communication;
- Instant messaging is not perceived to be a professional form of communication;
- Some clients do not have the technology available for IM or VC communication;
- The security of the communication is an issue in some projects and for some companies;
- Project sites are often remote with limited internet access;
- Projects are never urgent and can be attended to by email;
- Their companies are always late adopters of new communication technology;
- Their company does not have a standard instant messaging system;
- Instant messaging and video conferencing communication has never been necessary in their project.

From these findings it is apparent that instant messaging is more widely used than video conferencing. This builds on Harrin (2011, 2010b) in that IM is not only the most widely known CMC medium but it is also one of the most widely used communication platforms.

Table 12. CMC tools respondents use to communicate

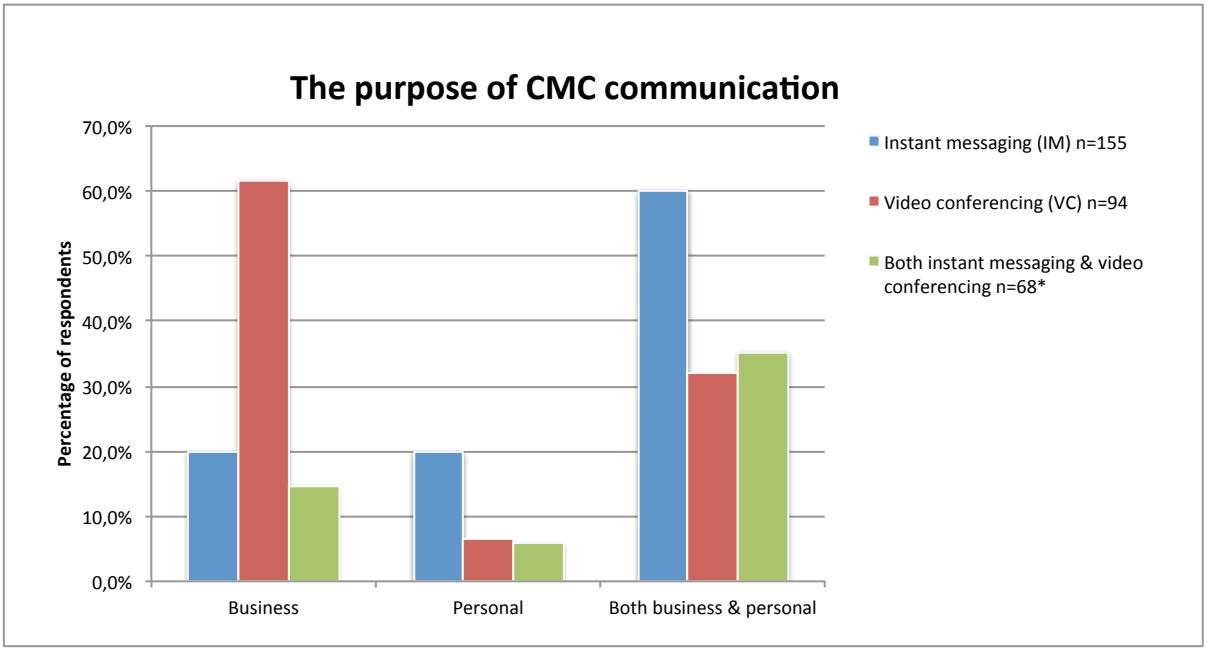
Computer Mediated Communication (CMC) tools used to communicate with others (all that apply were selected) n=210	Percentage of respondents
Instant Messaging, which is the exchange of typed messages between computer users in real time via the Internet.	43%
Video Conferencing, which is a technology that allows users in different locations to hold real-time face-to-face meetings without having to move to a single location	13%
Both Instant Messaging and Video Conferencing	32%
Neither	12%

Computer Mediated Communication (CMC) tools used to communicate with others (all that apply were selected) n=210	Percentage of respondents
Total	100%

When the respondents were asked for what purpose they use these mediums to communicate (see Table 13 and Figure 9), 60% indicated that they use IM for business and personal communication. Similarly, an equal proportion of the remainder replied that they use instant messaging for personal and business communication. The majority of respondents use video conferencing for business communication. Similarly, more of the respondents use both mediums for business communication as opposed to using it for personal communication. This is an interesting finding as it contradicts the general presumption that these tools are used more for personal use than for business (Harrin, 2011, 2010a, 2010b).

Table 13. The purpose of CMC communication per project role

The purpose for using the following CMC tools to communicate	Project leaders	Team members	Sponsor/ client	Other stakeholders	**Total**
Instant messaging business use n=155	10%	8%	1%	1%	**20%**
Instant messaging personal use n=155	12%	5%	1%	3%	**20%**
Instant messaging business & personal use n=155	22%	32%	3%	3%	**60%**
Video conferencing business use n=94	35%	20%	0%	6%	**62%**
Video conferencing personal use n=94	4%	2%	0%	0%	**6%**
Video conferencing business & personal use n=94	14%	15%	0%	3%	**32%**
Instant messaging & video conferencing business use n=68	6%	6%	0%	3%	**15%**
Instant messaging and video conferencing personal use n=68	4%	1%	0%	0%	**6%**
Instant messaging business & video conferencing personal use n=68	0%	0%	0%	0%	**0%**
Instant messaging personal & video conferencing business use n=68	6%	1%	0%	3%	**10%**
Instant messaging business & personal use & video conferencing business use n=68	16%	10%	0%	0%	**26%**
Instant messaging business & personal use & video conferencing personal use n=68	1%	1%	0%	0%	**3%**
Instant messaging business use & video conferencing business & personal use n=68	0%	0%	0%	0%	**0%**
Instant messaging personal use & video conferencing business & personal use n=68	1%	1%	0%	1%	**4%**
Instant messaging & video conferencing business and personal use n=68	15%	18%	0%	3%	**35%**



** Combinations of IM and/or VC, business and/or personal use were excluded from the table for the sake of clarity, please refer to table 3 for this information*

Figure 9. Purpose of CMC tool communication

The second research question aims to determine who the respondents communicate with in the project when they use these mediums. The results in Figure 10 indicate that the majority of respondents that use instant messaging for work communicate mainly with their team members and the project leader. This changes slightly when one looks at the use of video conferencing, where video conferencing is mainly used to communicate with stakeholders, thereafter the project sponsor/client, followed by project team members and finally the project leader. These findings are interesting in that it appears that video conferencing is in general used to communicate with large groups of people such as the other project stakeholders and the project team whereas instant messaging is used more to communicate with individuals such as the project leader and members of the project team. The vast majority of CMC communication takes place between the project team members, which is to be expected as the most communication takes place here.

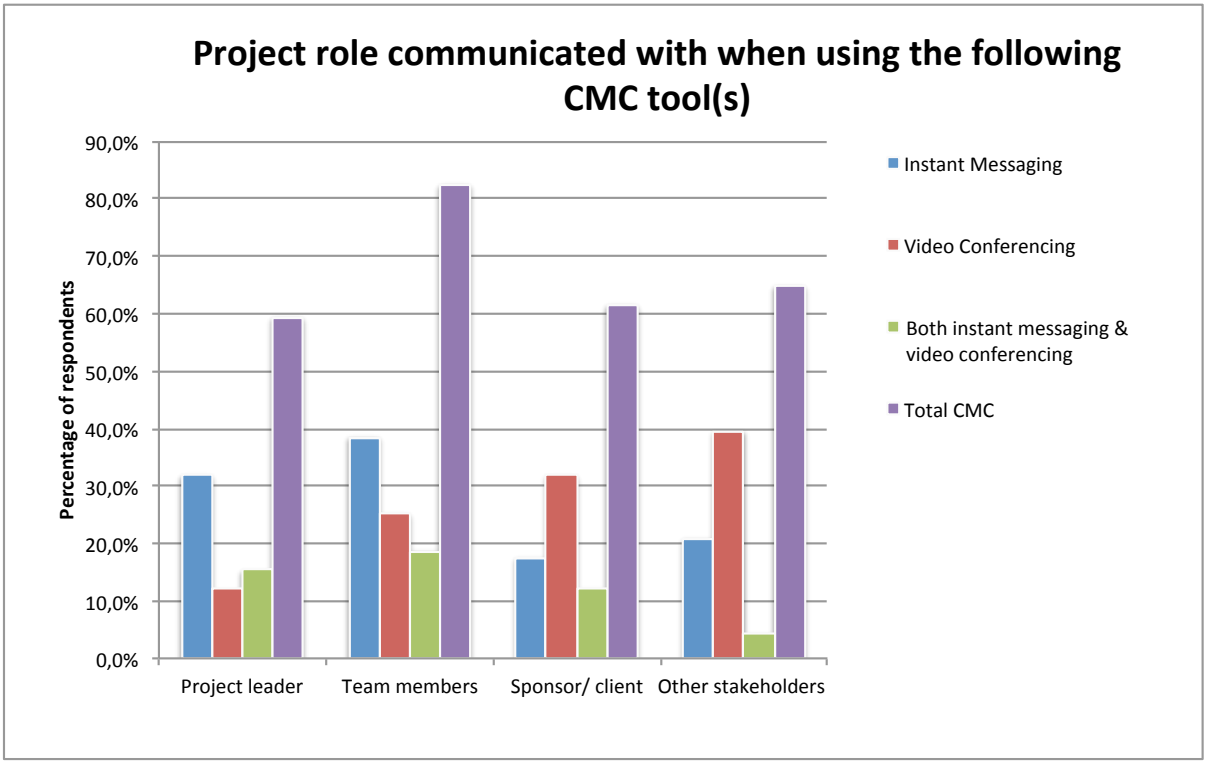


Figure 10. Recipients of CMC communication in projects

The third research question seeks to determine if the use of video conferencing and instant messaging in projects is sanctioned by a communications plan (Table 14). When the respondents were asked whether a communications plan existed for the project 67% responded affirmatively. Eight percent responded that they did not know if there was a communications plan in place and 25% responded that there was no communications plan for the project. Of the respondents that answered in the affirmative (Table 15), 55% stated that the use of CMC or social media tools such as instant messaging and video conferencing was not documented in the said plan. Thirty five percent said that such tools were documented in their communications plan for the project.

Table 14. Project communications plan

Presence of a project communications plan n=137	Percentage
Yes	67%
No	25%
I don't know	8%
Total	100%

Table 15. Use social media tools documented in project communications plan

Use of CMC/social media tools documented in the project communications plan n=137	Percentage
Yes	35%
No	55%
I don't know	4%
Not applicable	6%
Total	100%

Based on these findings it shows that project practitioners still need to be made aware of CMC tools and educated on the use thereof in their projects. This education would go a long way in assisting them to include these tools and mediums in the communications plan for projects because, whether they like it or not, CMC tools are being used in organisations and projects and it would be better to address the use of these tools rather than to ignore their existence. It is essential that the plan clearly states how different types of communication mediums including CMC are to be used to collected and transmit project information. Moreover, a communications plan is crucial for quality communication because a lack of a plan is a barrier to communication in a project (Carvalho, 2008).

When one looks at the frequency with which IM and VC are being used to communicate on a frequent basis, with members of the project team (see Figure 11) it came to light that:

- Instant messaging is being used to communicate with the project leader most of the time.
- Project participants are also most of the time using instant messaging to communicate with other project team members.
- No clear frequency of instant messaging communication is being used when communicating with project sponsors/clients however, it is used quite frequently to communicate with the other project stakeholders.

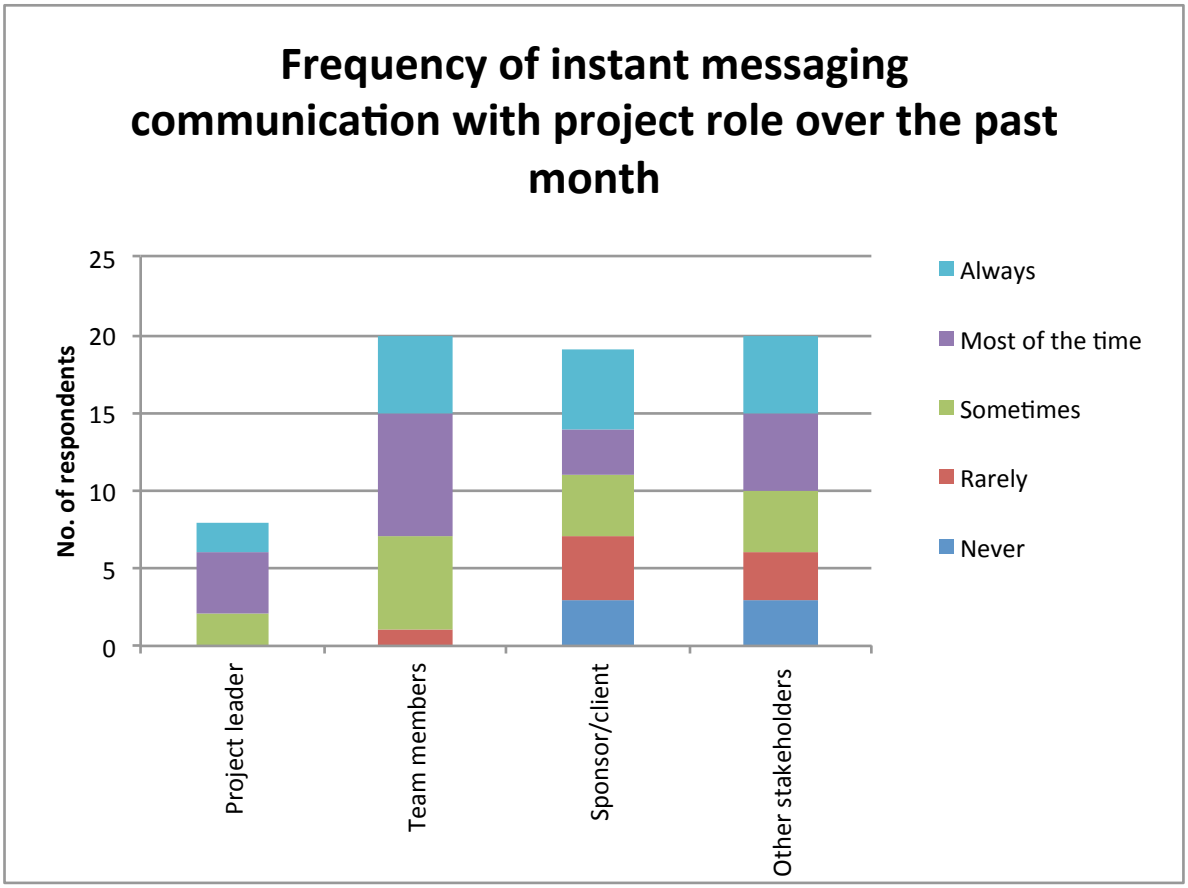


Figure 11. Frequency of IM communication with the various project roles

The frequency of video conferencing communication in projects yielded similar results (see Figure 12) in that:

- Most of the time video conferencing is used to communicate with the project leader, however a greater portion of the respondents indicated that they never, rarely or only sometimes use VC to communicate with the project leader.
- The frequency of VC communication with the project team members ranges from sometimes (majority) to never and always.
- VC is used most of the time to communicate with project sponsors/clients whereas it is only sometimes used to communicate with other stakeholders.

