An Investigation of the Role of Trust in Virtual Project Management Success

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I declare that this thesis is my account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

(Chanda Kabungo Mumbi)

Abstract

Studies show that virtual project teams, as an organizational working structure, are on the increase so organizations need assurance that they can be managed just as effectively as traditional projects. The virtual project structure introduces new challenges for project managers tasked with the job of delivering project success. One such challenge is the development and maintenance of trust within the virtual environment. Trust plays a major role in fostering relationships not only in teams but also in society in general.

The aim of the research is to explore the role of trust in virtual project teams and to investigate how trust influences project outcomes. Data was collected from a survey of members of the Project Management Institute. A model of trust in the virtual team environment is proposed and tested using Partial Least Squares (PLS). Analysis of the data shows that team trust predicts project success. Institution-based trust is found to have an influence on swift trust; however, the role of swift trust on virtual project success was less clear. The study also finds that the perceived traditional experience of the project manager does not have any influence on virtual project success.

Project managers must be aware of both interpersonal as well as organizational factors of trust as they plan for project success. They may find that there is a need to review their skills in readiness for the virtual project environment. This dissertation adds to the body of knowledge by providing insights into trust dynamics in the virtual project structure.

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Chapter 1 Introduction

1.1   Background

Advancements in information technology, coupled with the rapid growth of the Internet, have led to an expansion of globalization. Information Technology advancements have contributed to the breakdown of geographical and time barriers both within and between organizations in their pursuit of trade and economic growth (Guillen, 2001). The realization of the global economy has resulted in increased interaction, and/or integration, of economic systems that would normally have not been able to coexist due to time and space restrictions. As a result of the increase in interaction of systems many organizations are now evolving into flexible and dynamic forms that can adapt much more quickly to customer requirements (Jarvenpaa & Leidner, 1999). Information technology has played and continues to play a major role in this transformation and is seen as both an enabler and instigator of this new organizational form (Jarvenpaa & Ives, 1994). Information technology has permeated the fabric of most organizations and has become a significant component of most organizational processes resulting in the formation of global work teams.

The emergence and use of global work teams has significantly changed the landscape of the work environment. Global work teams that rely on information technology for interaction have been commonly referred to as virtual teams. Through these virtual teams, organizations are now able to tap into the expertise of skilled personnel from all corners of the globe and build teams that can collaborate and

thereby assist the organization in meeting its business objectives. Project managers may be in a position to be able to select the best resources for a project no matter where they are located (Gould, 2004). There is an emphasis on adhering to sound project management techniques that comes out of a need to reduce the number of projects that are either cancelled before completion or fail to deliver the expected product. In a study done by the Standish Group (2004), spanning a 10 year period, the results showed a reduction in failures of information technology projects from 31% in 1994 to 18% in 2004. There may therefore have been some improvements as a result of applying project management techniques. Corporations, governments and non-profit organizations are concerned about the need to reduce project failures by being conversant with the use of modern project management techniques (Robertson & Williams, 2006).

Virtual teams may be distributed within a single building, regionally, nationally or even globally. According to Gould (1997, p. 1), "Virtual teams are teams of people who primarily interact electronically and who may meet face-to-face occasionally". However, it is common in geographically dispersed organizations that some virtual team members may never meet face-to-face. This study uses the following definition of a virtual project team:

> A virtual project team is a group of people, working on the same project, that is spread over more than one work site, and whose members rely heavily on electronic communications, technology and means other than face-to-face meetings at one physical location.

This collective definition stresses the dimensions of groups, multi site locations and shared communication technologies. In this research, both virtual teams whose members may have the opportunity to meet face-to-face and virtual teams that

seldom meet face-to-face are considered. Teams may be distributed because of the changes being experienced by organizations as they seek to gain a competitive edge in the market and rethink the way they deal with their customers (Cascio, 2000). Mergers and acquisitions, emerging markets in different geographic locations, the need to reduce costs, the need to reduce time-to-market or product cycle time in general are some of the reasons that have prompted the need for virtual teams (Haywood, 1998). Travel issues have also received special attention owing to events in the travel industry such as the fateful September 11, 2001 terrorist attacks (Craft, 2004). The costs involved in frequent travel have made organizations rethink the way they do business. The rising price of oil owing to international disturbances and natural disasters has caused significant increases in fuel prices and this has influenced travel generally. Following such concerns, and other specific reasons, it may be impractical for team members of project teams to travel to meet in face-to-face situations.

As virtual project teams become an integral component of management forms, organizations need the assurance that the principles of project management that they have always relied on can be applicable to this new type of environment and enable them meet their business objectives. Virtual project teams need to be managed just as effectively as traditional teams. The virtual project team arrangement brings with it new challenges to project managers who are tasked with the job of delivering a successful product. One such challenge is the development and maintenance of trust within the virtual environment.

Trust is acknowledged as particularly important in newer organizational forms such as virtual collaborative relationships (McKnight, Cummings, & Chervany, 1998; Meyerson, Weick, & Kramer, 1996). A study by Delisle (2001) found trust to be among the top five critical success indicators for virtual teams. However, while researchers agree on the importance of trust in working relationships, agreeing on the definition of trust has proved to be more elusive. In this research, trust is defined as the willingness of virtual project team members to be reliant on each other based on the expectation that each team member will perform actions beneficial to the success of the team. In addition to searching for commonality in the definition of trust, another area of trust research that has invoked many discussions is how trust is developed. McAllister (1995) states that although trust's importance has been acknowledged, the matter of how it develops and functions has received little systematic theoretical attention.

1.2 Problem definition

Project Managers are responsible for overseeing projects to ensure success in the delivery of a product. Organizations appoint project managers with varying backgrounds, education and experiences to manage their projects. Traditionally project managers often rely on proven project management guidelines and techniques in an attempt to improve the chances of success in managing projects (PMI, 2004). In a virtual project environment, the setting is different from the traditional environment and different dynamics apply thereby possibly demanding a different approach. Virtual projects therefore pose new challenges different to traditional projects. "How can I manage them if I can't see them?" is a question that

many managers are asking (Cascio, 2000, p. 81). Cascio (2000) refers to this question as the first managerial challenge of the virtual workplace. Indeed how do you manage people in an environment that is devoid of physical contact when traditionally workers in project teams have always been part of the same physical surroundings? A study by Kerber and Buono (2004) reported that managers leading project teams in the virtual environment identified several issues that threatened project success. The following questions arose out of these issues:

- What is the role of a virtual project manager?

- How can a virtual project manager build high-quality relationships when people seldom, if ever, see each other in person?

- How can a virtual project manager enhance the performance of a virtual project team?

- How can virtual relationships be managed more effectively using the company's existing communication technologies?

- Is it possible to manage performance and ensure accountability at a distance?

Project managers need to understand how issues of trust can be handled in a virtual project because the dynamics of operation in this environment are very different from the traditional environment.

This study looks at issues of trust development and maintenance in the virtual environment from a project manager's perspective. The study does not focus on the technical activities such as writing code, but rather on the processes used to manage the nine project management knowledge areas as described in the Project

Management Body of Knowledge (PMBOK) (PMI, 2004), and other information dealing with project management knowledge, skills, and attitudes.

1.3 Aims and objectives

The aim of this study is to increase the understanding of the role of trust in virtual project teams from the perspective of project managers involved in managing such teams. The study achieves this by investigating the relationships between trusting intention, trust-building skills, trust formation and maintenance and project success in the virtual project environment. The virtual project environment possesses many challenges in comparison to a traditional environment. This thesis specifically addresses trusting intention, trust-building skills, trust formation and maintenance, and project success.

The study explores the skill demands placed on project managers taking into account the transition from traditional projects to virtual projects. Additionally the study seeks to explore the impact of the project manager's traditional project experience on project success in the virtual environment. The project manager is expected to possess a number of skills as a prerequisite to achieve success but trust building appears to form an integral skill on which many facets of team work depend upon. These facets include communication, organisational culture and cohesion and they are inexplicably intertwined. As part of the investigation, the study includes an exploration of how the trustworthiness of the project manager affects project success.

The concept of *swift trust* is also investigated, as it forms a crucial element of the trust development process at the beginning of projects. Swift trust relates to temporary teams whose existence is formed around a clear purpose and common task with a finite life span (Jarvenpaa, Knoll, & Leidner, 1998; Meyerson, Weick, & Kramer, 1996). Its elements include a willingness to suspend doubt about whether others who are *strangers* can be counted on in order to get to work on the group's task. Swift trust is built and maintained by a high level of activity and responsiveness and a positive expectation that the group activity will be beneficial (Meyerson, Weick, & Kramer, 1996). The study also addresses the role of trusting intention in achieving project success as compared to the role of a deterrence-based trust approach.

The following summarises the objectives of this research:

- To provide an understanding of the role of trust in virtual project team success from the perspective of project managers

- Explore organizational influences on swift trust

- Explore the impact of the trustworthiness and traditional project experience of the project manager on project success

A model of trust is proposed to explain the relationships between trust-building skills, trusting intention, trust formation and project success within the context of a virtual project.

1.4   Rationale for research

As projects become an integral part of organizational working structures, the trend to incorporate virtual project teams will continue. Virtual project teams are now on the increase due to several reasons, among these being globalization, cost reduction, technological advancements, expansion of market share and new ways of meeting business objectives (Lipnack & Stamps, 2000). This research is designed to increase the understanding of the role of trust in virtual teams from the perspective of project managers involved in managing such teams. Team members in a project team rely on each other to do what they have agreed to do in meeting their obligations to contribute to making a successful project. A critical factor in the successful completion of a project is trust in fellow team members to deliver their share of the work on time and with sufficient quality (Jarvenpaa, Knoll, & Leidner, 1998).

A review of trust literature suggests three main issues that remain inconclusive and these are the meaning of trust, the development of trust and the measurement of trust. This research investigates the development of trust as well as providing a review of the current views on how trust is conceptualized. The study proposes a solution for the measurement of trust within the virtual project environment.

1.5   Significance of research

This research makes five major contributions to scholarly knowledge. Firstly, the thesis outlines and clarifies the various definitions and views held by different trust researchers on trust definitions and attempts to present a clear view of the multi

dimensional characteristics of trust. By focussing on virtual project teams, the research provides an insight into the dynamics of trust that exist within a virtual project setting.

Secondly, the study contributes to trust research in the virtual team environment by offering ways of assessing trusting intention as a solution to overcoming the need to rely on deterrence-based trust. This could be very useful in that project managers that are tasked with managing virtual teams may need to review their attitudes in preparation for such challenges. The study investigates how project manager's previous experience with traditional teams impacts on managing virtual teams.

Thirdly, the study contributes to trust research by following on from the work of previous researchers such as Jarvenpaa, Knoll and Leidner (1998) and Jarvenpaa and Leidner (1999). Their studies showed evidence of swift trust in virtual teams but their studies did not investigate the means to attain this type of trust. This study investigates strategies to promote swift trust and seeks to demystify its existence by investigating how it can be made more predictable. This is a response to calls made by Jarvenpaa, Knoll and Leidner (1998) to investigate the findings of their study which were inconclusive with respect to the relationships that affect swift trust and team behaviours. A more rigorous assessment of swift trust may provide some answers. This research investigates the role of the project manager's trust-building skills in relation to the promotion of swift trust and the maintenance of a high level of trust throughout the life cycle of the project. A review of the literature shows that trust-building skill has not been previously measured in similar studies. In this study,

this skill is seen as playing a significant role in the formation and maintenance of a high level of trust and therefore should influence the success of the team.

Fourthly, the study introduces and tests a model for the measurement of trust in the virtual project management setting. Previous models have been used in trust research but not many have been used to investigate the dynamics of trust that exists in virtual project teams.

Finally, the study also contributes to knowledge in project management. The research has a direct practical application to project management.

Organizations that have invested in virtual project teams may be interested in the results with a view to avoiding pitfalls already experienced by others. Organizations that are planning to implement projects using virtual teams would be interested in the results, as this would guide them in making informed decisions, bearing in mind, the trust dynamics involved.

Universities will be interested to know the factors that lead to success in virtual project team management as they prepare graduates who will become future project managers. Information gathered from studies such as this can be used to redesign course materials at both undergraduate and postgraduate levels. Universities have been teaching project management for some time now. The field of project management continues to be an established area of study in many computing and

information fields at various levels of study. Researchers can build upon the findings of the research to add to the development of theory and guidance of practice.

Professional bodies, such as the Project Management Institute (PMI), would be interested in the findings; as such information can serve as inputs to guide reviews of current and future standards written by the body of professionals. Practitioners need to find out about studies that affect the corporate world and similarly academia needs to appreciate the pace of events that occur in the corporate world and see to it that practice is guided by research.

It is hoped that studies such as this can help bridge the gap between theory and practice. The results of this study provide a better understanding of the current trust issues associated with managing virtual project teams and lead to recommendations as to what needs to be done to increase the chances of success in managing virtual project teams.

1.6   Research approach

To provide answers to the research questions a model of trust in the virtual project environment was proposed and tested. Data to test the model was collected by means of a web-based survey of a sample of project managers with experience in managing projects in virtual environments. The primary source of participants was the Project Management Institute (PMI) membership. The PMI was chosen for two main reasons. Firstly, the PMI is the world's leading not-for-profit project management

professional association, with over 150,000 members worldwide. Secondly, the PMI was chosen for the leadership role it plays in the field of project management. The PMI provides access to its members to respond to research surveys that are approved as studies that advance project management research.

A review of existing instruments in the field of trust research was undertaken to identify those constructs that were applicable to the research and whose validity had previously been tested. New items were also developed as needed. On completion of piloting, the survey was made accessible to the PMI membership via a link on the PMI web site. Partial Least Squares was used to test the model.

1.7   Organization of the thesis

This thesis is organised in eight chapters. Chapter 1 provides a background to the research, presents the aims and objectives of the research, explains the rationale for undertaking the research and identifies the significance of the research.

Chapter 2 reviews the literature on virtual projects and project success. A number of issues that arise out of the review, such as the challenges posed by virtual project teams, are discussed.

Chapter 3 reviews the literature on trust and trust models. The trust models reviewed in this chapter help to form a base for the development of a trust model for the research. The chapter highlights the need to explore the role played by trust in achieving virtual project team success.

Chapter 4 describes the research questions that have arisen out of the aims of the research and the review of the literature. The chapter also describes the research model and the associated hypotheses to be tested.

Chapter 5 describes the research methodology used in the study. The chapter presents an overview of the methodology and the rationale behind the choice. The chapter also describes the data collection method and the choice of participants.

Chapter 6 presents the data analysis techniques used for the study. The chapter outlines the criteria used in the development of the measurement and structural models.

Chapter 7 reports the results of the data collection and analyses as described in Chapter 6. The results of the measurement model and structural model are presented. The chapter concludes by presenting the results of the testing of the hypotheses.

Chapter 8 presents a discussion of the results obtained in chapter 7 and the implications of the study for research and for practice. The chapter also discusses the limitations of the study.

1.8   Definition of key terms

This section includes definitions and descriptions of the key variables and terms that are used throughout the thesis.

Confirmatory factor analysis – this is a statistical technique used to test specific theoretical expectations about the structure of a set of measures (Gefen, Straub, & Boudreau, 2000).

Critical success factors - components which must exist within the organization in order to create an environment where projects may be managed with excellence on a consistent basis.

Deterrence-based trust – a type of trust that is based on an assumption that team members will do what they say they will simply because they fear they will be punished if they do not.

Indicator – an observed value (*manifest variable*) used as a measure of a concept or latent construct that cannot be measured directly. The researcher must specify which indicators are associated with each construct.

Institution-based trust – a type of trust that is the extent to which one believes that proper impersonal structures are in place (e.g. in an organization) to enable one to

anticipate a successful outcome in an endeavour such as participation in a virtual project.

Measurement model – a sub-model in structural equation modeling that: (1) specifies the indicators for each construct; and (2) assesses the reliability of each construct for estimating the causal relationships. The measurement model is similar in form to factor analysis; the major difference lies in the degree of control provided by the researcher. In the measurement model, the researcher specifies which variables are indicators for each construct, with variables having no loadings other than those on its specified construct.

Model - specified set of dependence relationships that can be tested empirically; an operationalization of a theory. The purpose of a model is to concisely provide a comprehensive representation of the relationships to be examined. The model can be formalized in a path diagram or a set of structural equations.

Perceived ability – the perception that the team considers one to be competent within a specific domain**.**

Perceived benevolence – the perception of whether the team considers one to be caring enough to behave in the team's best interests even in difficult situations.

Perceived integrity - the perception of whether the team considers one to adhere to a set of principles such as work habits that make him or her dependable and reliable.

Perceived honesty – the perception of whether team members consider one to be relied upon to tell the truth and not mislead the team.

Perceived traditional project experience - relates to the skills, methods and experience that the project manager has accumulated as a result of managing traditional teams.

Perceived trustworthiness - the perception that one is willing and able to act in the team's interests.

PMBOK - Project Management Body of Knowledge (PMBOK). A PMI standard handbook that includes a comprehensive coverage of project management terms and provides broadly accepted knowledge and practices that are generally applicable to most projects.