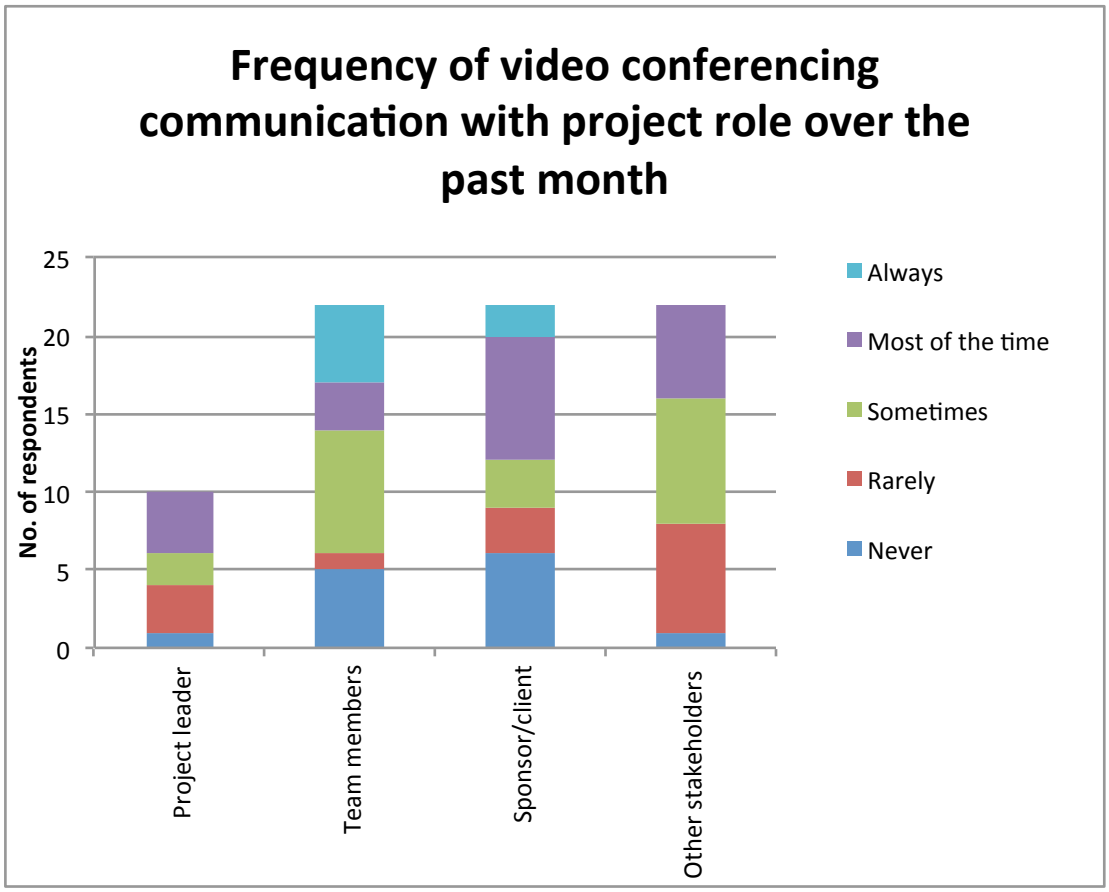


Figure 12. Frequency of VC communication with the various project roles

The respondents were also asked if they use IM and VC to communicate one-to-one or if they use the mediums to communicate with a group. The results indicate that the majority of respondents use IM to communicate one-to-one and the respondents were split as to whether they would use the medium to communicate with a group of people. The results for video conferencing indicated the opposite in that the respondents use video conferencing to communicate one-to-one to a lesser extent and to communicate with a group of people, to a greater extent.

The fifth research question investigates the contents of instant messaging and video conferencing communication that occurs in projects. Müller (2001) found that the content of quality project communication falls into one of the six categories listed in Figure 13. The results of the survey showed that the majority of instant messaging project content consisted of issues/risks and open items, status and achievement updates, project changes/amendments and technical aspects. It

appears as if IM content generally consists of urgent questions regarding project activities that might have gone wrong or turned out differently than expected; hence risks, project changes and technical aspects. IM also seems to be used for communicating project successes and updates as they happen. Some of the other IM content that was mentioned by the respondents was the communication of quick project information, task allocations, incomplete project handover details, an issues relating to expired warranties.

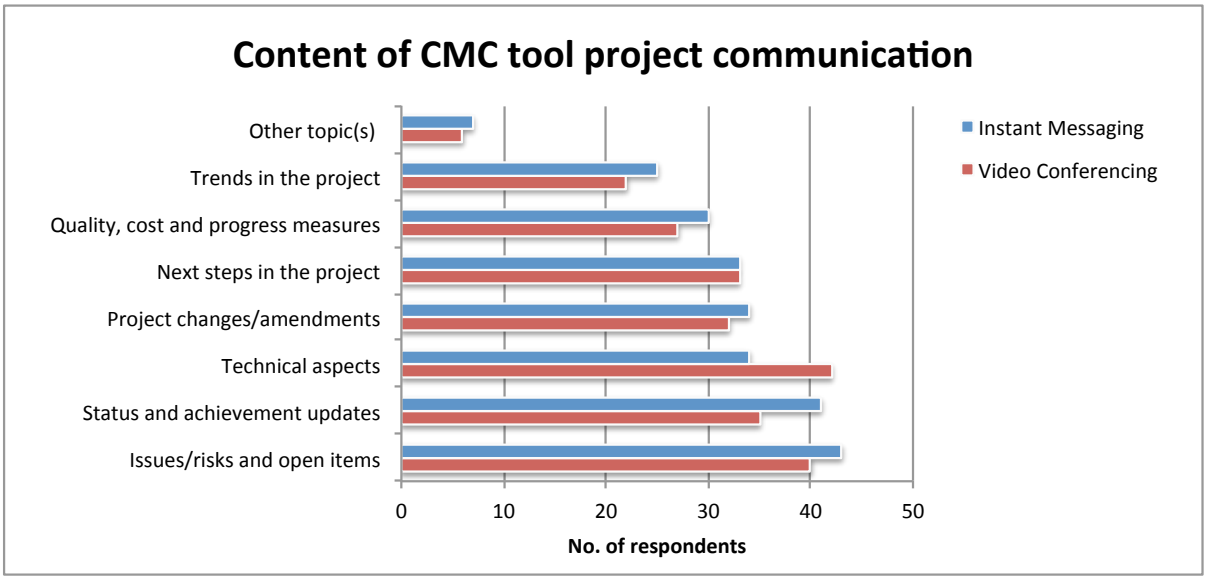


Figure 13. Content of CMC communication in projects

Likewise, the results for video conferencing, presented in Figure 13, indicate that the majority of its content in projects is characterised by technical aspects followed by issues/risks and open items and status and achievement updates. The difference between IM and VC is that it appears as if VC is used more often to obtain input (possibly from outside the project) regarding complicated technical aspects in the project. The reason for this may be that video conferencing is a much richer medium than IM as more information can be communicated such as detailed explanations, body language and voice inflections. In depth discussions can also take place more easily using VC than IM. The respondents mentioned that they also use video conferencing to communicate project closeout issues, project timelines and use it for crisis management.

The survey participants were asked if they perceived the content of their IM and VC communication to be of a formal (regimented, deliberate, impersonal) or more informal (spontaneous, casual, familiar) nature (Figure 14). The response was that 57% perceived the content of their IM communication to be more informal nature whereas 66% of the respondents perceived their VC communication to be more formal. This finding contradicts literature as written communication such as letters and emails are conventionally perceived to be more formal than verbal communication such as face-to-face or telephonic conversations (Turner and Müller, 2004). In this instance the written or typed instant messages are perceived to be a more informal form of communication than the verbal and visual communication of video conferencing.

The sixth research question investigates whether the use of instant messaging and video conferencing is determined by a person's access to technology (Figure 15). The response was that 69% felt that access to technology such as to internet, a computer and/or IM software does affect one's use of instant messaging as a communication medium. Similarly, 74% of respondents felt that access to technology such as internet, a webcam, a computer and/or VC software affected their use of video conferencing as a communication tool. These findings correspond with Ferreira in Carvalho (2008) in that technology can cause physical communication barriers to information transmission. It is also important to note that technology can significantly contribute to the breakdown of communication in a project if all aspects of its use are not taken into consideration when writing the communications plan (Carvalho, 2008; Daim et al., 2012).

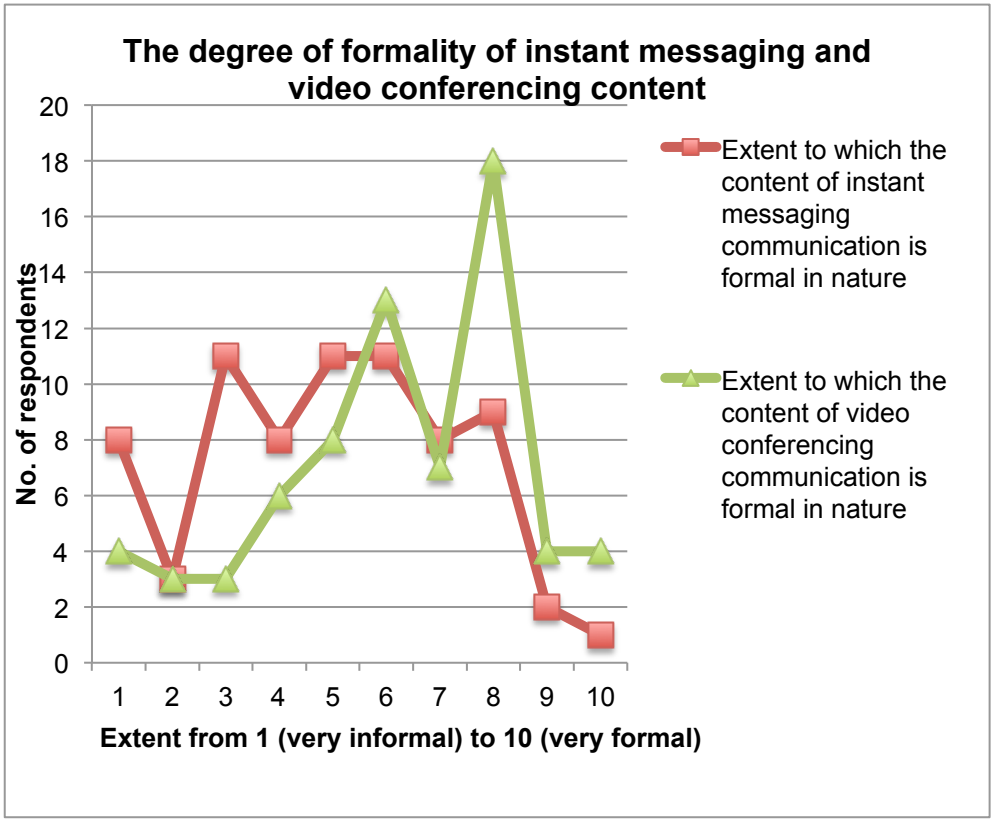


Figure 14. Extent of project CMC content formality

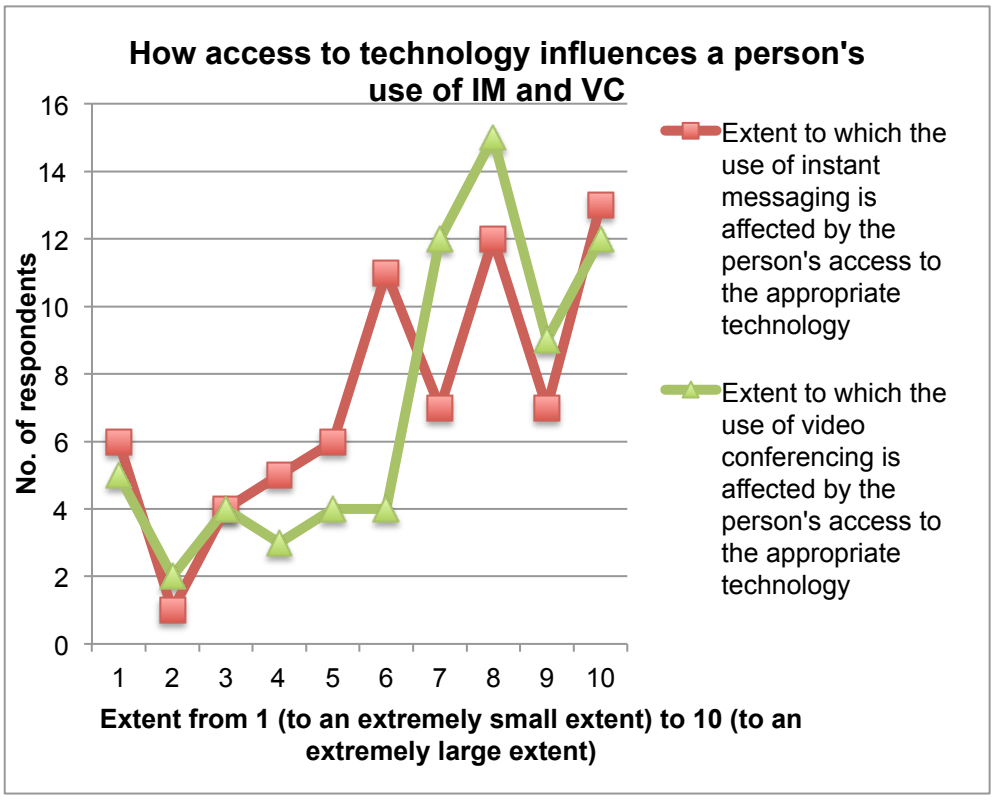


Figure 15. How access to technology determines a person's use of CMC tools

The final research question investigates whether IM and VC communication has an effect on the quality of communication if the team is geographically dispersed. As part of this question the survey participants were also asked to what extent instant messaging and video conferencing communication lead to more appropriate (increased amount) project communication (see Figure 16 for results). Sixty two percent stated that instant messaging communication to various degrees lead to an increased amount of project communication. Likewise 62% of the respondents also perceived video conferencing communication to lead to an increased amount of project communication. This finding is very positive for project communication as frequent communication between the project team members is beneficial because timely communication in projects results in the completion of projects and project success (Dalcher, 2009; PMI, 2013).