PMI - Project Management Institute (PMI). An international professional society for project managers.

Project - a project is a temporary endeavour undertaken to create a unique product or service.

Project management - project management is the application of knowledge, skills, tools and techniques to project activities in order to meet project requirements.

Project success – project success is measured by the successful conclusion of the project management process (Baccarini, 1999).

Structural equation modeling (SEM) – a multivariate data analysis technique used to estimate a series of interrelated dependence relationships simultaneously.

Swift trust - a presumption that other people in a given setting are trustworthy until proven otherwise (Meyerson, Weick, & Kramer, 1996).

Trust - the willingness of virtual project team members to be reliant on each other based on the expectation that each team member will perform actions beneficial to the success of the team.

Trust-building skills - skills of the project manager that contribute to the development and maintenance of trust formation throughout the lifespan of the project.

Trusting intention - the extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible.

Virtual team trust - The willingness of virtual project team members to be reliant on each other based on the expectation that each team member will perform actions beneficial to the success of the team.

Virtual project teams - a virtual project team is a group of people, working on the same project, that is spread over more than one work site, and whose members rely heavily on electronic communications, technology and means other than face-to-face meetings at one physical location.

Chapter 2 Literature Review on Projects

2.1 Introduction

This chapter examines projects in general and discusses the role of project management in organizations. The review commences with Section 2.2, which defines projects and their attributes. Section 2.3 describes the characteristics of traditional teams. This is followed by a discussion on virtual teams in Section 2.4, which also looks at some issues that affect virtual teams (communication, cohesion and culture). Section 2.5 discusses the role of project management in organizations followed by Section 2.6, which explores the changing role and significance of project managers in the project environment. Section 2.7 reviews project success in relation to both traditional and virtual teams.

2.2 Projects

Andersen (2006, p. 16) describes a project as a "temporary organization established by its base organization to carry out an assignment on its behalf". According to the PMI (2004) a project is "a temporary endeavour undertaken to create a unique product or service" (p. 5). The PMI is the world's largest professional association within the field of project management. Increasingly, companies are now using projects in their daily work to achieve their goals. Projects normally involve a diverse set of human resources performing interrelated activities, and the primary customer for the product is often interested in the effective use of resources to complete the project in an efficient and timely manner. The PMI (2004) outlines the

following attributes of a project: A project is temporary, a project results in a unique product and a project undergoes progressive elaboration. Temporary means that every project has a definite beginning and a definite end. The end is reached when the project's objectives have been achieved, or when it becomes clear that the project objectives will not or cannot be met, or the need for the project no longer exists and the project is terminated. Unique means that the product or service is different in a distinguishing way from all similar products or services. Progressive elaboration means that the project integrates the concepts of temporary and unique. The distinguishing characteristics of the product are initially broadly defined but become more explicit and detailed to the project team as the product develops (PMI, 2004).

Schwalbe (2004) points out the following characteristics of projects in addition to those provided by the PMI (2004): a project requires resources; a project has a primary sponsor; and a project has some uncertainty. Resources often come from various areas including people, hardware, software, or other assets depending on the type and magnitude of the project. A construction project, for example, may need building materials, cranes and trucks. People resources in a project may cross departmental, organizational and country boundaries. Resources need to be used effectively to meet project and other goals. Projects must have a primary sponsor, who usually provides the direction and funding for the project. Funding may range from hundreds of dollars for small school projects to millions of dollars required for a transnational railway system. Uncertainty arises from the unique nature of projects. It is not always possible to accurately estimate scope, time and cost of completion. Several techniques are used by project managers to reduce the margin of error but, clearly, a level of uncertainty forms a part of projects.

Shenhar (2001) identified three dimensions to distinguish among projects: uncertainty; complexity; and pace. The first dimension, uncertainty, is in agreement with the characteristics discussed by described by Schwalbe (2004). Project complexity is dependent on product scope, number and variety of elements, and the interconnection among them. The third dimension for distinguishing among projects involves the urgency and criticality of time goals. The same goal with different time constraints may require different project structures and different management attention.

Defining the objectives of the project at the onset of a project helps to remove misunderstandings and ensures that all team participants and stakeholders are left in no doubt as to the goals of the project. The review that follows looks at projects in general but specific attention is paid to projects that are information technology related.

Projects need to be differentiated from everyday tasks. In many organizations, miscommunication regarding the differentiation between normal or operations tasks and projects can be a source of misunderstanding and contention. To secure expertise and resources for projects, project managers often have to negotiate with line managers. This can create stresses and strains as power games and personal objectives come into play, making it a dysfunctional and chaotic process (Goldratt, 1997). When people are selected to become part of a project team because of a special skill that they possess, they may feel that they already have too much to do

and may not see the bigger picture or understand the objectives of the project. According to Kerzner (1987) to secure expertise, project managers must negotiate for the line manager's commitment. This can lead to development of trust between project and line managers. Project managers as well are often faced with the challenge of having to cope with their normal job in addition to managing projects (Cooke-Davies, 1990). In such cases, they too have to create an environment that will accommodate their participation as a project leader.

Every project is constrained in different ways by its scope, time and cost goals. These limitations are sometimes referred to in project management as the *triple constraint* (PMI, 2004). Proponents of quality standards use the term quadruple constraints stating that quality in projects must be included as a basic element alongside scope, time and cost. Project management tools and techniques assist project managers and their teams in carrying out scope, time, cost and quality management. The next section describes the characteristics of traditional project teams.

2.3 Traditional project teams

In the following sections, team characteristics are introduced to lay a foundation for differentiating between traditional and virtual environments. Firstly, the term 'team' is discussed followed by discussions about traditional and virtual teams. According to Katzenbach and Smith (1993, p. 112):

> "a team is a small group of individuals with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable".

This definition is one of the more commonly cited definitions of a team and is in line with the structure of project teams under investigation in this research. Perhaps the single differentiating factor between teams and other types of groups is represented by the term 'common purpose' in the definition above. Group members share a common purpose or goal, different from that of any another group. Project teams have traditionally been co-located, that is, team members are in the same physical location and therefore share the same time and space and have the opportunity for face-to-face interaction. The term 'traditional' is used in the study to refer to teams that are co-located and have face-to-face interaction.

Traditional teams have many advantages over virtual teams, some of which are explored in the following discussion. From the initial team selection and project initiation meeting, team members begin to build interrelationships and communication patterns almost immediately. Trust relationships start to emerge as soon as members get to know each other better. The traditional environment is seen as being irreplaceable for building trust (Nohria & Eccles, 1992). In many organizations, most of the members have a prior history and would already have worked with each other on previous tasks. Trust is probably easier to build in the traditional environment, because so much information can be collected visually. From direct observation of behavioural cues, people can decide instantly whether to trust another person or not. It is also possible to build trust in situations separate from the work environment such as: (i) meeting over lunch or breakfast in the company cafeteria; (ii) meeting by chance in the corridors within the company buildings; (iii) meeting at social gatherings on a weekend and realizing that you have similar

interests; and (iv) getting on the same bus or train to and from work and walking together to the office. The ability to develop these relationships means that members can communicate at a high level. Trust relationships lead teams to work together effectively (Jarvenpaa, Knoll, & Leidner, 1998).

In addition to relating to the team as a whole, team members form smaller units within the group with those with whom they share common interests. The richness of non-verbal communication is apparent in traditional teams. In a face-to-face setting, it is possible to read and interpret cues and signals from the other person (Chidambaram, 1996). A team member, whose contribution in a meeting is met with a negative expression from the project manager or any other team member, will experience a sense of rejection. A manager using a particular tone of voice can be immediately recognized as sending a message that offers praise, criticism or even sarcasm. This may be seen as an advantage in that members quickly find out where they stand because of their interpretation of the situation. However, this may also be a disadvantage if the comment is a negative one and was not meant to cause any conflict or misunderstanding. In the modern office traditional teams are no longer confined to just relying on face-to-face communication but have the opportunity to communicate and interact by taking advantage of information technology (Arnison & Miller, 2002). This enriches the possibilities of traditional communication in the traditional environment.

2.4 Virtual teams

This part of the review begins with a description of virtual teams as discussed in the literature. This is followed by a description of the type of virtual teams on which the study is focused. A discussion of the business reasons for the increase in virtual teams then follows. The review continues with an examination of issues that affect or influence success in virtual project teams. The issues under examination are communication, cohesion, culture and trust.

Peterson and Stohr (1999) identified virtual teams as a group of individuals who work across time, space and organizational boundaries with links strengthened by webs of communication technology. They have complementary skills and are committed to a common purpose, have interdependent performance goals, and share an approach to work for which they hold themselves mutually accountable. Jarvenpaa and Leidner (1999, p. 792) define virtual teams as:

> "groups of geographically and organizationally dispersed knowledge workers brought together across time and space through information and communication technologies on an (as needed basis) in response to specific customer needs or to complete unique projects".

The two views presented share some similiarities. Both groups of researchers describe time, space and communication links as being paramount to the features of virtual teams.

Projects are identified as one of the reasons for the formation of virtual teams. Krill and Juell (1997) view a virtual project as a collaborative effort towards a specific goal or accomplishment which is based on a 'collective yet remote' performance.

The formation of virtual teams has made it possible for virtual projects to become a reality. In addition to the discussion of the definition of virtual teams, researchers have also been interested in the level of virtuality or the virtualness of a team. Teams have been classified into levels of virtuality depending on the amount of face-to-face interaction and electronic mediated interaction. Beise and Niedeman (1999) relate the amount of virtualness to the amount of technology in use. They explain virtualness by describing a framework that distinguishes four types of teams: inactive, traditional, highly virtual and fully supported. *Inactive* is used to describe a team that meets very rarely either electronically or face-to-face. *Traditional* refers to a team that experiences more face-to-face interaction and very little electronic interaction. *Highly virtual* refers to a team that relies more on electronic communication than face-to-face regardless of the location of the members. *Fully supported* refers to a team that experiences arrangements of high electronic communication as well as high face-to-face interaction.

According to Arnison and Miller (2002) virtual teams are like traditional teams, the main difference however is that team members primarily interact electronically. In some cases such teams may be located within the same physical space but choose to communicate through information technology mediation.

McNamara (1999) identifies seven basic types of virtual teams. These are networked teams, parallel teams, project or product-development teams, work or production teams, service teams, management teams and action teams. According to McNamara (1999), project or product-development teams are teams that conduct projects for users or customers for a defined period of time. Tasks are usually non-routine, and

the results are specific and measurable and the team has decision-making authority. The definition by Jarvenpaa and Leidner (1999) introduced earlier is complemented by the description of project teams and virtual teams given by McNamara (1999) to capture the context of the types of organizational forms under study.

There are several business reasons that may have led to an increase in the use of virtual teams. Researchers such as Cascio (2000), McNamara (1999), and Gould (2004) have identified some of the reasons why this is the case. Their findings are based on case and survey studies of organizations such as IBM, Hewlett-Packard and other Fortune 500 companies that use virtual teams on a wide scale. Cost appears to be one of the most important factors in the decision to deploy virtual teams (Cascio, 2000; McNamara, 1999; Speechley, 2005). Virtual teams use electronic and other techniques to lower travel and facility costs, reduce project schedules, improve decision making time and communication (Gould, 2004). The requirement to outsource and take advantages of cheaper labour markets has also arisen from cost related policies adopted by organizations. The existence of cheap labour markets has led many organizations to send offshore functions that had been traditionally performed in-house or by contractors. In some cases, this has resulted in the formation of virtual teams.

Globalization is another reason that has compelled organizations to use virtual teams on a wide scale (Cascio, 2000; McNamara, 1999; Speechley, 2005). More and more organizations are taking advantage of advancements in technology and the need for globalization to deploy virtual teams. There is also an emergence of environments

which require inter-organizational cooperation as well as competition (McNamara, 1999). In the global market, with its ever increasing competitiveness, organizations find themselves needing to reach the best employees wherever they may be located (Cascio, 2000; McNamara, 1999). Being able to tap into resources dispersed across the globe has several advantages such as overcoming time barriers, gaining access to the best employees who may be located anywhere in the world, emergence of environments which require inter-organizational cooperation as well as competition (McNamara, 1999; Speechley, 2005). In software related product development teams, work on a product may continue throughout the 24-hour period as opposed to an 8-hour workspace.

The issues faced by virtual teams are similar to those faced by traditional teams but are complicated by time and distance (Cascio, 2000; Lipnack & Stamps, 2000). Some of the issues that project managers may face in such environments include the following:

- Interaction issues. Lack of physical interaction with its associated verbal and nonverbal cues (Cascio, 2000).
- Setup costs. The costs of setting up a virtual office can be substantial. Centrally organized teams can more easily share resources whereas in virtual environments this is not possible and organizations have to plan for purchases for each office (Cascio, 2000).
- Cultural issues. Virtual teams span national and cultural boundaries therefore culture can be a source of conflict in communication efforts.
- Managing isolation. Workers in a virtual environment may feel disadvantaged without some level of social interaction with decision makers

who could play a part in influencing the direction of their careers (Cascio, 2000).

- Managing trust. Coworkers need to be able to trust each other and accept that each will fulfill their obligations and behave predictably. This may pose a challenge in virtual teams (Handy, 1995).

The issue of trust is crucial in the context of virtual teams. Because of the lack of face-to-face encounters, the ability to build trust is made more difficult. Traditional face-to-face encounters are considered a necessity for trust building (Handy, 1995; Jarvenpaa & Leidner, 1999). In the next sections, issues affecting success in virtual teams are discussed. The issues are communication, cohesion and culture.

2.4.1 Communication

Communication represents one of the most critical activities performed by virtual groups (Kayworth & Leidner, 2002). Communication presents a number of challenges for project managers tasked with implementing a virtual work environment. Project managers need to be able to use available tools efficiently to maximize communication efforts. As a result of team members not being co-located, communication between them becomes a challenge from the onset. A number of studies have researched the differences in communication modalities between traditional face-to-face and virtual teams with conflicting results (Chidambaram, 1996; Hightower & Sayeed, 1995; Warkentin, Sayeed, & Hightower, 1997).

A study by Hightower and Sayeed (1995) found that virtual teams exchange information less effectively than face-to-face teams. This result is in agreement with findings by Handy (1995) who also showed that virtual information exchanges were much less effective than face-to-face encounters. This view is supported in later studies by Jarvenpaa and Leidner (1999), Engkavanish (1999) and Beise (2004). Beise (2004) used a case study method to investigate IT project managers' perceptions and their use of information and communication technology media to support project management tasks. Participants for the study comprised a convenience sample of a dozen project managers managing various project teams within a single organization. The study concluded that the use of communication technologies does not appear to substitute for, but rather complements, the use of traditional communication, thus rendering support for the suggestion that traditional communication is more effective compared to virtual communication. Powell, Picolli and Ives (2004) in a study of virtual teams also argue that traditional teams tend to communicate more effectively.

However, this view is not supported by the Chidambaram (1996) study which showed that when virtual teams are given sufficient time to develop strong intra-group relationships and to adapt to the communication medium, they may communicate just as effectively as traditional teams. With projects having predefined periods, establishing communication within that limited period presents a challenge for virtual teams especially in projects with a short time span. The results from Chidambaram (1996) suggest that teams that are working on longer projects have a better chance of improving their communication, however it is unclear whether this

improvement would allow communication to reach the levels experienced by traditional teams.

Another study which does not agree with the findings of Hightower and Sayeed (1995) and Handy (1995) is that of Warkentin Sayeed and Hightower. (1997). They used an experiment method to compare teams of undergraduate students using an asynchronous system with teams meeting in a face-to-face environment and showed that there was no statistically significant difference between the effectiveness of communication (measured by information exchange) between traditional teams and virtual teams but that the traditional teams had a more positive perception of the interactivity.

In a study of virtual organizational teams by Gould (2004), the inability to correctly interpret messages was cited as "very frustrating" by team members. Managers need to find ways of communicating that will compensate for the loss of such non-verbal communication. Walther (1995) developed a hyper personalization theory for groups limited to computer-supported communication. The theory argues that, because individuating information (cues that help others understand if they are similar or different, for example, physically) is so scarce in a virtual context, members assume similarity and tend to reveal factors and cues about themselves that only reinforce this similarity. This suggests that team members will as much as possible, put aside differences that would be so evident in a face-to-face relationship and instead concentrate on their similarities as a means to enforce better team relationships

within the virtual environment. This hints towards the development of an assumed trust.

Overall, it appears that the literature is not conclusive on whether traditional teams enjoy a more effective mode of communication than virtual teams. However, there appear to be more studies that support that view. With advancements in communication technologies and the heavy reliance on these technologies in virtual environments, team members are faced with the task of having to gain proficiency in using these tools. This, in itself, may pose a barrier to communication.

Haywood (1998) provides four principles that successful virtual teams have in common. They include:

- Standards for availability and acknowledgement are defined and respected.

- Team members replace lost context in their communication.

- Team members regularly use synchronous communication.

- Senders take responsibility for prioritizing communication.