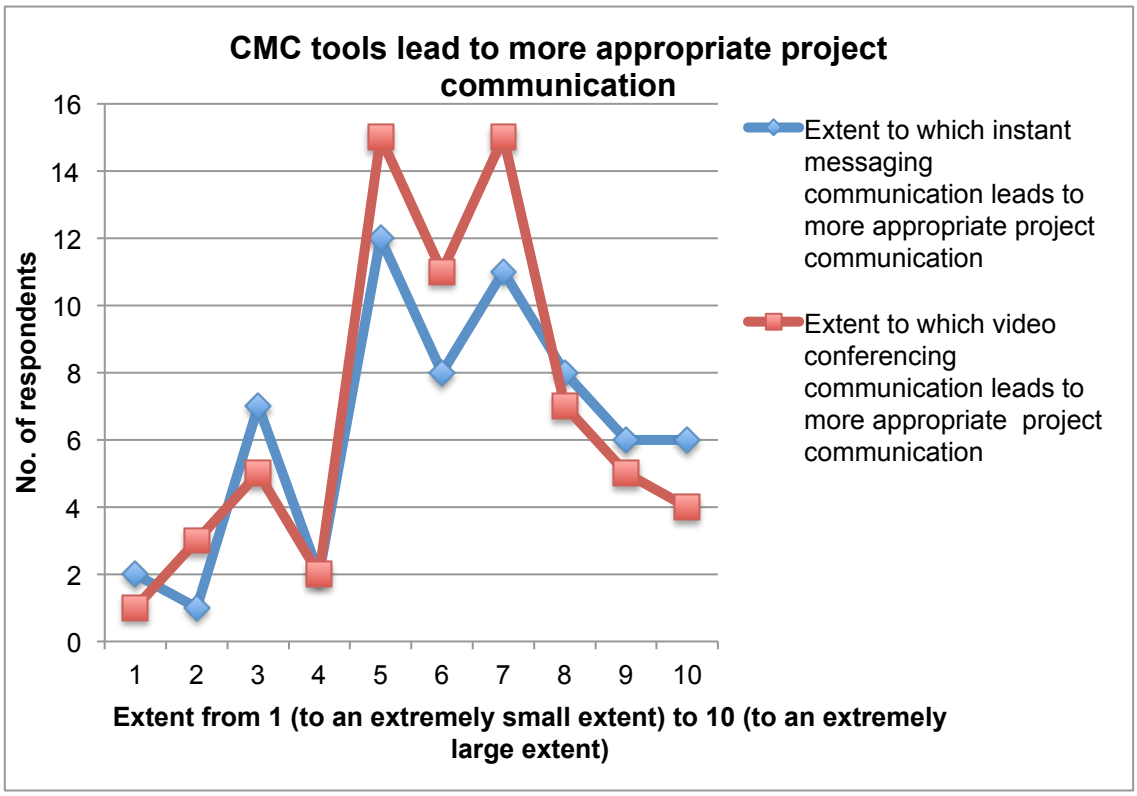


Figure 16. The extent to which CMC tools lead to more project communication

A question was also posed to the survey participants to determine from them if IM or VC communication in projects increases or decreases the quality/effectiveness

of the communication if the team is geographically dispersed (see Figure 17 and Figure 18). It was established that 84% found instant messaging and 88% found video conferencing to increase the quality or effectiveness of the communication if the team was geographically dispersed. These findings show that the use of IM and VC encourages timely communication in projects which would counteract the decrease in frequency of interaction that occurs when project teams are not co-located such as in the case of virtual teams (Dietrich et al., 2010; Van den Bulte and Moenaert, 1998).

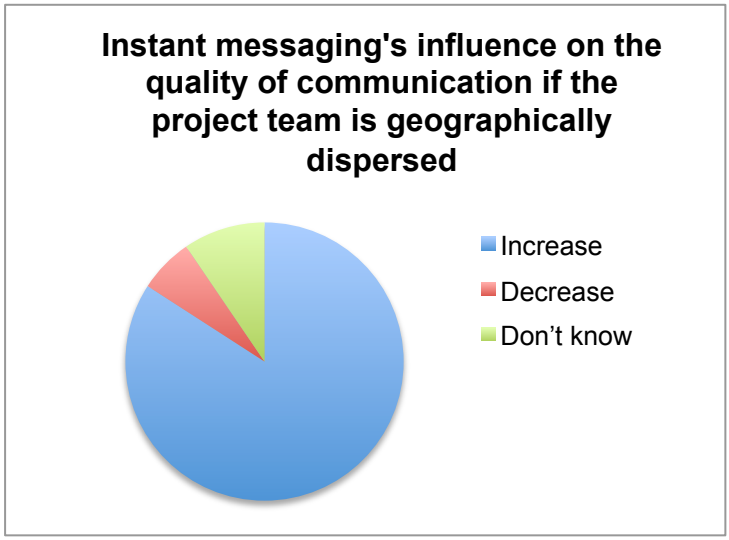


Figure 17. Influence of instant messaging on the quality of communication in geographically dispersed projects

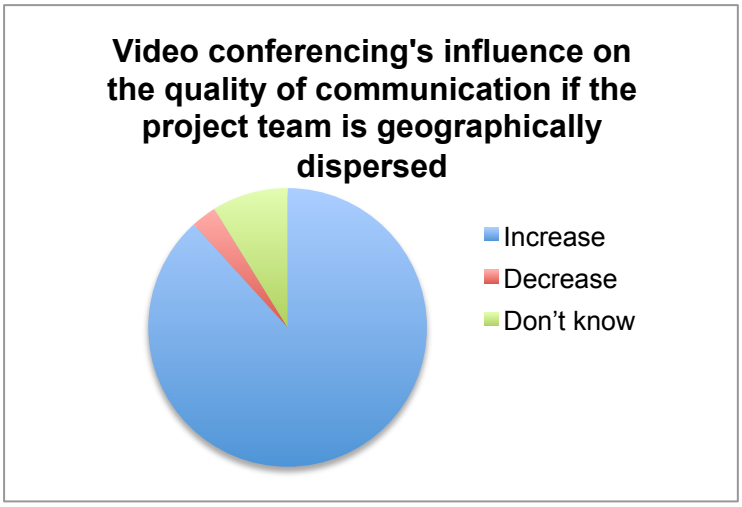


Figure 18. Influence of video conferencing on the quality of communication in geographically dispersed projects

6.5. Conclusions

This paper set out to determine the extent to which computer-mediated communication (CMC) methods such as instant messaging (IM) and video conferencing (VC) is being used for communication in projects and its impact on the quality thereof. It was found that the prevalence of instant messaging and video conferencing use in projects was medium to low. As 32% of respondents use both mediums to communicate and 43% only use IM compared to the 12% that only use VC. The study found that instant messaging tends to be used in equal measure for business and personal communication, whereas video conferencing is primarily used for business communication. This was an interesting finding as the authors' perception before conducting the research was that both these mediums were used more for personal communication than for business.

The second objective of the study was to determine the influence of these mediums on the quality of communication in a project. Quality communication in a project is determined by the communication channels, communications plan, audience, communication content, technology, type and frequency of interaction in the project. Each of these factors are discussed in more detail below.

The research found that the 57% of the respondents that use IM and/or VC in projects have between 6 and 20 stakeholders with which they need to communicate. Thus IM and VC is generally used in projects where there are few to a moderate number of communication channels.

A communications plan was in place for 67% of the projects with which the respondents were involved however the majority said that the use of CMC tools was not covered by these communications plans.

The project audience for IM and VC communication differed as IM is used to communicate one-to-one with people whereas VC is mainly used to communicate with groups.

The study found there to be a difference between the content of IM and VC communication. IM content was characterised by quick discussions regarding day-to-day issues and providing status updates as well as quick responses to technical questions on the project whereas VC content was characterised by in-depth discussions of technical issues as well as discussions regarding issues/risks, open items and status updates.

Access to the appropriate technology determined to a large extent, the respondent's use of IM and VC tools.

The study also investigated the respondents' perception of the formality of the two mediums (as it relates to the communication type) and it was found that IM is perceived to be a more informal way of communicating as opposed to VC which is perceived to be somewhat more formal.

Data relating to the frequency of interaction for the two mediums determined that instant messaging is mainly used to communicate one-to-one with the project leader, team members and stakeholders whereas video conferencing is used for communicating with groups in the project such as the team members, stakeholders and representatives of the client.

Finally, the survey indicated that both mediums lead to an increased amount of communication in the project and that this subsequently increased the quality or effectiveness of the communication where the project team was geographically dispersed.

In conclusion the study found that instant messaging and video conferencing are being used significantly to communicate in projects and both can have a positive effect on the quality of project communication as they add significant value to various aspects of the communication process that occurs in projects. The research was limited by a small sample size. Further research regarding the impact of other forms of CMC on project communication is encouraged. Moreover

research on how and when to use different types of CMC during the various stages or phases of a project would also be interesting.

Appendix A. Sample questionnaire relating to frequency of interaction

Excerpt of the sample questionnaire	Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent) **1 2 3 4 5 6 7 8 9 10**
To what extent does instant messaging (IM) communication lead to more appropriate (increased amount) project communication?	
To what extent does video conferencing communication lead to more appropriate (increased amount) project communication?	

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Chapter 7

Conclusions

7.1. Introduction

To ensure success, project managers spend much time communicating with team members and other stakeholders. The importance of 'human factors' such as communication, trust and collaboration amongst the project team members to ensure project success, is emphasized in literature. But how does the project manager know if he is communicating effectively, building collaboration and trust in his team and if this will ultimately have an effect on the success of the project? Similarly, if the project manager is making use of a programme call centre or computer mediated communication (CMC) does he know what influence this will have on the quality of the communication in his project?

The scientific relevance of this research is to obtain greater insight and expand on the theory underlying project communication management and its influence on project success. Few studies have theoretically determined and empirically modelled the interdependencies among these factors nor have the measurable variables of each factor been identified. Furthermore, the influence of programme call centres and CMC on the quality of project communication has not been established. Therefore, the following main research question can be stated:

How does project communication influence the perceived success of the project?

To answer the above over-arching question, a relational approach was used in three studies reported in Chapter 2, Chapter 3 and Chapter 4, in which the relationship between project communication, trust, collaboration and success is explored. In addition to investigating the influence of a programme call centre and CMC on the quality of project communication, which is reported in Chapter 5 and Chapter 6 respectively.

Each study addresses a specific sub-question:

- Chapter 2 answers the theoretical sub-question 1: *Which human factors in conjunction with project communication influence the perceived success of a project?*
- Chapter 3 answers the empirical sub-question 2: *How is project success influenced by the quality of communication, level of trust and degree of collaboration between project team members?*
- Chapter 4 answers the empirical sub-question 3: *What is the impact of a call centre on communication in a programme and its projects?*
- Chapter 5 answers the empirical sub-question 4: *What are the programme benefits of improving team communication in its projects using a contact centre?*
- Chapter 6 answers the empirical sub-question 5: *What is the impact of instant messaging and video conferencing on the quality of project communication?*

The next section of this concluding chapter will provide a theoretical summary of the relational human factors model put forward in this research. The subsequent section will discuss the main outcomes of the empirical studies reported in Chapters 3 to 6. Section 7.4 addresses the theoretical and practical relevance of the human project success factors model as well as the relevance of the findings regarding the influence of a programme call centre and CMC on the quality of communication experienced in a project. Lastly, the limitations of this study and possible future research directions will be explicated in Section 7.5.

7.2. Theoretical framework

The initial aim of the study was to determine how project communication influences project success. After an extensive study of literature (details in Chapter 2) it became apparent that project communication influences the perceived success of a project both directly and indirectly through its influence on other human factors in the project. Based on this finding, the following objectives were defined to guide the research:

- Identify the **main** 'human-related' success factors or constructs that play a role in determining project success. (Limited to those uncovered by the literature study in Chapter 2).
- Establish which elements/variables determine the main 'human-related' success factors.
- Specify a 'human-related' factors model for achieving project success.

It was determined from literature that quality communication, a high level of trust and a high degree of collaboration amongst the project team members, are the main 'human-related' success factors, which ensure project success. The identification of these main 'human-related' success factors is also based on a empirical study done in Chapter 4 which found that there was a relationship between project communication, collaboration, trust and project performance. The 'human-related' success factors and criteria are but one of the three legs that together ensure project success; the other two legs are (a) project performance and (b) knowledge integration and innovation.

Once the relationship between the main human success factors of communication, trust, collaboration and success had been theoretically established, literature was again used to determine which variables determine these main factors. It was found that the quality of communication in a project is determined by:

- whether there is a communications plan in place,
- access to and the way in which technology is utilised for communication,
- the frequency of interaction,
- the communication content,
- a balance between different types of communication,
- the number of communication channels in the project and
- the way in which information is communicated to the project audience.

The level of trust in the project is determined by:

- the degree of knowledge exchange taking place in the project,
- whether imported trust is present in the project or not,

- how risks are addressed and
- whether the project team meets each other's expectations and/or that of the stakeholder.

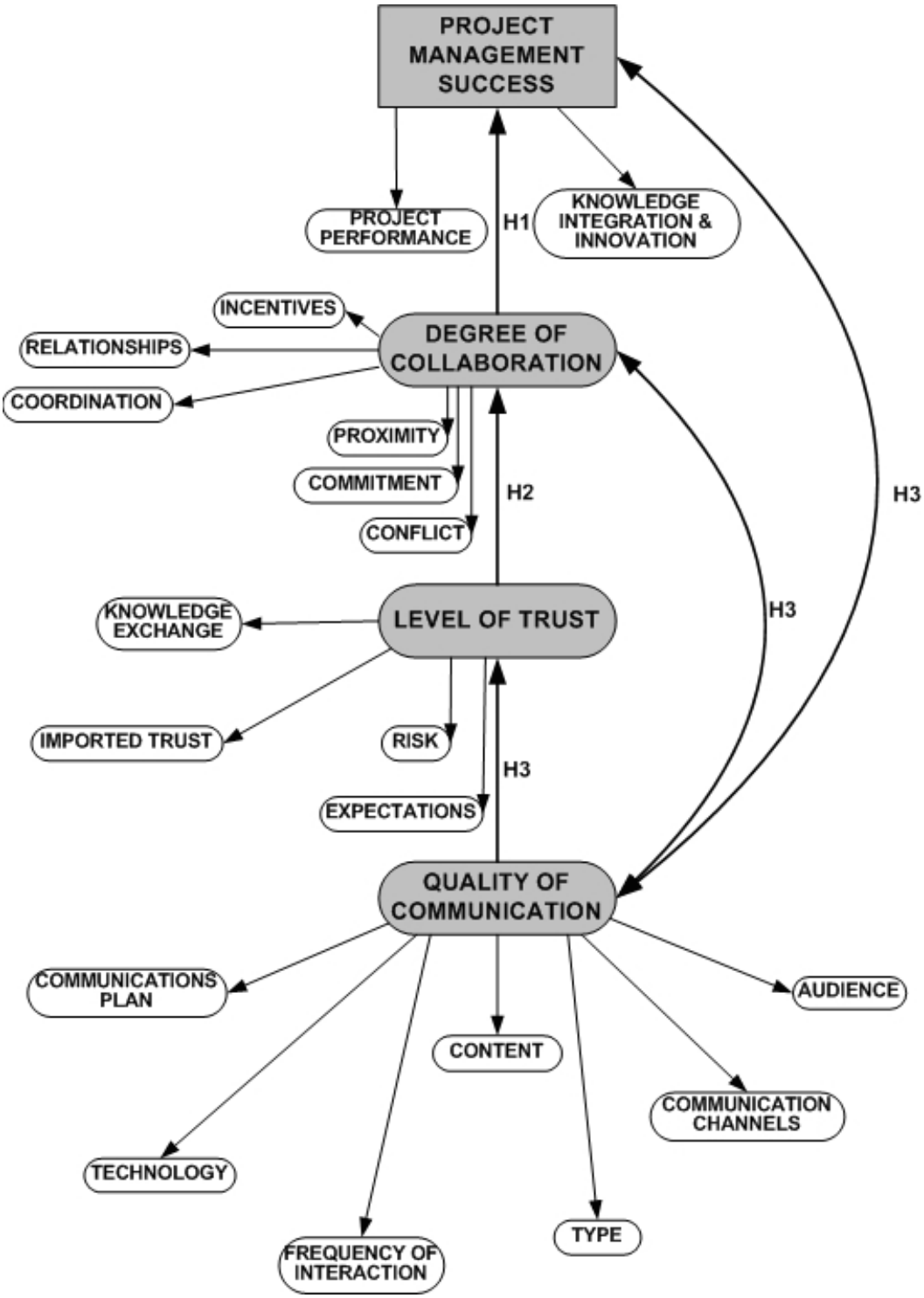

Figure 19. Specification of a 'human-related' project success model

The elements that determine the degree of collaboration include:

- the nature and strength of project relationships,
- coordination and cohesion amongst the team members,
- the proximity of team members to each other,
- the nature and alignment of member incentives,
- team member commitment to the project objectives and
- degree of conflict resolution.