The study by Haywood (1998) emphasizes the importance of communication issues in achieving success. According to Jarvenpaa and Leidner (1999) extensive and predictable communication patterns, a display of high task goal clarity, superior time management skills and alertness to deadlines are seen as a recipe for success. Trust is seen as an outcome of communication behaviours such as providing accurate information, explaining decisions and demonstrating sincere and appropriate openness. Increasing the frequency and predictability of communication and

enforcing feedback on a regular basis can improve communication effectiveness leading to higher trust and improved team performance (Jarvenpaa & Leidner, 1999).

2.4.2 Cohesion

Cohesion is defined as the extent to which group members are attracted to the group and to each other, and has been found to be related to many desirable traits in groups (Chidambaram, 1996). In the game of soccer, which is an example of a face-to-face team effort, cohesion is seen as the glue that binds together the aspirations of a team. By achieving cohesion in this game, players are able to play not only with each other but also for each other. Lipnack and Stamps (1999) refer to purpose as the "all encompassing glue" that binds a virtual team regardless of reporting structure. In the study by Warkentin Sayeed and Hightower (1997) that compared cohesion between face-to-face and virtual teams in an experimental setting, it was found that that there was a significant difference between the two environments. The face-to-face groups reported a higher degree of cohesion, were more satisfied with the decision process followed by the groups, and were more satisfied with the team's outcome. Group members need to develop positive attitudes towards each other in order to feel like working for each other. As group members develop more positive attitudes towards one another, their satisfaction with the group's work increases (Chidambaram, 1996). Group cohesiveness has been linked to a number of positive outcomes, including heightened awareness of problems, inclination to change, enhanced motivation, increased morale, better decision making and greater creativity (Budman, Soldz, Demby, Davies, & Merry, 1993; Chidambaram, 1996).

2.4.3 Culture

Culture is a complex issue that continues to be a topic of debate in the literature. According to Hall (1998) culture is what gives people their identity no matter where they are born. Their culture is formed by a communication framework: words, actions, postures, gestures, tones of voice, facial expressions, the way they handle time, space, and materials, and the way they work, play, make love, and defend themselves. Cultural and language differences are common in global virtual teams owing to the diversity of the teams. Studies have examined the role of cultural differences among virtual team members. Cultural differences appear to lead to coordination difficulties and create obstacles to effective communication (Kayworth & Leidner, 2000). Members base their interpretation of messages on their cultural and other experiences. Even when communicating fluently in the same language interpretations may be different owing to diversity in culture, organizational and national backgrounds (Kayworth & Leidner, 2002).

One of the major dimensions of cultural variability is individualism-collectivism (Hofstede, 1980). In individualistic cultures, the needs, values, and goals of the individual take precedence over the needs, values, and goals of the group. In collectivist cultures, the needs, values, and goals of the group take precedence over the needs, values, and goals of the individual. The negative effects of cultural differences may be mitigated by an effort to actively understand and accept the differences (Robey, Khoo, & Powers, 2000). Project managers must make an effort to understand more about the cultures of the team members before and after team composition to better arm themselves with the prerequisite knowledge needed in managing situations that will arise as a result of cultural differences. Trust is

culturally rooted, in that it is closely tied to the norms, values and beliefs of the individual team member's culture. Understanding and accepting cultural differences among team members can lead to better outcomes of team performance and thus lead to project success. The following section looks at the background on project management.

2.5 Project management

Although the literature shows that there are several definitions of project management, only one of them is listed here, taken from the PMBOK (2004, p. 8):

> "Project management is the application of knowledge, skills, tools and techniques to project activities in order to meet project requirements".

Organizations have been practicing project management techniques for a very long time. The origin of the modern concept of project management is said to have been the Manhattan Project, which the U.S. military undertook, leading to the development of the atomic bomb. The Manhattan Project involved many people with different skills at several different locations. The project lasted about three years and cost almost \$2 billion in 1946 (Schwalbe, 2004). The building of the pyramids of Egypt and the Great Wall of China are also recognized as projects with most of the underlying principles of project management being applicable (Schwalbe, 2004).

The PMI has identified 39 project management processes, based on nine knowledge areas, among them, cost, time, quality and procurement (PMI, 2004). Processes may include communication and information, project monitoring, planning and control, decision-making and review processes. Organizations use project management to

accomplish a series of business goals, strategies, and work tasks within a well-defined schedule and budget. Project management is now playing a bigger role in support of an organization's competitive strategy to deliver desired outcomes (Milosevic, 2003). Project management has special features, compared to other forms of management. Project management is directed toward organizing activities to achieve goals of scope, cost, and time (PMI, 2004; Turner 1999) and, increasingly, toward broader customer and business goals (Shenhar, 2001). Project management induces a temporary organizational structure as part of or replacing the old organizational structure (PMI, 2004). Project management includes both standardized and organization-specific tools and good practices (PMI, 2004). Project management promotes distributed and project-specific responsibilities in the organization (PMI, 2004; Turner & Müller, 2005).

2.6 Project managers

Project managers work with project sponsors, the project team, and the other people involved in a project to meet project goals. A project manager is charged with the responsibility of ensuring that a project reaches its successful conclusion, delivering that which it set out to achieve. Project managers must identify, assess and manage risks that could affect the project and prevent it from reaching its successful conclusion. A project manager needs the ability to engage every member of the project team, whether in a traditional or virtual setting, to openly discuss the risks that may be anticipated and offer possible solutions to minimize or eliminate the risks or their effects.

A project manager is seen as one of a number of factors that are critical for project success (Jiang, Klein, & Balloun, 1996; Jiang, Klein, & Margulis, 1998; Leigh & Maynard, 1995; The Standish Group, 2001). The skills and competencies of the project manager are worth examining in an effort to find out how they match up to changing project environments. Jiang, Klein and Chen (2001) surveyed 500 information system project managers and found that the project manager's performance is a significant predictor of project performance. Their study provided evidence of the critical role performed by project managers and the need for organizations to involve their IS project managers in projects as early as possible. In another study that supports this need, the Standish group (2001) found that 97% of all successful projects have an experienced project manager at the helm.

A study by Bander (1986) lists the project management skills that are critical for project success: planning; managing tasks; managing the project team; interfacing with the user; and interfacing with the rest of the organization. Bander (1986) adds four areas of competency that are deemed as necessary to perform those functions: problem solving; managerial identity; achievement orientation; and strong influence. In a study that involved 100 project managers, Zimmerer and Yashin (1998) identified the skills and characteristics they deemed critical for effective project management and the characteristics that made project managers ineffective. Table 2-1 lists these characteristics.

Table 2-1: Significant characteristics of effective and ineffective project managers

Effective Project Managers	Ineffective Project Managers
Lead by example	Set bad example
Are visionaries	Are not self-assured
Are technically competent	Lack technical expertise
Are decisive	Are poor communicators
Are good communicators	Are poor motivators
Stand up to top management when necessary	
Support team members	
Encourage new ideas	

Taken from Zimmerer and Yashin (1998).

The Standish Group (2001) research reported that the skills required for effective project management are business, technical, project management, decision, process, detail, organization, and communication skills.

The skills identified by the studies above show some similarities and differences in several areas. All three studies agree that technical competency and communication skills are necessary skills for a project manager. Bander (1986) refers to technical competency as a problem solving competency. Project managers are at the forefront of communication with the stakeholders of the project. Bander (1986) and the Standish Group (2001) agree on the issue of organizational skills as a critical skill. Decisiveness is also deemed a critical skill by the Standish Group (2001) and Zimmerer and Yashin (1998) but is not specified in the Bander (1986) study though it may be implied in the competencies listed. Bander (1986) and the Standish Group (2001) agree on the need for project management skills such as planning and management. This is not explicitly specified in the Zimmerer and Yashin (1998)

study. Generally, there are more common areas than differences between the three studies in question.

More recent studies show a different set of skills as being critical to project success in virtual project team environments. Pearlson (2001) suggests that project managers venturing into the virtual world for the first time are faced with three paradoxes: (i) an increase in structure and flexibility—flexibility in the sense of the work environment and structure as it relates to the pattern of interaction between virtual workers and management; (ii) greater individuality and more teamwork—individual effort is needed due to distance, but there needs to be unity and commitment by the team members on objectives; (iii) an increase and decrease in control—control over the worker is reduced, but managers must maintain strong control over the structure of the group. There is a tendency to have a more structured virtual environment to compensate for the lack of informal communication. To overcome these challenges project managers may need different skills that are more appropriate to handle these situations. Pearlson (2001) suggests approaching the new environment by embracing a totally new perspective, considering different viewpoints and time dimensions and formalizing the informal.