Once the determining variables for project communication, trust and collaboration had been established the next objective was to specify a 'human-related' factors model for achieving project success. The specification of this model is shown in Figure 19. The model provided the theoretical framework, which was empirically verified in Chapter 3 using structural equation modelling. The following hypotheses, derived from literature and tested in Chapter 3 are indicated by H1, H2 and H3 in the model in Figure 19.

Hypothesis 1. Project success becomes better as the degree of collaboration becomes better.

Hypothesis 2. The degree of collaboration increases as the level of trust in the project increases.

Hypothesis 3. The quality of communication in the project has a direct positive effect on the level of trust, degree of collaboration and perception success in the project.

To explore the framework further, four empirical studies were performed to address four topics: empirical confirmation of the project success model (Chapter 3), the impact of a call centre on communication in a programme and its projects (Chapter 4), the programme benefits of improving team communication in its projects using a call centre (Chapter 5) and the influence of CMC instant messaging and video conferencing on the quality of project communication (Chapter 6). The next section will provide a summary of the empirical findings and interpretations of these four empirical studies.

7.3. Main empirical findings and interpretations

7.3.1. Empirical confirmation of the project success model

The results of the first empirical study are reported in Chapter 3. It confirms that the theoretical propositions of Chapter 2 can be empirically verified. Structural equation modelling techniques were used in this chapter to empirically verify the theoretical model proposed in Chapter 2 and shown in Figure 19. The model, in spite of a relatively small sample size, produced good results which are commensurate with similar studies (Doloi et al., 2011). Empirical evidence is provided that indicates that project success is positively influenced by the degree of collaboration and indirectly by the level of trust between project team members based on a foundation of quality of communication. It was however not possible to model the influence of the quality of communication on the other constructs and on the success of the project due to insufficient data. The quality of communication in a project is nevertheless still essential in a project to provide the foundation on which trust and collaboration flourish. It was determined that the level of trust in a project is influenced by:

- the expectations that the project team have of each other,
- the knowledge exchange that takes place between them and
- the degree of trust that is imported from other familiar settings (imported trust).

The degree of risk present in the project was found to have no significant link with the level of trust experienced in the project. This alters the widely accepted view that the relationship between risk and trust is reciprocal; and in contrast to the results published by Daim et al. (2012) which contended that an acceptable degree of risk is responsible for an increase in the level of trust in a project.

This study similarly found that the degree of collaboration in a project is influenced by:

- the physical proximity between its team members,
- the commitment the team members have towards the project,

- conflict between the team members where less conflict improves the collaboration,
- the degree of coordination in the project team,
- the strength of the relationships between team members and other stakeholders and
- a balance of intrinsic and extrinsic incentives.

Overall the key findings provided an interesting insight into the concept of human-related success factors in projects. Moreover, a refined empirical model (see Figure 20) is put forward to show that project success is positively influenced by the degree of collaboration and indirectly by the level of trust between project team members based on a foundation of quality of communication.

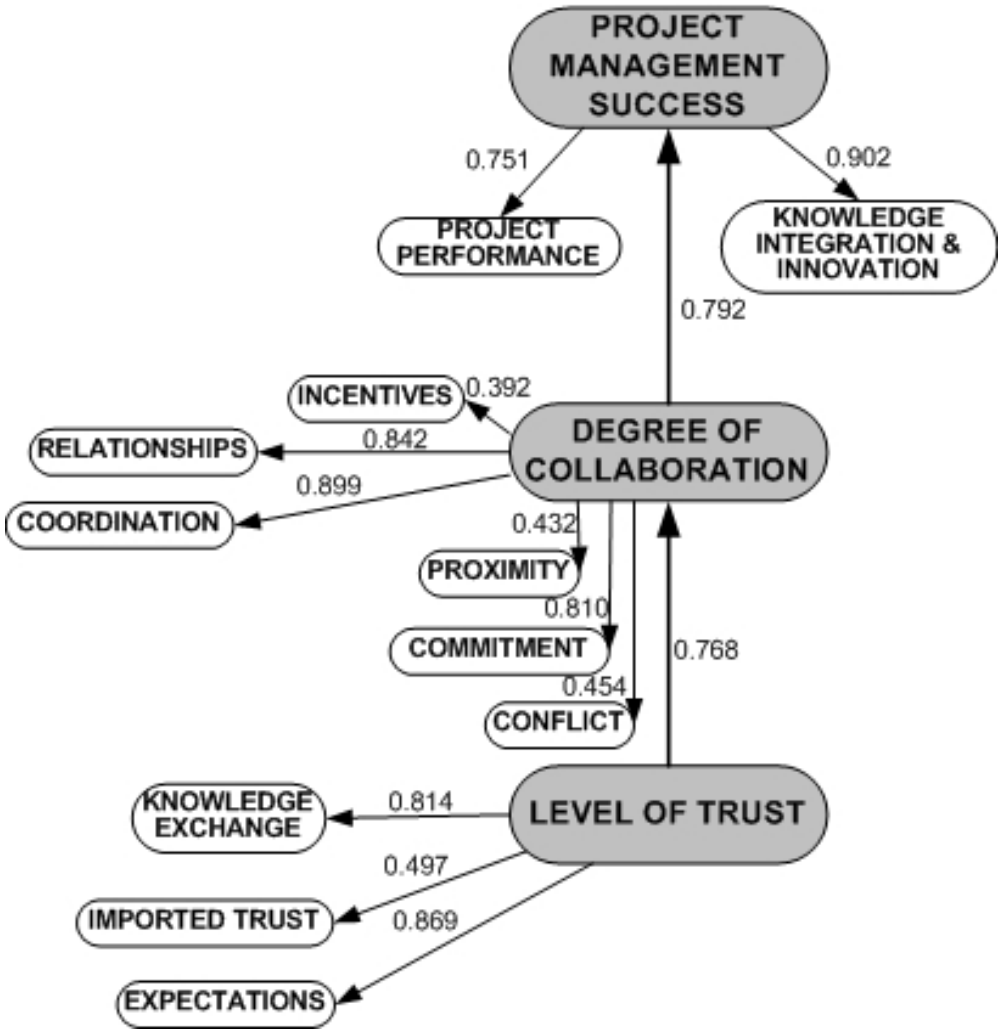

Figure 20. Final model with standardized path coefficients

7.3.2. The impact of a call centre on communication in a programme and its projects

An exploratory approach to understanding the facets of project communication was used in Chapter 4. This study provides some interesting insight into the role that call centres can play in projects. Even though the response rate may be considered low the study provides sufficient evidence of the positive role that a call centre can play in facilitating and managing communication to aid project performance; to warrant further research in the subject.

Chapter 4 proposes that call centres can provide the correct combination of informal and formal communication to increase the communication, collaboration and trust between principals and agents in a project. Moreover; call centres can improve the client's perception of service delivery and customer satisfaction. The quality of project deliverables and the overall performance of the project can also benefit from the functions performed by a programme call centre. The results support Turner and Müller's (2004) research which states that:

1. trust exists where informal communication is used,
2. frequent informal and formal communication, written and verbal, breed collaboration which increases the trust the principal has in the agent and improves his service delivery experience (Müller, 2003) and that
3. collaboration is a key condition for high performance in projects.

The questions raised in this chapter are answered in that it is established that the functions performed by the call centre increase the frequency of project team communication and contribute to the team's perception of project performance within the RAMP programme. Furthermore, in the study frequent call centre communication leads to the avoidance of project surprises this in turn contributes to collaboration and trust.

This chapter provides evidence that the RAMP Call Centre effectively facilitates and manages the repair and maintenance programme project communication and the perception of 73.8%, 52.9% and 81.3% of the project managers, contractors and clients respectively is that the functions performed by the call centre improves the performance of their RAMP projects.

The study emphasises the practical value of call centres for programmes such as the one described in this study. While this study specifically investigated the role of call centres in communication within a programme comprising of small projects, the results seem to provide some substantiation of the validity of the principal–agency theory in projects in general.

7.3.3. The programme benefits of improving team communication in its projects using a contact centre

The purpose of Chapter 5 is to determine if there are any programme benefits to improving the projects' team communication through the use of a contact centre. This empirical study follows on from the empirical study done in Chapter 4 in which it was established that the functions performed by the programme call/contact centre increases the frequency of project team communication and contributes to the team's perception of project performance. Chapter 5 ties in with the main purpose of this thesis in that it determines the larger impact of improved project communication, which forms the foundation of the model put forward in this thesis.

The results of the chapter show that when the contact centre is used in the RAMP programme to facilitate and manage the communication between team members in the projects, several benefits are realised. The study also determines the value that the RAMP Contact Centre adds to the programme. This finding validates the national expenditure for the programme and ensures it continued support. Furthermore support for the call centre facilitated communication and project performance model, which is put forward in Chapter 4, is also obtained from this study.

Most notably in the case of RAMP investigated in Chapter 5, customer satisfaction is perceived to improve as it provides the numerous clients and beneficiaries of the programme immediate access to communicate their breakdowns to the rest of the project team by making use of a central contact point a.k.a the RAMP Contact Centre, in this instance. By using the breakdown communication and regular reporting functionalities of the Contact Centre the project teams' communication improves. The project team perceives the Contact Centre to be effective in its task of managing breakdown communication between the project team members and in assisting the project team to improve the quality of project deliverables by keeping the client informed regarding progress and giving him a channel of communication with the project team, should a project issue occur.

Other benefits which occur, as a direct result of the improved communication between the team members, is that the quality of project deliverables improves as a result of the communication between the Contact Centre and the project manager, contractor and client. The improved quality of deliverables also influences the level of service delivery perceived and experienced by the members of the project team, especially the clients. The majority (93%) of the programme participants perceived that service delivery improves due to the frequent interaction between the RAMP Contact Centre and the project team members. In conclusion, the RAMP Contact Centre improves the communication between team members in the project, as well as the project team's perception of the quality of project deliverables, service delivery and customer satisfaction.

7.3.4. The influence of CMC instant messaging and video conferencing on the quality of project communication

Chapter 6 sets out to determine the extent to which computer-mediated communication (CMC) methods such as instant messaging (IM) and video conferencing (VC) are being used for communication in projects and its impact on the quality thereof. The way in which this chapter relates to the main research question of this thesis is that it investigates how the quality of communication in a project (which forms the basis of the model put forward in this thesis) is affected by

modern communication mediums such as instant messaging and video conferencing. One can no longer just assume that all communication in a project takes place face-to-face or using traditional communication methods such as by telephone. This chapter investigates the phenomenon of computer-mediated communication and its influence on the empirically confirmed variables (as per Chapter 3) that determine quality project communication.

It is found in Chapter 6 that the prevalence of instant messaging and video conferencing use in projects was medium to low. As 32% of respondents use both mediums to communicate and 43% only use IM compared to the 12% that only use VC. The study found that instant messaging tends to be used in equal measure for business and personal communication, whereas video conferencing is primarily used for business communication. This was an interesting finding as the author's perception before conducting the research was that both these mediums were used more for personal communication than for business.

The second objective of the chapter was to determine the influence of these mediums on the quality of communication in a project. Quality communication in a project is determined by the communication channels, communications plan, audience, communication content, technology, type and frequency of interaction in the project. Each of these factors is discussed in more detail below.

The research found that the 57% of the respondents that use IM and/or VC in projects have between 6 and 20 stakeholders with which they need to communicate. Thus IM and VC is generally used in projects where there are few to a moderate number of communication channels.

A communications plan was in place for 67% of the projects with which the respondents were involved however the majority said that the use of CMC tools was not covered by these communications plans.

The project audience for IM and VC communication differed as IM is used to communicate one-to-one with people whereas VC is mainly used to communicate with groups.

The study found there to be a difference between the content of IM and VC communication. IM content was characterised by quick discussions regarding day-to-day issues and providing status updates as well as quick responses to technical questions on the project whereas VC content was characterised by in-depth discussions of technical issues as well as discussions regarding issues/risks, open items and status updates.

Access to the appropriate technology determined to a large extent, the respondent's use of IM and VC tools.

The study also investigated the respondents' perceptions of the formality of the two mediums (as it relates to the communication type) and it was found that IM is perceived to be a more informal way of communicating as opposed to VC which is perceived to be somewhat more formal.

Data relating to the frequency of interaction for the two mediums determined that instant messaging is mainly used to communicate one-to-one with the project manager, team members and stakeholders whereas video conferencing is used for communicating with groups in the project such as the team members, stakeholders and representatives of the client.

Finally, the survey indicated that both mediums lead to an increased amount of communication in the project and that this subsequently increased the quality or effectiveness of the communication where the project team was geographically dispersed.

In conclusion, Chapter 6 found that instant messaging and video conferencing are significantly being used to communicate in projects and both mediums can have a

positive effect on the quality of project communication as they add significant value to various aspects of the communication process that occurs in projects.

7.4. Implications to theory and practise

7.4.1. Implications to theory

This research is theoretically relevant because it proposes and empirically confirms a SEM model of the relationship between project success and the degree of collaboration, level of trust and quality of communication in a project. The model indicates that project success is positively influenced by the degree of collaboration and indirectly by the level of trust between project team members based on a foundation of quality of communication. Furthermore, the influence of a programme call centre, instant messaging and video conferencing on the quality of communication in a project is also empirically determined.

The theoretical implications of the programme call centre findings in Chapter 4 on the model and project communication include:

- The functions performed by a programme call centre increase the frequency of project team communication.
- The call centre contributes to the team's perception of project performance within the programme.
- The frequent call centre communication leads to the avoidance of project surprises this in turn contributes to collaboration and trust.
- It was confirmed that trust exists where informal communication is used as in Turner and Müller (2004).
- It was confirmed that frequent informal and formal communication, written and verbal, breed collaboration which increases the trust the principal has in the agent and improves his service delivery experience as in (Müller, 2003).
- It was confirmed that collaboration is a key condition for high performance in projects as in Turner and Müller (2004).