Project managers of virtual teams are faced with several complex issues to contend with as they strive for success in this environment. Most project management techniques were designed for co-located project teams. These techniques may prove ineffective in global multi-site organizations (The Standish Group, 1999). This conclusion is similar to that made by Gould (2004) who found in his study that some

of the behaviours such as control management based on constant scrutiny, considered good management practices in the traditional environment were changed, or even eliminated, because the team was physically separated. Another study, which supports the view that a different approach needs to be taken when managing virtual teams, is that of Pare and Dube (1999). They conducted in-depth interviews with experienced virtual project managers and their findings showed that, even though all team members have to make adjustments to face the virtual environment, the project manager seems to require the most change. The findings discussed above are different from those of Trautsch (2003) whose study found that there were no significant differences in the techniques used for managing virtual project teams compared to managing traditional project teams. Trautsch (2003) surveyed project managers with virtual team experience and concluded that this was an unexpected result considering the added complexity of virtual team management.

In a study on the changing nature of leadership, Speechley (2005) conducted a case study of virtual teams within a global pharmaceutical company. He found that traditional leadership development initiatives had not equipped project managers with the skills or techniques necessary to successfully operate in the far more complex virtual environment. In other words project managers coming from a traditional background were ill prepared to manage virtual teams. The study showed that project managers in the organization became increasingly aware that traditional forms of leadership, such as command and control, were no longer adequate. They also recognized that different, or at least more enhanced skills and techniques, were required to lead these teams successfully. Speechley (2005) also found that few project managers have been trained to lead and manage teams in this new

environment. Project managers often lacked the skills, tools and techniques to meet the new challenges they faced. The results of the study showed that the individual qualities displayed by project managers were considered very important, particularly when you cannot see the project manager and you have to depend on trust and integrity. These findings are similar to findings by Handy (1995) who suggests the need for project managers to establish relationships with line managers as a way to establish shared expectations of the input expected from team members. Communication through meetings in virtual teams takes on a far more significant role than it did in traditional type teams and was considered a pivotal interface for team members.

According to Rolfe (2006) the new world of virtual project management requires many of the same skills as traditional project management, however, it means letting go of some of the control, which may be difficult. Coordination skills are primary because of the reduced communication of virtual teams. Generally, it would seem from the discussion above that project managers who are tasked to manage virtual teams may have to review their approach and skills before taking on this task.

Project management authors, Gray and Larson (2000), recommend that project managers be innovative and adapt to changing circumstances in order to maintain control. This view is echoed by Lee-Kelley (2002) who suggests that managers need the ability to alter their instinctive style to match the situation. Virtual project teams present the opportunity for such an adjustment from project managers. The challenge for project managers of virtual teams is to create a level of collaboration and

productivity that rivals the experience of the best co-located teams, and to accomplish these outcomes against the backdrop of the rapid changes facing businesses today (Kerber & Buono, 2004). Project managers may need to adapt as they prepare for the changing roles that come with virtual project challenges if they are to achieve project success.

2.7 Project success

Applying project management techniques is seen by organizations as a way to increase the chances of achieving project success. Researchers do not seem to agree on what constitutes project success or how project success should be measured. This part of the review gives an insight into previous research on project success, success factors, critical success factors and success indicators. According to Pinto and Prescott (1988), previous research results indicate that the relative importance of several of the success factors changes significantly, based on life-cycle stages. Table 2-2 gives an indication of the success criteria studied by various researchers. Generally, most researchers agree on individual criteria but do not agree on the combination of these criteria that makes one project perceived as a success while another is seen as a failure.

Table 2-2: Success criteria identified by researchers

Success criteria	Author
Project completed on schedule	Pinto and Slevin (1986); Turner and Müller (2005); Kerzner (1987); Beise (2004); Baccarini, (1999)
Project met the budget	Pinto and Slevin (1991); Beise (2004); Baccarini (1999); Pinto and Slevin (1986)
Users satisfied with outcomes of project	Baccarini (1999); Pinto and Slevin (1986); Baccarini (1999); Beise (2004)
Project management process was a success	Baccarini (1999); Pinto and Slevin (1986)
Organizational success	Pinto and Slevin (1986); Baccarini, (1999)

Baccarini (1999) proposed the logical framework method (LFM) as a foundation for defining project success. The LFM represents project success as consisting of two components: project management success and product success. According to Baccarini (1999), project management success has three key components: (i) meeting time, cost, and quality objectives (project outputs and inputs); (ii) quality of the project management process; (the manner in which the project management process was conducted); and (iii) satisfying project stakeholders' needs where they relate to the project management process. Product success has three components: (i) meeting the project owner's strategic organizational objectives (project goal); (ii) satisfaction of users' needs (project purpose); and (iii) satisfaction of stakeholders' needs where they relate to the product (Baccarini, 1999). This view of product success is similar to the view of Shenhar, Dvir, Levy and Maltz (2001) who identified the following areas of relevance for product success: impact on customer; direct business and organizational success; and preparing for the future.

It follows that project management success focuses upon project process and, in particular, the successful accomplishment of cost, time, and quality objectives (Baccarini, 1999). Andersen (2006) states that project management success expresses what the project should deliver at what time and at what cost. On the other hand, project product success is seen to be dependent more on the efforts of the organization that the project serves. The views of both Baccarini (1999) and Andersen (2006) suggest that project managers have more influence over project management success as opposed to product success which depends more on the organization. This may be a likely proposition as illustrated in the following example. An organization may hire a project manager to ensure the successful delivery of a product. The project manager's task is to see to it that the project management process delivers the product as expected by the client. On completion of the process, the project manager may claim project success. However, the long-term organization view of the success of the product may deliver a different verdict and claim that the product was not a success. This may be due to many reasons such as, for example, users of the product may move on to something new or better and may actually just abandon the product. This action does not diminish the fact that the project itself was a success in that it delivered what the client requested. Despite the differences between product success and project management success, both involve stakeholders' satisfaction, which is seen as a crucial part of project success.

2.7.1 Project manager perspectives of project success

In many projects, there is a need to identify which of a large number of stakeholders are going to have the most influence in determining project success. A project manager is expected to be able to control and influence the achievement of the

project management success criteria of cost, time, and performance. Good project management can contribute toward product success even though it is unlikely to be able to prevent product failure (Andersen, 2006). Since the project manager is the main focus of this study, there is more of an emphasis on success of the project management aspect of success rather than the product aspect. The criteria of whether a project has successfully met the objectives of time, cost, and quality is a short-term measure made on completion of the project (Andersen, 2006). One of the issues that have come out of the literature on project success is the differences in the way that project managers perceive project success in comparison to customers' perceptions. Kupakuwana and Berg (2005) observe that project managers largely interpret successful projects as meeting the project management criteria such as budget and schedule, whereas customers interpret successful projects as those meeting product success criteria such as product reliability. This suggests two views, a short-term view of the project process, and a long-term view relating to the project's product. This study adopted the short-term view of project success as it is seen to be within the control of the project manager. Throughout the study, the terms *project success* and *project management success* are used interchangeably.

Research by the Standish Group (2004) spanning a 10 year period shows that there has been a steady improvement in information technology project success partially as a result of applying project management techniques. The Standish Group (2004) classifies projects into three resolution types:

- Successful: The project is completed on time and on budget, with all features and functions as originally specified.

- Challenged: The project is completed and operational, but over budget, over the time estimate and with fewer features and functions than initially specified.

- Failed: The project is cancelled before completion.

Table 2-3 shows that even though there are still many projects that are failing or not being completed, the rate of success appears to be increasing slightly while the rate of failures seems to be falling more rapidly.

Table 2-3: Project resolution history 1994-2004 (The Standish Group, 2001, 2004)

	Succeeded	Challenged	Failed
1994	16%	53%	31%
1996	27%	33%	40%
1998	26%	46%	28%
2000	28%	49%	23%
2004	29%	53%	18%

2.7.2 Success factors - traditional perspective

As part of their research, the Standish Group identified a list of ten factors that lead to project success. The ten most important factors in order of influence on project success were: (i) Executive Support; (ii) User Involvement; (iii) Experienced Project Manager; (iv) Clear Business Objectives; (v) Minimized Scope; (vi) Standard Software Infrastructure; (vii) Firm Basic Requirements; (viii) Formal project management methodology; (ix) Reliable Estimates; and (x) Other (The Standish Group, 2001). They point out that not all projects require all ten factors to be successful, however the more factors present in the project strategy, the higher the level of confidence. Research such as this by the Standish Group highlights the need

for organizations to remain concerned with the failure rates of projects as these have a negative impact on their ability to meet business objectives. Project management, as a field of study and a business approach, aims to understand the factors that make projects successful with the aim of replicating this success on a more consistent basis.