- The benefits of a programme call centre are improved team communication in the projects, better quality of project deliverables, service delivery and customer satisfaction.

The theoretical implication of instant messaging and video conferencing use on the quality of communication in a project include (details in Chapter 6):

- Both mediums increase the amount of communication in the project.
- Both mediums increase the quality or effectiveness of the communication in projects where the project team is geographically dispersed.

Based on the above theoretical findings the main contribution of this study is that it explains how project communication influences the perceived success of a project both theoretically and empirically. The theoretical outcome of this research is that it enhances existing knowledge of project communication, trust, collaboration and project success.

7.4.2. Implications to practice

This study provides many practical applications and insights for better communication management. It educates project managers as to the influence of programme call centres and computer mediated communication (which are widely used) on the quality of communication in a project as an entry point to understanding how communication, trust and collaboration leads to a more successful project.

The practical applications of the findings in this thesis include:

1. The quality of communication in a project can be improved by:
    - putting a communications plan in place,
    - looking at access to technology in the project and the way in which technology is utilised for communication,
    - the frequency of interaction,
    - the communication content,
    - a balance between different types of communication,

- making provision for the number of communication channels in the project and
- the way in which information is communicated to the project audience.

2. The level of trust in a project can be improved by:
   - identifying and addressing the expectations that the project team have of each other,
   - promoting knowledge exchange between team members and
   - importing trust from another familiar setting at the start of the project.

3. The degree of collaboration in a project can be improved by:
   - trying as far as possible to maintain physical proximity between team members,
   - increasing the commitment the team members have towards the project,
   - addressing or reducing conflict between the team members,
   - promoting coordination in the project team,
   - strengthening the relationships between team members and other stakeholders and
   - ensuring a balance of intrinsic and extrinsic incentives for project team members.

4. Instant messaging and video conferencing can benefit the project by:
   - Promoting the use of IM and VC for project communication.
   - Using IM and/or VC in projects where there are between 6 and 20 stakeholders i.e. few to a moderate number of communication channels.
   - Drafting a communications plan for the project and addressing the use of CMC tools in said plan.

- Using IM to communicate one-to-one with people and using VC to communicate with groups of people in the project.
- Using IM to communication day-to-day project issues and providing status updates as well as quick responses to technical questions.
- Using VC for in-depth discussions of technical issues as well as discussions regarding issues/risks, open items and status updates.
- Allowing team members access to the appropriate IM and VC technology in the project.
- Using IM for informal, internal project communication with the team members and project manager.
- Using VC for formal, external project communication with the client and other stakeholders.
- Using IM to communicate one-to-one with the project manager, team members and stakeholders.
- Using VC to communicate with groups in the project such as team members, stakeholders and representatives of the client.

7.5. Limitations and future research

The research was limited in the first instance by the human-related success factors uncovered during the literature study. It is possible that there could have been more.

The research was limited in the second instance by a relatively small sample size and for this reason it was not possible to model the influence of the quality of communication on the other factors and on the success of the project. In this respect, it is suggested that more research be done to model the quality of communication with a larger sample size. Furthermore, similar research conducted elsewhere with a large sample size would also provide for more realistic estimations of impacts and accuracy of results asserted in the SEM analysis.

Overall the key findings relating to the SEM model provided an interesting insight into the concept of human-related success factors in projects. However a case study based analysis on a number of successful and failed projects where the focus is on the extent of communication, trust and collaboration in the project may further validate the findings from a practical perspective. The contrast between the successful and failed projects will be an important determination to highlight any distinctions between the factors impacting on success.

Based on the theoretical study conducted in Chapter 2 a recommendation for future research could also include:

- Enriching the study by conducting a qualitative case study or expert panel discussion.
- Determination of the type or level of the factors that determine the quality of communication, level of trust and degree of collaboration which is required in each phase of the project life cycle in order to achieve project success at the end.
- Investigating the suitability of the theory developed in this study within the context of the Management of Projects (MoP) paradigm (Morris, 1994).
- Determination of the role that the project manager and various other stakeholders would play in terms of the project communication success model.

A final limitation of the research is that both the studies done in Chapters 3 and 4 respectively cannot be generalised to project management across the global as the majority of the respondents, for both studies, were from South Africa. Therefore, with respect to the study done in Chapter 4 a follow-up study is recommended for it to be possible to make generalisations regarding the population and to provide stronger validation for the call centre facilitated communication and project performance model established in the chapter. It would also be interesting to investigate whether the findings in Chapter 4 regarding the impact of a call centre on communication in a programme and its projects can be generalised to larger projects and also whether the principal–agency theory equally applies to projects where call centres are not being used.

A last recommendation for future research relating to Chapter 4 is that the extent of the mistrust and conflict of interest between a project's principals and agents should be investigated. Finally, other applications of call centres to projects and project communication should be investigated, as well as the utilisation of call centres for project knowledge management.
Future research possibilities relating to Chapter 5 could be to investigate the programme benefits associated with a contact centre that facilitates or manages the bulk of the communication in a programme or to establish the specific project benefits of improving communication between team members.

Items for further research regarding Chapter 6 could include the impact of other forms of CMC on project communication. Moreover research on how and when to use different types of CMC during the various stages or phases of a project would also be interesting.

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Doloi, H., Iyer, K.C. & Sawhney, A., 2011. Structural equation model for assessing impacts of contractor's performance on project success. *International Journal of Project Management*, 29(6), pp.687–695. Available at: http://linkinghub.elsevier.com/retrieve/pii/S026378631000089X [Accessed February 11, 2013].

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Müller, R., 2003. Determinants for external communications of IT project managers. *International Journal of Project Management*, 21(5), pp.345–354.

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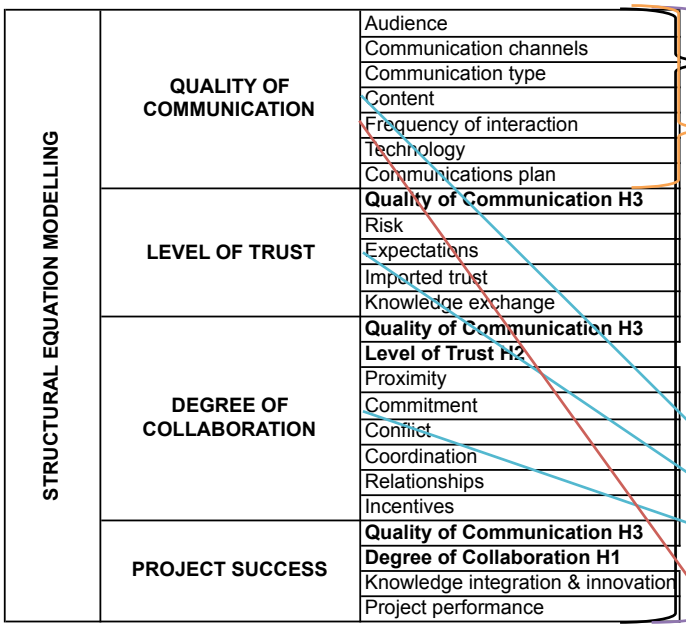
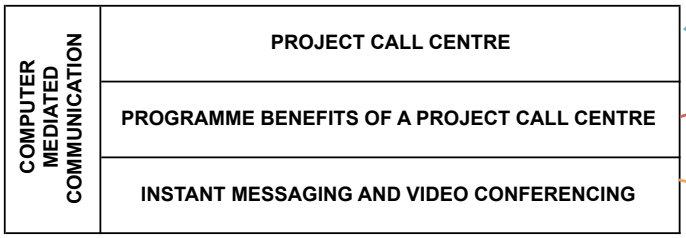
APPENDIX 1 GUIDING DIAGRAM

Chapter 1: an introductory chapter

Provides an introduction to project communication, trust, collaboration, success and structural equation modeling
States the research goal and research questions





Chapter 2: a theoretical chapter

"The specification of a structural equation (SEM) model for project communication, trust, collaboration and success" - *published in conference proceedings of IPMA World Congress, 2014*

Chapter 3: an emperical chapter

"Structural equation model for assessing impacts of communication, trust, collaboration on project success" - *submitted to the IJPM, 2014*

Chapter 4: an emperical chapter

"The impact of a call centre on communication in a programme and its projects" - *published in the IJPM, 2013*

Chapter 5: an emperical chapter

"The programme benefits of improving team communication in its projects using a contact centre" - *published in SAJIE, 2013*

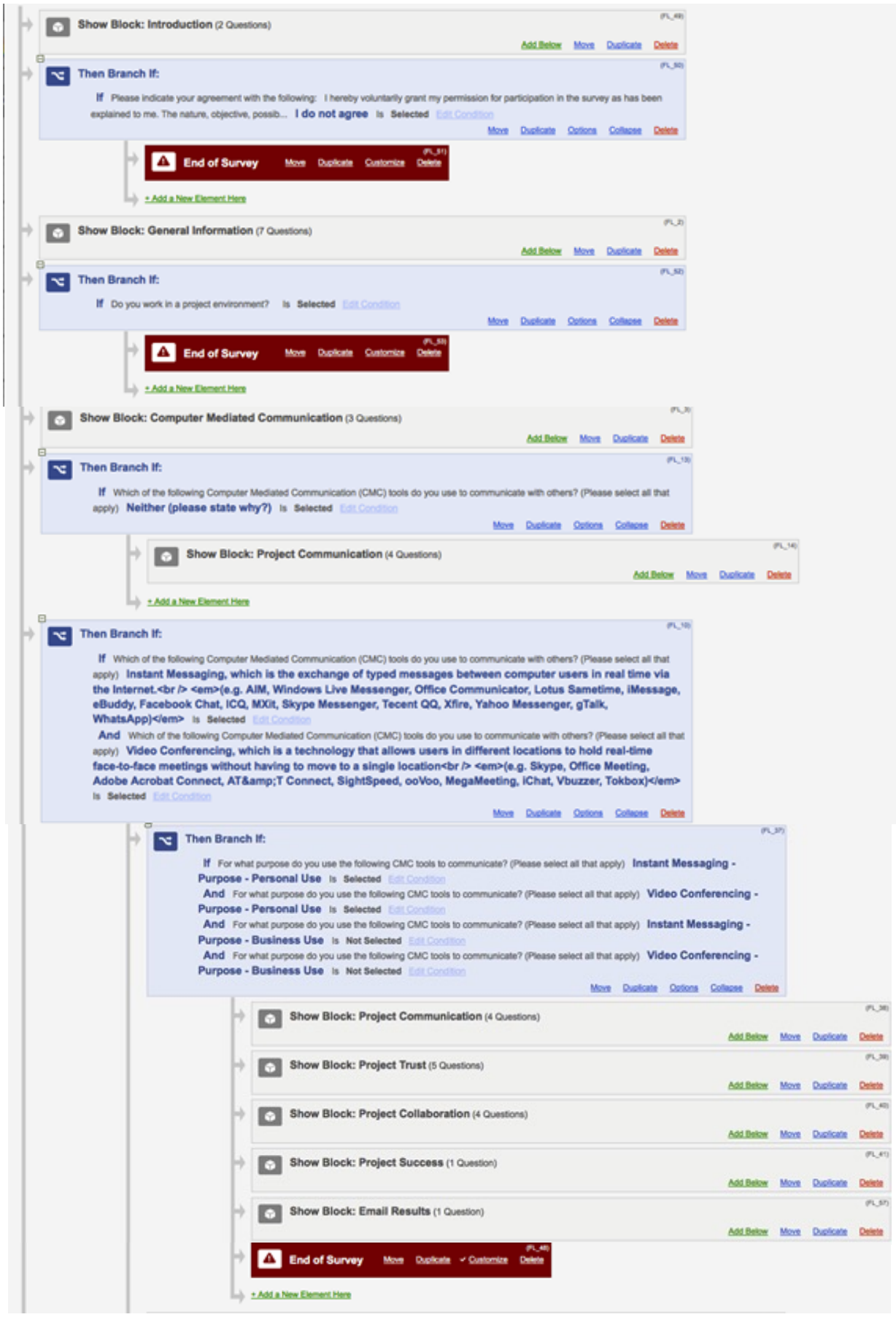
Chapter 6: an emperical chapter

"The Impact of Instant Messaging and Video Conferencing on the Quality of Project Communications" - *submitted to the IJPM, 2014*

Chapter 7: a concluding chapter

Provides concluding remarks regarding the emperical findings & theoretical relevance of the study.
Implications & limitations to theory & practise as well as future research is also discussed.

APPENDIX 2 SURVEY FLOW FOR CHAPTERS 3 AND 6


Show Block: Introduction (2 Questions)
Add Below Move Duplicate Delete
Then Branch If:
If Please indicate your agreement with the following: I hereby voluntarily grant my permission for participation in the survey as has been explained to me. The nature, objective, possib... I do not agree Is Selected Edit Condition
Move Duplicate Options Collapse Delete
End of Survey Move Duplicate Customize Delete
+ Add a New Element Here
Show Block: General Information (7 Questions)
Add Below Move Duplicate Delete
Then Branch If:
If Do you work in a project environment? Is Selected Edit Condition
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End of Survey Move Duplicate Customize Delete
+ Add a New Element Here
Show Block: Computer Mediated Communication (3 Questions)
Add Below Move Duplicate Delete
Then Branch If:
If Which of the following Computer Mediated Communication (CMC) tools do you use to communicate with others? (Please select all that apply) Neither (please state why?) Is Selected Edit Condition
Move Duplicate Options Collapse Delete
Show Block: Project Communication (4 Questions)
Add Below Move Duplicate Delete
+ Add a New Element Here
Then Branch If:
If Which of the following Computer Mediated Communication (CMC) tools do you use to communicate with others? (Please select all that apply) Instant Messaging, which is the exchange of typed messages between computer users in real time via the Internet.
 (e.g. AIM, Windows Live Messenger, Office Communicator, Lotus Sametime, iMessage, eBuddy, Facebook Chat, ICQ, MXit, Skype Messenger, Tecent QQ, Xfire, Yahoo Messenger, gTalk, WhatsApp) Is Selected Edit Condition
And Which of the following Computer Mediated Communication (CMC) tools do you use to communicate with others? (Please select all that apply) Video Conferencing, which is a technology that allows users in different locations to hold real-time face-to-face meetings without having to move to a single location
 (e.g. Skype, Office Meeting, Adobe Acrobat Connect, AT&T Connect, SightSpeed, ooVoo, MegaMeeting, iChat, Vbuzzer, Tokbox) Is Selected Edit Condition
Move Duplicate Options Collapse Delete
Then Branch If:
If For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Instant Messaging - Purpose - Personal Use Is Selected Edit Condition
And For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Video Conferencing - Purpose - Personal Use Is Selected Edit Condition
And For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Instant Messaging - Purpose - Business Use Is Not Selected Edit Condition
And For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Video Conferencing - Purpose - Business Use Is Not Selected Edit Condition
Move Duplicate Options Collapse Delete
Show Block: Project Communication (4 Questions)
Add Below Move Duplicate Delete
Show Block: Project Trust (5 Questions)
Add Below Move Duplicate Delete
Show Block: Project Collaboration (4 Questions)
Add Below Move Duplicate Delete
Show Block: Project Success (1 Question)
Add Below Move Duplicate Delete
Show Block: Email Results (1 Question)
Add Below Move Duplicate Delete
End of Survey Move Duplicate Customize Delete
+ Add a New Element Here