According to Kerzner (1987) critical success factors are those elements which must exist within the organization in order to create an environment where projects may be managed with excellence on a consistent basis. Kerzner (1987) used a case study method and identified six critical success factors as: corporate understanding of project management; executive commitment to project management; organizational adaptability; project manager selection criteria; project manager's leadership style; commitment to planning; and control. According to this list, it is crucial that the corporation as a whole embraces and understands project management. Organizational adaptability refers to the ability of the organization to change its working environment or processes in order to accommodate projects. For example, if some workers have been designated to be part of a project team in addition to their current jobs or tasks, the organization must be able to adapt to this change so that both operational and project tasks are carried out with minimal disruptions. Project manager selection criterion is possibly one of the biggest decisions that management has to make. Policies and procedures must be in place that ensures the best candidate is selected for a project in accordance with the skills and specialization being sought. The leadership skills of a project manager and his or her commitment to planning and control can have a huge bearing on the success or failure of the project.

Pinto and Slevin (1989) used a questionnaire to study success factors in various research and development projects. Their study resulted in the development of a 10-factor model of the project implementation process and an instrument called the project implementation profile (PIP), which has been used by project managers to monitor the current state of each of the ten factors at various stages of the project life cycle (Pinto & Slevin, 1987; Pinto & Slevin, 1989). The PIP has been applied by several researchers including Pinto (1990), Pinto and Prescott (1988), Delisle (2001) and Mahaney and Lederer (2006). The ten factors identified by Pinto and Slevin (1989) were: project mission; top management support; project schedule/plans; client consultation; personnel selection; technical tasks; client acceptance; monitoring and feedback; communication; and troubleshooting. Other factors included in the research were defined as: characteristics of the project leader; power and politics; environmental events; and urgency. According to the study by Pinto and Slevin (1989) the importance of the critical success factors changes with the stage of the project life cycle.

The studies discussed above highlight some interesting similarities and disparities in what constitutes a critical success factor for project success. All three studies list executive support as a critical success factor of high priority. Without support from top management, projects are likely to struggle. The Standish Group (2001) study is in agreement with the Pinto and Slevin (1989) study on the issue of client involvement. Surprisingly this is not listed as a factor in the Kerzner (1987) study. All three studies agree on the influence or importance of the project manager as a critical success factor as well as the use and support of formal project management techniques in order to achieve success. Other factors that differ between the three

studies are mainly related to the type of projects that were under study. The Standish group study, for example, concentrated on software development projects while the Pinto and Slevin (1989) study investigated various research and development projects. The Kerzner (1987) study looked at a case study from a single organizational perspective.

2.7.3 Success factors - virtual perspective

More recent studies have attempted to define project success in line with new forms of organizational structures and the advent of virtual project teams. Results show that there is a growing perception that success in virtual teams is not defined in the same way that success is defined in traditional teams. A study by Delisle (2001) found support for the conclusion that the perceptions of success indicators differ in some ways between virtual projects and traditional projects. Delisle (2001) used a quantitative, web-based survey to study success and communication in virtual project teams. The study targeted a sample of project managers from various organizations. The results of the study found that virtual teams showed a higher focus on customer relationships (satisfaction and use of product or service).

According to Delisle (2001), critical success indicators (CSI) are those internal and external influences an organization heeds when doing a project well, while critical success criteria (CSC) refers to those markers by which to judge the success of the project. Delisle (2001) identified open communication, commitment, fun, communication skills and trust as the top five CSI at the virtual team level. Other

CSI found to be significant in the study by Delisle (2001), include project manager skills, competency, delegate authority, and planning and control.

According to Beise (2004) project success is measured by deliverables, employee satisfaction, schedule, budget, client satisfaction, political perception and risk management. Both Beise (2004) and Delisle (2001) agree that project success metrics continue to evolve. Vakola and Wilson (2004) also identified success factors that differ from those of the traditional view. Their study used a questionnaire and interviews of senior managers to investigate critical success factors in virtual organizations in the construction industry. They found information sharing, organizational culture and team working, acceptance of change and training to be important issues that need to be addressed by virtual teams. According to Vakola and Wilson (2004), the human factor in virtual teams plays a major role in the overall success or failure, despite the technological advancements.

The project management literature shows that the view of project success in virtual teams differs from the view of project success in traditional teams. The critical success factors continue to evolve over time. Researchers view project success factors differently although some factors remain consistent. Kupakuwana and Berg (2005) state that success factors are moving away from the traditional measures of time, cost and scope. The virtual view shows new factors such as trust (Delisle, 2001), communication skills, changing project manager skills (Delisle, 2001), employee and client satisfaction (Beise, 2004), information sharing, team work, and acceptance of change (Vakola & Wilson, 2004) take centre stage alongside the

traditional factors. Answers to questions such as the following remain inconclusive: Does success in traditional team environments mean the same thing as success in the virtual environment? Just how prepared are project managers in dealing with the new challenges introduced by the virtual environment? Research is not clear on these issues but there is agreement on the evolution that is taking place as far as defining what project success really means in the virtual environment. As the definition and perspective of success factors appears to be changing over time, the project manager's skills and competencies need to be reviewed in line with the changes. The literature on project success does not give sufficient emphasis to the impact of the project manager and specifically the skills of the project manager as success factors. Among the new success factors identified in the project success literature is the issue of trust. This topic is explored further in Chapter 3.

2.8 Overview

This chapter reviewed the background on project teams and the role of project management in organizations. The chapter introduced projects and how they differ from other everyday tasks. A definition of teams was then explored, followed by discussions on the characteristics of traditional and virtual teams. Some of the dimensions of virtual teams were explored further with a view to understand their influence on team participation and outcomes. The reasons for the emergence of virtual teams were reviewed as studies show that this is a growing trend in organization forms. The next section explored the background and role of project management in organizations. The role of project managers was then reviewed. The skills of the project manager have come into question especially on whether the

skills attained in traditional environments are still relevant and transferable to the virtual environment. The review also illuminates the issues and challenges faced by project managers in the virtual project environment. This discussion was then followed by a discussion of project success. Project success was defined and reviewed from both a traditional and virtual perspective. The next chapter provides a literature review of trust and the role it plays in relation to project success.

Chapter 3 Literature Review on Trust

3.1 Introduction

This chapter reviews the literature on the role of trust in virtual project success with a view to highlighting relevant research on the topic. The chapter begins by discussing the role played by trust in society (Section 3.2). Section 3.3 discusses dictionary meanings of trust and views adopted by researchers. Section 3.4 looks at how trust has been conceptualized by researchers. Section 3.5 discusses views on how trust is developed and reviews this from a traditional and virtual environment perspective. Finally, section 3.6 explores trust models that have been investigated by previous researchers.

3.2 Introduction

The role played by trust in fostering relationships is recognized throughout the literature on teams. Couch and Jones (1997) identify trust as a critical element in any close or important relationship. Simmel (1978, p. 178) provides a forceful statement on the role of trust in social life:

> "Without the general trust that people have in each other, society itself would disintegrate, for very few relationships are based entirely upon what is known with certainty about another person, and very few relationships would endure if trust were not as strong as, or stronger than, rational proof or personal observation".

Similar views have been expressed by other researchers who have gone as far as saying that the activities of society would come to a complete halt if people did not trust each other (Gardner, 1990). Trust is particularly important in newer

organizational forms such as virtual collaborative relationships (McKnight, Cummings, & Chervany, 1998; Meyerson, Weick, & Kramer, 1996). The issue of trust is at the centre of successful virtual team management (Gould, 2004). In the virtual world, trust is a way to "manage people whom you do not see" (Handy, 1995, p. 41). Handy (1995, p. 44) relates the importance of trust as a management issue in the following statement

> "If we are to enjoy the efficiencies and other benefits of the virtual organization, we will have to rediscover how to run organizations based more on trust than on control. Virtuality requires trust to make it work: Technology on its own is not enough".

Lipnack and Stamps (1996), claim that in virtual teams of the Information Age, trust is a 'need to have' quality in productive relationships. A study by Delisle (2001) found trust to be among the top five critical success indicators in virtual teams.

These views find credence in everyday life which is filled with so many examples of the role that trust plays in human interactions. Examples of trust encounters abound in love relationships, normal interpersonal dealings, work relationships and international relations. A son, who is told by his father that if he does well in school he will be rewarded, trusts that his father will honour his word when he achieves good grades. Workers pay their taxes trusting that the government in place will spend their hard earned money wisely for the benefit of the whole society. Trust is also at the centre of international disputes or disagreements. The ongoing international controversy surrounding the ownership of nuclear power continues to be an agenda on the United Nations forum. Trust is the main issue in this standoff as, even though one side claims that they need nuclear power for energy purposes, the other side does not trust that nuclear power will be used for the stated purpose but

rather as a weapon for some countries to annihilate their enemies. There are many such examples that signify the role of trust in our lives on a daily basis.