End of Survey Move Duplicate Customize Delete
+ Add a New Element Here
Show Block: CMC Project Communication Both (9 Questions)
Add Below Move Duplicate Delete
Show Block: CMC only IM & VC business use (2 Questions)
Add Below Move Duplicate Delete
Show Block: Project Trust (5 Questions)
Add Below Move Duplicate Delete
Show Block: Project Collaboration (4 Questions)
Add Below Move Duplicate Delete
Show Block: Project Success (1 Question)
Add Below Move Duplicate Delete
Show Block: Email Results (1 Question)
Add Below Move Duplicate Delete
End of Survey Move Duplicate Customize Delete
Then Branch If:
If Which of the following Computer Mediated Communication (CMC) tools do you use to communicate with others? (Please select all that apply) Instant Messaging, which is the exchange of typed messages between computer users in real time via the Internet.
 (e.g. AIM, Windows Live Messenger, Office Communicator, Lotus Sametime, iMessage, eBuddy, Facebook Chat, ICQ, MXit, Skype Messenger, Tecent QQ, Xfire, Yahoo Messenger, gTalk, WhatsApp) Is Selected Edit Condition
Move Duplicate Options Collapse Delete
Show Block: CMC IM (13 Questions)
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Then Branch If:
If For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Instant Messaging - Purpose - Personal Use Is Selected Edit Condition
And For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Instant Messaging - Purpose - Business Use Is Not Selected Edit Condition
Move Duplicate Options Collapse Delete
Show Block: Project Communication (4 Questions)
Add Below Move Duplicate Delete
+ Add a New Element Here
+ Add a New Element Here
Then Branch If:
If Which of the following Computer Mediated Communication (CMC) tools do you use to communicate with others? (Please select all that apply) Video Conferencing, which is a technology that allows users in different locations to hold real-time face-to-face meetings without having to move to a single location
 (e.g. Skype, Office Meeting, Adobe Acrobat Connect, AT&T Connect, SightSpeed, ooVoo, MegaMeeting, iChat, Vbuzzer, Tokbox) Is Selected Edit Condition
Move Duplicate Options Collapse Delete
Show Block: CMC VC (13 Questions)
Add Below Move Duplicate Delete
Then Branch If:
If For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Video Conferencing - Purpose - Personal Use Is Selected Edit Condition
And For what purpose do you use the following CMC tools to communicate? (Please select all that apply) Video Conferencing - Purpose - Business Use Is Not Selected Edit Condition
Move Duplicate Options Collapse Delete
Show Block: Project Communication (4 Questions)
Add Below Move Duplicate Delete
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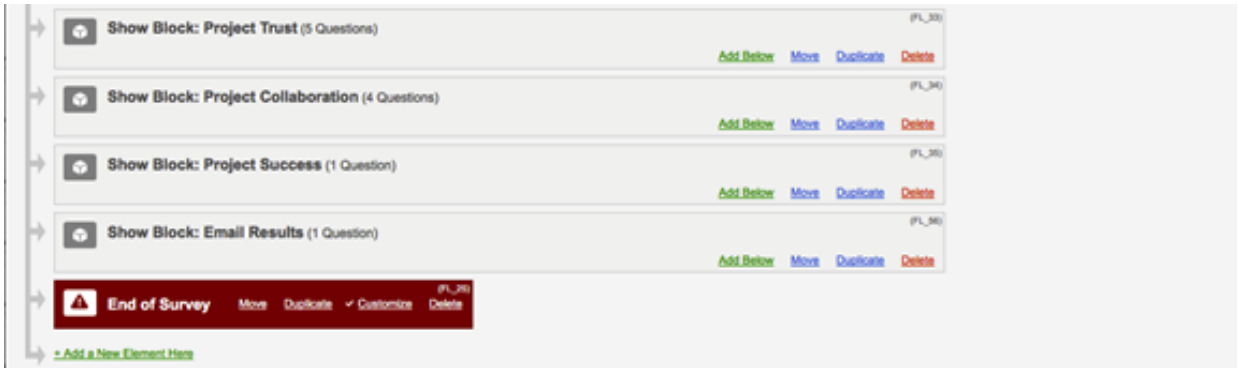
+ Add a New Element Here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Add Below Move Duplicate Delete
Show Block: Project Collaboration (4 Questions)
Add Below Move Duplicate Delete
Show Block: Project Success (1 Question)
Add Below Move Duplicate Delete
Show Block: Email Results (1 Question)
Add Below Move Duplicate Delete
End of Survey Move Duplicate Customize Delete
+ Add a New Element Here

APPENDIX 3 QUESTIONAIRE FOR CHAPTERS 3 AND 6

Introduction

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Q1.
Please note that your participation in this survey is voluntary and all information provided will remain confidential and will only be used for academic purposes.

The survey takes between 10 and 15 minutes to complete.

If you have any questions, please contact me at tarynjbarnard@gmail.com
Thank you very much for your participation!

Kind regards,
Taryn Bond-Barnard

Q2.
Please indicate your agreement with the following:

- ***I hereby voluntarily grant my permission for participation in the survey as has been explained to me.***
- ***The nature, objective, possible safety and health implications have been explained to me and I understand them.***
- ***I understand my right to choose whether to participate in the survey and that the information furnished will be handled confidentially. I am aware that the results of the survey will be used for academic purposes.***

○ I agree

○ I do not agree

General Information

Q3. **Welcome to the survey!**

Please select only one answer for the following questions, or provide an answer where applicable.

Q4. **What is the principal industry of your organisation?**

- ○ Agriculture
- ○ Construction
- ○ Finance, insurance, real estate
- ○ Government
- ○ Health care
- ○ Information technology
- ○ Manufacturing
- ○ Mining
- ○ Retail, wholesale
- ○ Services
- ○ Transportation
- ○ Communication, utilities
- ○ Nonprofit
- ○ Other (please specify)

Q5. **What type of business entity do you work for?**

- ○ Sole proprietor
- ○ Closed Corporation (name ends in "CC")
- ○ Private Company (name ends in "(Pty) Ltd." or "Proprietary Limited")
- ○ Public Company (name ends in "Ltd")
- ○ State Owned Company (name ends in "SOC Ltd")
- ○ Personal Liability Company (names ends in "Incorporated" or "Inc.")
- ○ A not for profit business, previously Section 21(b) (name ends in "NPC")
- ○ Government
- ○ Other business entity (please specify)

Q6. **Do you work in a project environment?**

- ○ Yes
- ○ No

Q7. **What is your role usually in a typical project or programme?**

- ○ Project/Programme Manager
- ○ Project Team Member
- ○ Project Sponsor and/or Client
- ○ Project Stakeholder (e.g. subcontractor, functional manager, regulatory authority, external party etc.)
- ○ Other (Please specify)

Q8. **What gender are you?**

- ○ Male
- ○ Female

Q9. **What is your age? (In years)**

Computer Mediated Communication

Q10. **Please select (It can be more than one answer) or provide an answer where applicable**

Q11. **Which of the following Computer Mediated Communication (CMC) tools do you use to communicate with others?**

(Please select all that apply)

- ☐ Instant Messaging, which is the exchange of typed messages between computer users in real time via the Internet.
  (e.g. AIM, Windows Live Messenger, Office Communicator, Lotus Sametime, iMessage, eBuddy, Facebook Chat, ICQ, MXit, Skype Messenger, Tecent QQ, Xfire, Yahoo Messenger, gTalk, WhatsApp)
- ☐ Video Conferencing, which is a technology that allows users in different locations to hold real-time face-to-face meetings without having to move to a single location
  (e.g. Skype, Office Meeting, Adobe Acrobat Connect, AT&T Connect, SightSpeed, ooVoo, MegaMeeting, iChat, Vbuzzer, Tokbox)
- ☐ Neither (please state why?)

Q12. **For what purpose do you use the following CMC tools to communicate? (Please select all that apply)**

	Purpose	
	Business Use	Personal Use
Instant Messaging	☐	☐
Video Conferencing	☐	☐

Project Communication

Q13. **You have come to the end of the questions regarding your use of computer-mediated communication in projects.**

Before answering the following questions please think about your experience of communicating with project team members in a typical project

The communication referred to in the following questions includes all types of communication such as face-to-face, telephonic, written and/or computer-mediated communication (CMC)

Q14. **With how many stakeholders (including project team members) do you communicate, in a typical project?**

1 - 5	6 - 20	21 - 50	51 - 100	101 - 500	500 and over
○	○	○	○	○	○

Q15. **Is there a Project Communications Plan for your project?**

- ○ Yes
- ○ No
- ○ I do not know

Q16. **Is the use of CMC/social media tools documented in the Project Communications Plan?**

- ○ Yes
- ○ No
- ○ I do not know
- ○ Not applicable

Project Trust

Q17. **Please think about your experience of working with other project team members in a typical project, before answering the following questions.**

Q18. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent does **communication** regarding the project improve the **cooperation** between you and your project team members?	○	○	○	○	○	○	○	○	○	○
To what extent is the project **communication** that you receive **predictable** (e.g. from the expected sender, in the accepted format, with the appropriate content)?	○	○	○	○	○	○	○	○	○	○
To what extent do you receive **communication** regarding the project **on time/when you need it**?	○	○	○	○	○	○	○	○	○	○

Q19. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent do you **receive project knowledge from others** during project communication opportunities?	○	○	○	○	○	○	○	○	○	○
To what extent do you **convey your knowledge to others** during project communication opportunities?	○	○	○	○	○	○	○	○	○	○

Q20. **Do you and your project team members discuss technical uncertainties when you communicate?**

- ○ Yes
- ○ No

Q21. **Percentage on a scale from 0% to 100%**

		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
What percentage of your project team members have you **met face-to-face?**		○	○	○	○	○	○	○	○	○	○	○

Project Collaboration

Q22. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent are **you** committed to achieving the project goals?	○	○	○	○	○	○	○	○	○	○
To what extent are **the other team members** committed to achieving the project goals?	○	○	○	○	○	○	○	○	○	○

Q23. **Frequency on a scale of 1 (never) to 5 (always)**

	Never	Rarely	Sometimes	Most of the Time	Always
To what extent do you resolve conflicts in the project?	○	○	○	○	○
To what extent do the other project team members resolve conflicts?	○	○	○	○	○

Q24. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent is your understanding of the **project goals aligned** with that of your other team members?	○	○	○	○	○	○	○	○	○	○
To what extent are you aware of the **project rules and procedures?**	○	○	○	○	○	○	○	○	○	○
To what extent does everyone in the project team have a **shared/the same understanding** of the **project goals?**	○	○	○	○	○	○	○	○	○	○
To what extent is the project team's actions/work **coordinated?** *(i.e. working together with a shared understanding of mutual goals)*	○	○	○	○	○	○	○	○	○	○
To what extent are you **co-located** with your project team members? *(i.e close together as to share common facilities, in the same or nearby geographic location)*	○	○	○	○	○	○	○	○	○	○
To what extent are you **extrinsicly incentivised** *(money, benefits, bonus, pay raise, time off, promotion, nice work environment & facilities etc.)* by your company/manager to **collaborate** with others on a project?	○	○	○	○	○	○	○	○	○	○
To what extent are you **intrinsicly incentivised** *(words of thanks, acknowledgement of competence or progress, given a challenging task, included in decision making process, etc.)* by your company/manager to **collaborate** with others on a project?	○	○	○	○	○	○	○	○	○	○

Q25. **On a scale of 1 (poor) to 10 (excellent)**

	1 (Poor)	2	3	4	5	6	7	8	9	10 (Excellent)
How would you rate your relationship with the **project manager?**	○	○	○	○	○	○	○	○	○	○
How would you rate your relationship with the **project team members** *(e.g. peers, subordinates, etc.)*?	○	○	○	○	○	○	○	○	○	○
How would you rate your relationship with the **project stakeholders** *(e.g. subcontractors, functional managers, regulatory authorities, external parties, etc.)?*	○	○	○	○	○	○	○	○	○	○
How would you rate your relationship with the **project sponsor and/or client?**	○	○	○	○	○	○	○	○	○	○

Project Success

Q26. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
In general, to what extent is the **exchange of knowledge** amongst the project team members responsible for the ultimate success of the project?	○	○	○	○	○	○	○	○	○	○
In general, to what extent is the **achievement of performance measures** (time, cost and quality) throughout the project life cycle responsible for the ultimate success of the project?	○	○	○	○	○	○	○	○	○	○

Email Results

Q27. **Thank you for completing the survey! If you would like to receive a copy of the final results please enter your email address below.**

CMC Project Communication Both

Q28. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent do you use **Instant Messaging (IM)** to communicate one-to-one?	○	○	○	○	○	○	○	○	○	○
To what extent do you use **Instant Messaging (IM)** to communicate with a group of people?	○	○	○	○	○	○	○	○	○	○
To what extent do you use **Video Conferencing** to communicate one-to-one?	○	○	○	○	○	○	○	○	○	○
To what extent do you use **Video Conferencing** to communicate with a group of people?	○	○	○	○	○	○	○	○	○	○

Q29. **With how many stakeholders (including project team members) do you communicate, in a typical project?**

1 - 5	6 - 20	21 - 50	51 - 100	101 - 500	500 and over
○	○	○	○	○	○

Q30. **Is there a Project Communications Plan for your project?**

- ○ Yes
- ○ No
- ○ I do not know

Q31. **Is the use of CMC/social media tools documented in the Project Communications Plan?**

- ○ Yes
- ○ No
- ○ I do not know
- ○ Not applicable

Q32. **What does the content of your project conversations primarily consist of when using the following tool(s)? (Please select all that apply):**

	Instant Messaging	Video Conferencing
Status and achievement updates	☐	☐
Project changes/amendments	☐	☐
Issues/risks and open items	☐	☐
Next steps in the project	☐	☐
Quality, cost and progress measures	☐	☐
Trends in the project	☐	☐
Technical aspects	☐	☐
Other topic(s) (please specify)	☐	☐

Q33. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent does **Instant Messaging (IM)** communication lead to **more appropriate** (increased amount) project communication?	○	○	○	○	○	○	○	○	○	○
To what extent does **Video Conferencing** communication lead to **more appropriate** (increased amount) project communication?	○	○	○	○	○	○	○	○	○	○

Q34. **Does this increase or decrease the quality (effectiveness) of the communication if the project team is geographically dispersed?**

	Increase	Decrease	I do not know
Instant Messaging	○	○	○
Video Conferencing	○	○	○

Q35. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent is your use of Instant Messaging affected by the access you have to the appropriate technology? *(e.g. to what extent does access to IM software, the internet or computer affect how often you IM?)*	○	○	○	○	○	○	○	○	○	○
To what extent is your use of Video Conferencing affected by the access you have to the appropriate technology? *(e.g. to what extent does access to VC software, the internet, webcam, a computer affect how often you use video conferencing?)*	○	○	○	○	○	○	○	○	○	○

Q36. **Extent on a scale of 1 (very informal) to 10 (very formal)**

	1 (Very informal)	2	3	4	5	6	7	8	9	10 (Very formal)
To what extent is the **content** of what you communicate using **Instant Messaging (IM) formal** (regimented, deliberate, impersonal) or **informal** (spontaneous, casual, familiar) in nature?	○	○	○	○	○	○	○	○	○	○
To what extent is the **content** of what you communicate using **Video Conferencing formal** (regimented, deliberate, impersonal) or **informal** (spontaneous, casual, familiar) in nature?	○	○	○	○	○	○	○	○	○	○

CMC only IM & VC business use

Q37. **Before answering the following questions please think about your experience of communicating with project team members in a typical project.**

Q38. **Who do you communicate with in your project team when you use the following CMC tool(s)?**

(Please select all that apply)

	Instant Messaging	Video Conferencing
The project manager	☐	☐
Project team members (e.g. peers, subordinates etc.)	☐	☐
Stakeholders (e.g. subcontractors, functional managers, regulatory authorities, external parties etc.)	☐	☐
The project sponsor and/or client	☐	☐

CMC IM

Q39. **For what purpose do you use Instant Messaging to communicate? (Please select all that apply)**

	Purpose	
	Business Use	Personal Use
Instant Messaging	☐	☐

Q40. **Before answering the following questions please think about your experience of communicating with project team members in a typical project.**

Q41. **Who do you communicate with in your project team when you use Instant Messaging? (Please select all that apply)**

- ☐ The project manager
- ☐ Project team members *(e.g. peers, subordinates etc.)*
- ☐ Stakeholders *(e.g. subcontractors, functional managers, regulatory authorities, external parties etc.)*
- ☐ The project sponsor and/or client

Q42. **How often in the last month have you used Instant Messaging to communicate with the following people?**

	Never	Rarely	Sometimes	Most of the Time	Always
The project manager	○	○	○	○	○
Project team members *(e.g. peers, subordinates etc.)*	○	○	○	○	○
Stakeholders *(e.g. subcontractors, functional managers, regulatory authorities, external parties etc.)*	○	○	○	○	○
The project sponsor and/or client	○	○	○	○	○

Q43. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent do you use **Instant Messaging (IM)** to communicate one-to-one?	○	○	○	○	○	○	○	○	○	○
To what extent do you use **Instant Messaging (IM)** to communicate with a group of people?	○	○	○	○	○	○	○	○	○	○

Q44. **With how many stakeholders (including project team members) do you communicate, in a typical project?**

1 - 5	6 - 20	21 - 50	51 - 100	101 - 500	500 and over
○	○	○	○	○	○

Q45. **Is there a Project Communications Plan for your project?**

- ○ Yes
- ○ No
- ○ I do not know

Q46. **Is the use of CMC/social media tools documented in the Project Communications Plan?**

- ○ Yes
- ○ No
- ○ I do not know
- ○ Not applicable

Q47. **What does the content of your project conversations primarily consist of when using Instant Messaging?**

(Please select all that apply)

	Instant Messaging
Status and achievement updates	☐
Project changes/amendments	☐
Issues/risks and open items	☐
Next steps in the project	☐
Quality, cost and progress measures	☐
Trends in the project	☐
Technical aspects	☐
Other topic(s) (please specify)	☐

Q48. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent does **Instant Messaging (IM)** communication lead to **more appropriate** (increased amount) project communication?	○	○	○	○	○	○	○	○	○	○

Q49. **Does this increase or decrease the quality (effectiveness) of the communication?**

	Increase	Decrease	I do not know
Instant Messaging	○	○	○

Q50. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent does access to the **appropriate technology** (e.g. IM software, the internet, a computer) affect your use of **Instant Messaging (IM)**?	○	○	○	○	○	○	○	○	○	○

Q51. **Extent on a scale of 1 (very informal) to 10 (very formal)**

	1 (Very informal)	2	3	4	5	6	7	8	9	10 (Very formal)
To what extent is the content of what you communicate using **Instant Messaging (IM)** **formal** (regimented, deliberate, impersonal) or **informal** (spontaneous, casual, familiar) in nature?	○	○	○	○	○	○	○	○	○	○

CMC VC

Q52. **For what purpose do you use Video Conferencing to communicate? (Please select all that apply)**

	Purpose	
	Business Use	Personal Use
Video Conferencing	☐	☐

Q53. **Before answering the following questions please think about your experience of communicating with project team members in a typical project.**

Q54. **Who do you communicate with in your project team when you use the following CMC tool? (Please select all that apply)**

- ☐ The project manager
- ☐ Project team members *(e.g. peers, subordinates etc.)*
- ☐ Stakeholders *(e.g. subcontractors, functional managers, regulatory authorities, external parties etc.)*
- ☐ The project sponsor and/or client

Q55. **How often in the last month have you used Video Conferencing to communicate with the following people?**

	Never	Rarely	Sometimes	Most of the Time	Always
The project manager	○	○	○	○	○
Project team members *(e.g. peers, subordinates etc.)*	○	○	○	○	○
Stakeholders *(e.g. subcontractors, functional managers, regulatory authorities, external parties etc.)*	○	○	○	○	○
The project sponsor and/or client	○	○	○	○	○

Q56. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent do you use **Video Conferencing** to communicate **one-to-one?**	○	○	○	○	○	○	○	○	○	○
To what extent do you use **Video Conferencing** to communicate with **a group of people?**	○	○	○	○	○	○	○	○	○	○

Q57. **With how many stakeholders (including project team members) do you communicate, in a typical project?**

1 - 5	6 - 20	21 - 50	51 - 100	101 - 500	500 and over
○	○	○	○	○	○

Q58. **Is there a Project Communications Plan for your project?**

- ○ Yes
- ○ No
- ○ I do not know

Q59. **Is the use of CMC/social media tools documented in the Project Communications Plan?**

- ○ Yes
- ○ No
- ○ I do not know
- ○ Not applicable

Q60. **What does the content of your project conversations primarily consist of when using Video Conferencing? (Please select all that apply):**

	Video Conferencing
Status and achievement updates	☐
Project changes/amendments	☐
Issues/risks and open items	☐
Next steps in the project	☐
Quality, cost and progress measures	☐
Trends in the project	☐
Technical aspects	☐
Other topic(s) (please specify)	☐

Q61. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent does **Video Conferencing** communication lead to **more appropriate** (increased amount) project communication?	○	○	○	○	○	○	○	○	○	○

Q62. **Does this increase or decrease the quality (effectiveness) of the communication?**

	Increase	Decrease	I do not know
Video Conferencing	○	○	○

Q63. **Extent on a scale of 1 (to an extremely small extent) to 10 (to an extremely large extent)**

	1 (To an extremely small extent)	2	3	4	5	6	7	8	9	10 (To an extremely large extent)
To what extent does **access to the appropriate technology** (e.g. VC software, the internet, webcam, a computer) affect your use of **Video Conferencing (VC)?**	○	○	○	○	○	○	○	○	○	○

Q64. **Extent on a scale of 1 (very Informal) to 10 (very formal)**

	1 (Very informal)	2	3	4	5	6	7	8	9	10 (Very formal)
To what extent is the content of what you communicate using **Video Conferencing formal** (regimented, deliberate, impersonal) or **informal** (spontaneous, casual, familiar) in nature?	○	○	○	○	○	○	○	○	○	○

APPENDIX 4 QUESTIONAIRE FOR CHAPTERS 4 AND 5

Client Survey

The Impact of Call Centres on Project Communication Management -

1. Communication Frequency and Type

1. Do you agree that you get good, prompt service from the RAMP Call Centre?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. How many breakdowns do you log when you phone the RAMP Call Centre?

- ◯ 5 or more
- ◯ 3 to 4
- ◯ 1 to 2
- ◯ None

3. Do you agree that it is easier to get hold of the RAMP Call Centre than the consultant?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Communication Frequency and Type

1. How often do you receive informal communication (telephone calls, voice mails) from the RAMP Call Centre?

- ◯ Every day or more
- ◯ 2-6 times a week
- ◯ About once a week
- ◯ About once a month
- ◯ Never

The Impact of Call Centres on Project Communication Management -

2. Do you agree that the content of the informal communication (telephone calls, voice mails) you receive from the RAMP Call Centre can be trusted?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that the frequent information you receive from the RAMP Call Centre increases your verbal communication with the consultant?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Project Information and Communication Management

1. Does the Call Centre phone you to notify you that the breakdown has been closed?

- ◯ Yes, often
- ◯ Yes, sometimes
- ◯ No, rarely
- ◯ No, never
- ◯ I can't remember

2. Do you let the Call Centre know if a breakdown is not repaired properly?

- ◯ Yes, often
- ◯ Yes, sometimes
- ◯ No, rarely
- ◯ No, never
- ◯ I can't remember

The Impact of Call Centres on Project Communication Management -

3. Do you phone the RAMP Call Centre to follow up calls that are still open?

- ◯ Yes, often
- ◯ Yes, sometimes
- ◯ No, rarely
- ◯ No, never
- ◯ I can't remember

4. Do you agree that the breakdowns logged with the RAMP Call Centre are a true reflection of the breakdowns on site?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

4. Project Information and Communication Management

1. Do you agree that the RAMP Call Centre effectively records and manages the communication and information regarding breakdowns?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Do you agree that the RAMP Call Centre effectively manages the communication of breakdowns between the project manager, consultant, contractor and client?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

The Impact of Call Centres on Project Communication Management –

3. Which would you prefer: that the RAMP Call Centre communicates with you by?

- ◯ Telephone
- ◯ Fax/email
- ◯ Both telephone and fax/email
- ◯ It does not matter
- ◯ Other

If other (please specify)

_____

5. Collaboration and Performance

In the following questions the PROJECT TEAM refers to the project manager, consulting engineer (consultant), contractor and client (user department beneficiaries and/or Department of Public Works) involved with the RAMP contract

1. Do you agree that the higher the frequency of communciation between the RAMP Call Centre and the project team, the higher the level of collaboration/teamwork between the project team members?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Do you agree that the RAMP Call Centre effectively manages the communication of breakdowns between the project manager, consultant, contractor and client(you)?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

The Impact of Call Centres on Project Communication Management -

3. Do you agree that a higher frequency of communciation between the RAMP Call Centre and project team members leads to improved breakdown repairs (quality of repairs)?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

6. Collaboration and Performance

1. Do you agree that a higher frequency of interaction between the RAMP Call Centre and the project team members improves the service delivery of the Repair and Maintenance Programme?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

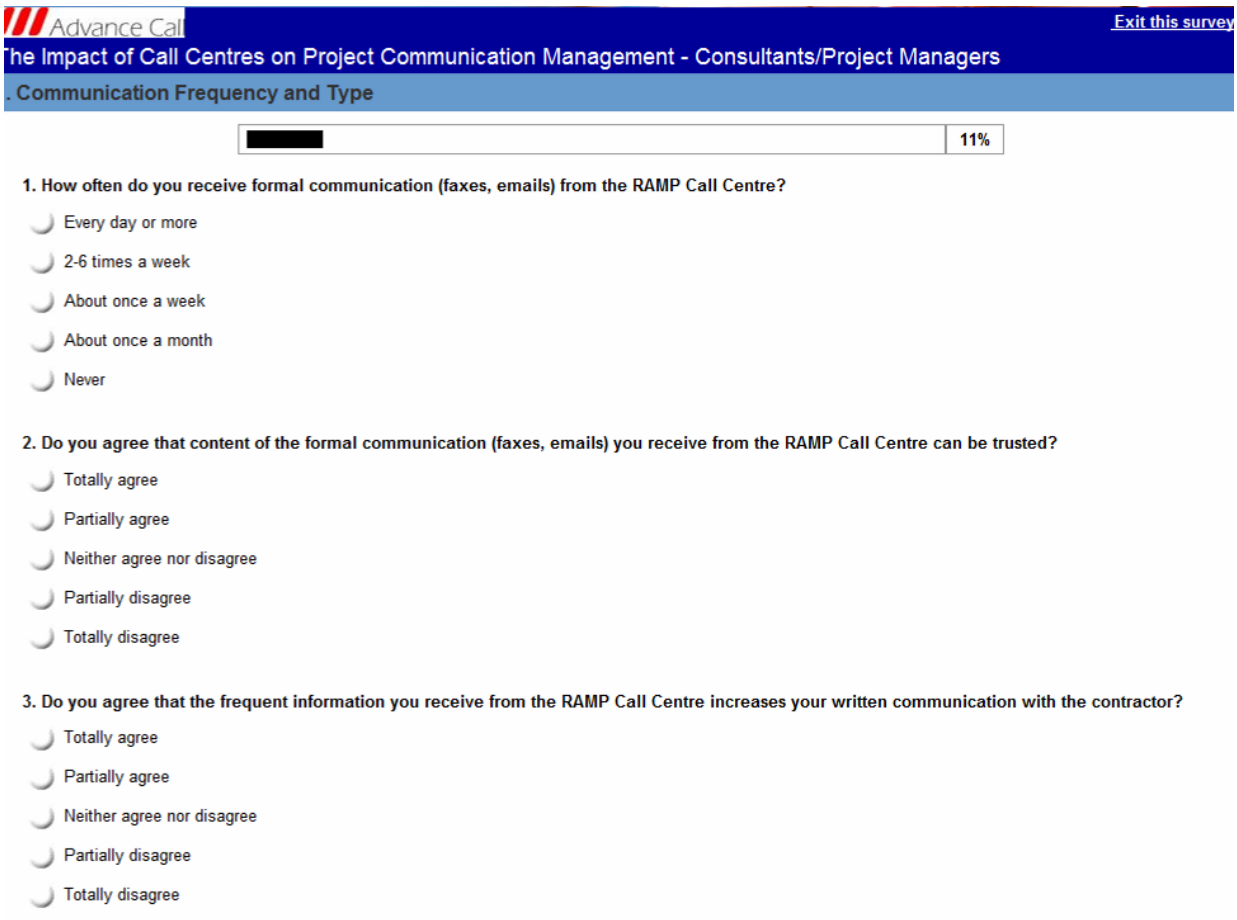
2. Do you agree that the functions performed by the RAMP Call Centre improves the performance of a RAMP project?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that by being allowed to log calls with the RAMP Call Centre you are more satisfied with the service provided by the RAMP Call Centre?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

Project Manager and Consultant Survey



Advance Call

Exit this survey

The Impact of Call Centres on Project Communication Management - Consultants/Project Managers

. Communication Frequency and Type

11%

1. How often do you receive formal communication (faxes, emails) from the RAMP Call Centre?

- Every day or more
- 2-6 times a week
- About once a week
- About once a month
- Never

2. Do you agree that content of the formal communication (faxes, emails) you receive from the RAMP Call Centre can be trusted?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

3. Do you agree that the frequent information you receive from the RAMP Call Centre increases your written communication with the contractor?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

1. How often do you receive informal communication (telephone calls, voice mails) from the RAMP Call Centre?

- Every day or more
- 2-6 times a week
- About once a week
- About once a month
- Never

2. Do you agree that content of the informal communication (telephone calls, voice mails) you receive from the RAMP Call Centre can be trusted?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

3. Do you agree that the frequent information you receive from the RAMP Call Centre increases your verbal communication with the contractor?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

1. How often do you communicate verbally with the client (beneficiaries on site)?

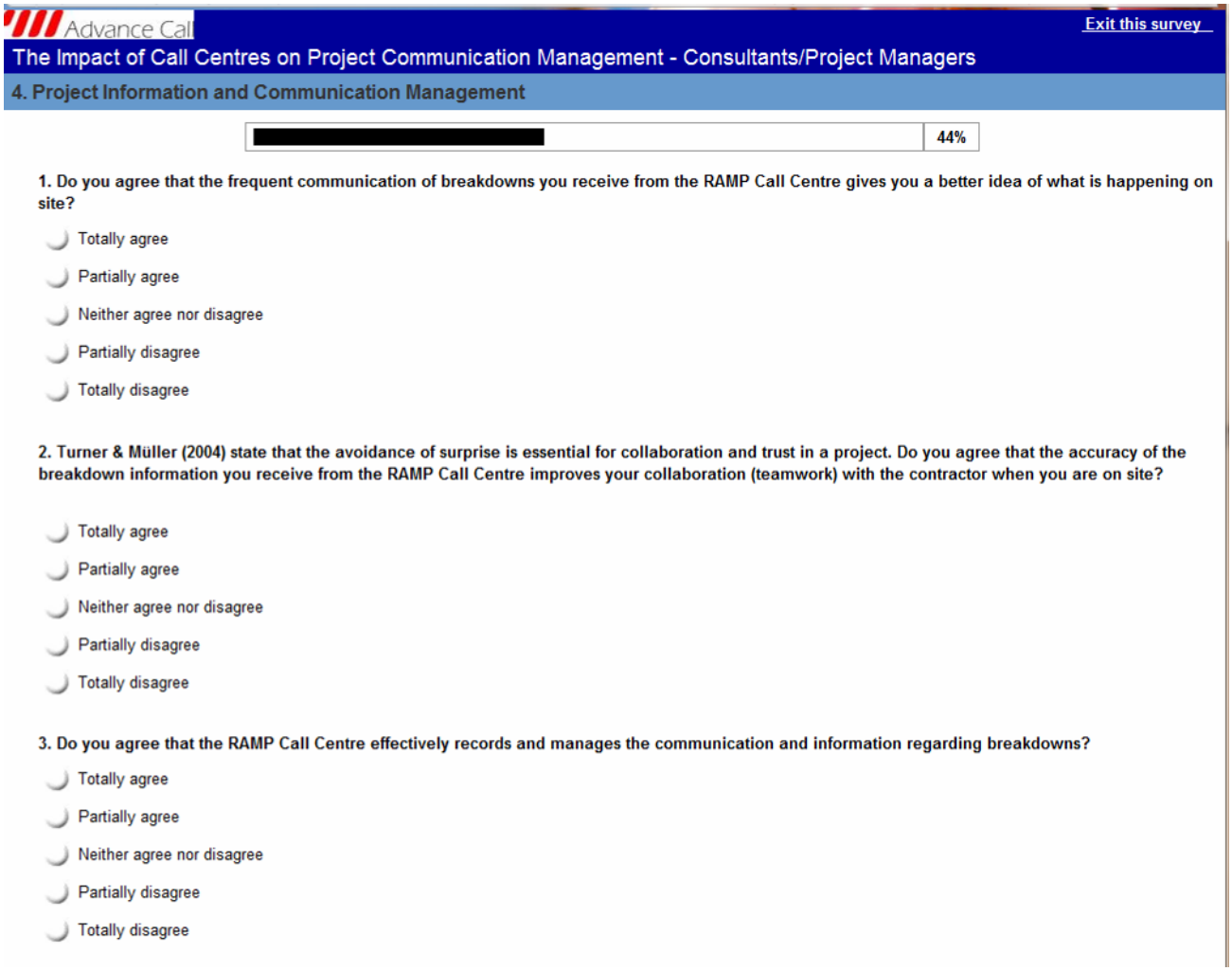
- Every day or more
- 2-6 times a week
- Once a week
- Once a month
- Never

2. Do you agree that the frequent information you receive from the RAMP Call Centre increases your verbal communication with the client (beneficiaries on site)?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

3. Do you agree that the combination of telephone calls and faxes/reports that you receive from the RAMP Call Centre improves the collaboration (teamwork) between the consultant and the contractor?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree



Advance Call

Exit this survey

The Impact of Call Centres on Project Communication Management - Consultants/Project Managers

4. Project Information and Communication Management

44%

1. Do you agree that the frequent communication of breakdowns you receive from the RAMP Call Centre gives you a better idea of what is happening on site?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

2. Turner & Müller (2004) state that the avoidance of surprise is essential for collaboration and trust in a project. Do you agree that the accuracy of the breakdown information you receive from the RAMP Call Centre improves your collaboration (teamwork) with the contractor when you are on site?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

3. Do you agree that the RAMP Call Centre effectively records and manages the communication and information regarding breakdowns?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

1. Do you agree that the RAMP Call Centre significantly improves the management of project communication for the Repair and Maintenance Programme?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

2. How often do you contact the RAMP Call Centre to request a report or more information regarding a breakdown?

- Every day or more
- 2-6 times a week
- About once a week
- About once a month
- Never

3. Do you agree that the information contained in the RAMP breakdown summary, pending call and payment reduction reports is useful?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

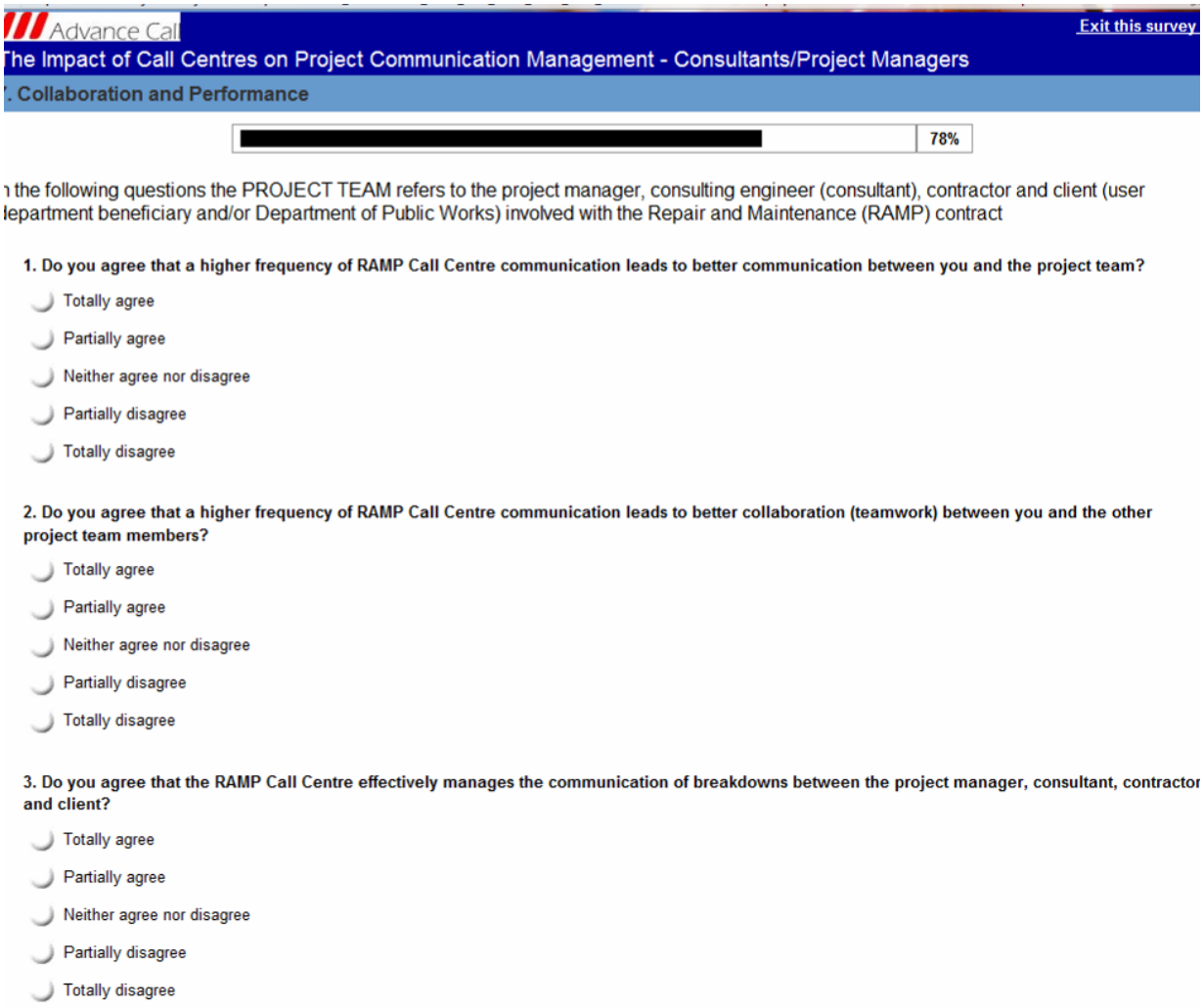
1. Do you agree that the pending call report helps you to monitor the contractor's progress?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

2. Which would you prefer: that the RAMP Call Centre notifies you of breakdowns only by?

- Telephone
- Fax/email
- Both telephone and fax/email
- It does not matter
- Other

If other (please specify)



Advance Call

Exit this survey

The Impact of Call Centres on Project Communication Management - Consultants/Project Managers

. Collaboration and Performance

78%

n the following questions the PROJECT TEAM refers to the project manager, consulting engineer (consultant), contractor and client (user lepartment beneficiary and/or Department of Public Works) involved with the Repair and Maintenance (RAMP) contract

1. Do you agree that a higher frequency of RAMP Call Centre communication leads to better communication between you and the project team?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

2. Do you agree that a higher frequency of RAMP Call Centre communication leads to better collaboration (teamwork) between you and the other project team members?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

3. Do you agree that the RAMP Call Centre effectively manages the communication of breakdowns between the project manager, consultant, contractor and client?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

1. Do you agree that a higher frequency of communciation between the RAMP Call Centre and project team members leads to improved quality of project deliverables?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

2. Do you agree that a higher frequency of interaction between the RAMP Call Centre and the project team members improves the service delivery of the Repair and Maintenance Programme?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

3. Do you agree that the functions performed by the RAMP Call Centre improve the performance of a RAMP project?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

1. Do you agree that by allowing the client/beneficiaries to log calls with the RAMP Call Centre that it improves customer satisfaction?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

2. With how many Repair and Maintenance (RAMP) contracts are you currently involved e.g. part of the project team? (Please enter the number)

3. Do you agree that the answers you have selected in this survey are representative (valid) for all the other RAMP contracts with which you are involved?

- Totally agree
- Partially agree
- Neither agree nor disagree
- Partially disagree
- Totally disagree

4. Would you like to receive a summary of the findings of this study?

- Yes
- No

If yes, then please enter your email address

Contractor Survey

The Impact of Call Centres on Project Communication Management –

1. Communication Frequency and Type

1. How often do you receive formal communication (faxes, emails) from the RAMP Call Centre?

- ◯ Every day or more
- ◯ 2-6 times a week
- ◯ About once a week
- ◯ About once a month
- ◯ Never

2. Do you agree that content of the formal communication (faxes, emails) you receive from the RAMP Call Centre can be trusted?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that the frequent information you receive from the RAMP Call Centre increases your written communication with the consultant?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Communication Frequency and Type

1. How often do you receive informal communication (telephone calls, voice mails) from the RAMP Call Centre?

- ◯ Every day or more
- ◯ 2-6 times a week
- ◯ About once a week
- ◯ About once a month
- ◯ Never

The Impact of Call Centres on Project Communication Management –

2. Do you agree that content of the informal communication (telephone calls, voice mails) you receive from the RAMP Call Centre can be trusted?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that the frequent information you receive from the RAMP Call Centre increases your verbal communication with the consultant?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Communication Frequency and Type

1. How often do you communicate verbally with the client (beneficiaries on site)?

- ◯ Every day or more
- ◯ 2-6 times a week
- ◯ Once a week
- ◯ Once a month
- ◯ Never

2. Do you agree that the frequent information you receive from the RAMP Call Centre increases your verbal communication with the client (beneficiaries on site)?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

The Impact of Call Centres on Project Communication Management -

3. Do you agree that the combination of telephone calls and faxes/reports that you receive from the RAMP Call Centre improves the collaboration between you (the contractor) and the consultant?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

4. Project Information and Communication Management

1. Do you agree that the frequent communication of breakdowns you receive from the RAMP Call Centre gives you a better idea of what is happening on site?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Do you agree that most of the breakdowns that occur on site get logged with the RAMP Call Centre?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that the RAMP Call Centre effectively records and manages the communication and information regarding breakdowns?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

The Impact of Call Centres on Project Communication Management –

4. Do you agree that the RAMP Call Centre effectively manages the communication of breakdowns between the project manager, consultant, contractor and client?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

5. Project Information and Communication Management

1. Do you agree that the response times (priorities) allocated to different types of breakdowns are reasonable?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Do you agree that it is convenient for you that the RAMP Call Centre informs you of all breakdowns logged for your RAMP contract?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that the priority for a breakdown influences your response time for that breakdown?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

The Impact of Call Centres on Project Communication Management -

4. Which would you prefer: that the RAMP Call Centre notifies you of breakdowns only by?

- ◯ Telephone
- ◯ Fax/email
- ◯ Both telephone and fax/email
- ◯ It does not matter
- ◯ Other

If other (please specify)

6. Collaboration and Performance

In the following questions the PROJECT TEAM refers to the project manager, consulting engineer (consultant), contractor and client (user department beneficiaries and/or Department of Public Works) involved with the RAMP contract

1. Do you agree that a higher frequency of RAMP Call Centre communication leads to better communication between you and the project team?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Do you agree that a higher frequency of RAMP Call Centre communication leads to better collaboration (teamwork) between you and the other project team members?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

The Impact of Call Centres on Project Communication Management -

3. Do you agree that the RAMP Call Centre effectively manages the communication of breakdowns between the project manager, consultant, contractor and client?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

7. Collaboration and Performance

1. Do you agree that a higher frequency of communciation between the RAMP Call Centre and project team members leads to improved quality of project deliverables?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

2. Do you agree that a higher frequency of interaction between the RAMP Call Centre and the project team members improves the service delivery of the Repair and Maintenance Programme?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

3. Do you agree that the functions performed by the RAMP Call Centre improves the performance of a RAMP project?

- ◯ Totally agree
- ◯ Partially agree
- ◯ Neither agree nor disagree
- ◯ Partially disagree
- ◯ Totally disagree

8. Collaboration and Performance