3.3   Definitions of trust

While researchers agree on the importance and role of trust in relationships, agreeing on the *definition of trust* has proved to be more elusive. Clarifying the definition of trust is essential in view of the various interpretations that exist. The literature on trust gives both dictionary and research definitions of trust and reveals the multifaceted dimensions of trust. Everyday interpretations and meanings of trust serve to justify the need to discuss both sources of trust meanings. Trust is complex and multidimensional (Lewis & Weigert, 1985) and this possibly accounts for the various ways that researchers have defined it. A dictionary definition and the approaches taken by researchers to explain trust will now be discussed.

According to the Websters dictionary (1976) trust is the "complete assurance and certitude regarding the character, ability, strength, or truth of someone or something". The dictionary also lists several words that are related to trust, these include, confidence, dependence, faith, hope, reliance, assurance, certainity, certitude, conviction, credence, credit and positiveness. The following attributes of trust stand out in the selected definition: ability, dependency, reliability, confidence and truth, At least one or more of these attributes must be present in the transaction of trust that occurs between two parties. When trust is involved, one must rely on another who is considered reliable or one must depend on another who is considered

dependable. We also note that in everyday language, trust may be expressed as a noun, verb, adjective or an idiom.

Trust has been viewed by researchers from different academic disciplines; each providing their own definitions and views. A discussion of some of the definitions proposed by researchers is necessary when attempting to understand the links that exist between scientific definitions and everyday usage of the term. Researchers agree on the multidimensional aspects of trust (Bromiley & Cummings, 1995; Mayer, Davies, & Schoorman, 1995; McAllister, 1995; Strickland, Cafferty, Allen, Klecka, & Silver, 1968). The following discussion looks at some of the definitions provided by the literature on trust.

Rotter (1971), one of the early trust researchers, defined trust as a generalized tendency to assume others would fulfil expectations. In this definition, an assumption is made by the trustor that the trusted party will fulfil expectations. Larzelere and Huston (1980, p. 596) defined trust as "the extent that a person believes another person (or persons) to be benevolent and honest". In this definition, the dimensions of honesty and benevolence are seen to be critical for one to be trusted by other people. Baier (1986, p. 235) defined trust as an "accepted vulnerability to another's possible but not expected ill will (or lack of good will) towards one". In this definition, the focus is on vulnerability, which is defined in terms of the goods or things one values and whose care one partially entrusts to someone else, who has some discretion over him or her (Meyerson, Weick, &

Kramer, 1996, p. 170). Vulnerability presumes the possibility of losing something of value.

Gambetta (1988), on the other hand, views trust from a different angle, that which revolves around uncertainty and the need for monitoring. Gambetta (1988, p. 219) argues that:

> "trusting a person means believing that when offered the chance, he or she is not likely to behave in way that is damaging to us, and trust will typically be relevant when at least one party is free to disappoint the other, free enough to avoid a risky relationship, and constrained enough to consider that relationship an attractive option".

Gambetta (1988) follows this argument by stating that an unmonitored person will take advantage of the trust given to them. To Gambetta (1988), the need to monitor a trustee is imperative if issues of uncertainties of trust are to be resolved. Trust therefore becomes an issue of monitoring. One may ask: Why monitor someone if you trust them? Can you both trust and still find a need to monitor a person? Let us take an example of an organisation whose management has assured the employees that they have been entrusted to use the network facilities as a tool for productivity. If management implements strict monitoring controls using security related software packages that allow it to have access to all the network related activities of the employees, can the employees feel that they are trusted? Employees would generally feel that they are not trusted by management. On the other hand, management can argue in view of the above definition of trust that they do trust their employees and that the security measures are just a safety net to reduce uncertainties.

Luhmann (1988, p. 98) views trust as "an attitude that allows for risk-taking decisions". In this definition trust is about risk, and risk is about the choice to expose oneself to a situation where the possible damage may be greater than the advantage sought. If one is to trust, first one must presuppose an element of risk and the possibility of disappointment. Luhmann (1988) argues therefore that trust and confidence are different ways of asserting expectations that may lapse into disappointment.

Currall (1990) defined trust as an individual's reliance on another person under conditions of dependence and risk. The attributes reliance, dependence and risk are used in this definition to highlight the notion that individuals rely on others to service their needs. There is an element of risk in that the outcome may not be as expected. According to Mayer, Davies and Schoorman (1995, p. 712) "trust is the willingness of another party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party". Trust is based on the expectation that others will behave as expected. In this definition, there is an emphasis on the vulnerability attribute of the trustor who must be willing to place themselves in this position while accepting the limitations of being unable to control or monitor the actions of the trusted party. The main attributes of this definition can be identified as vulnerability and willingness. The definition by Mayer, Davies and Schoorman (1995) is in agreement with the definition by Baier (1986) but extends that further by emphasizing the lack of reliance on control and monitoring mechanisms. Their definition is also in agreement with the definition by Currall (1990) in that placing oneself in a position of vulnerability implies that the trustor is

aware of the risks involved. However even though the trustor is aware of the risks involved there is an element of dependency and thus the trustor is prepared to rely on the other party.

Another approach is that taken by Cahoon and Rowney (1996), who defined trust as the act of placing confidence; and the firm belief in the honesty, and integrity of another person or thing. The attributes of trust in this definition can be broken down into confidence, belief, honesty and integrity. Gambetta (1988) notes that trust is the specific expectation that another's actions will be beneficial rather than detrimental. In this case, the trustor believes in the goodness or noble intentions of the trusted party.

Most of the definitions discussed above are within the context of a dyadic relationship (between two people) (Baier, 1986; Currall, 1990; Mayer, Davies, & Schoorman, 1995), however, trust has also been defined at a collective level within the context of teams or groups (Bromiley & Cummings, 1996; Jarvenpaa, Knoll, & Leidner, 1998; Sarker, Valacich, & Sarker, 2003). Bromiley and Cummings (1996) view collective trust as the common belief among group members that individuals will behave in accordance with the commitments, will be honest in the negotiations preceding those commitments, and will refrain from taking undue advantage of another. Sarker, Valacich and Sarker (2003) define virtual team trust as the degree of reliance individuals have on their remotely located team members taken collectively (i.e., as a group). This definition is one of a few that directly relates trust to a virtual team.

3.4 Conceptualizing trust

This section introduces some of the ways that trust has been conceptualized by researchers. The section attempts to categorize different types of trust found in the literature. The section also attempts to relate trust constructs to categories suggested by researchers. It is necessary to understand the different interpretations by different authors. Owing to its complexity and multidimensional nature, the concept of trust may be approached and applied in varying ways, with each application having merit and relevance in its own way. In a study on guidelines for measuring trust in organizations, Paine (2003) describes various attributes of trust as being multi-level, culturally rooted, communication based, dynamic and multi dimensional (Table 3-1).

Table 3-1: Attributes of trust

Attribute	Description
Multi level	Trust results from interactions that span co-worker, team, organizational and inter-organizational alliances.
Culturally rooted	Trust is closely tied to the norms, values and beliefs of the organizational culture.
Communication based	Trust is the outcome of communications behaviours, such as providing accurate information, giving explanations for decisions, and demonstrating sincere and appropriate openness.
Dynamic	Trust is constantly changing as it cycles through phases of building, destabilization and dissolving.
Multi dimensional	Trust consists of multiple factors at the cognitive, emotional and behavioural levels, all of which affect an individual's perception of trust. Trust has been one of several dimensions frequently included in the measurement of relationships.

Taken from Paine (2003)

In attempting to provide a focus on trust research, McKnight and Chervany (1996, p. 25) proposed the following criteria for using trust constructs:

1. The constructs should cover a broad spectrum of concept types that will be representative of most commonly used scientific and everyday usages.

2. The constructs should facilitate scientific measurement and prediction.

3. The constructs should be parsimonious enough to be easily understood and distinguished.

4. The constructs should be 'scalable' to additional levels of analysis.

5. The constructs should properly represent conceptualizations from several disciplines.

The following section describes some commonly used categorizations of trust constructs.

3.4.1 Categories of trust

Interpersonal (personal) trust, institution-based (impersonal) trust and dispositional trust are identified in the trust literature as three major categories of trust (McKnight & Chervany, 1996). McKnight and Chervany (1996) defined and categorized six trust constructs: trusting intention, trusting behaviour, trusting beliefs, system trust, dispositional trust, and situational decision to trust, which form part of a common set of trust constructs used by researchers. Some of these form part of the first categorization. However another view of trust is presented by Shapiro, Sheppard and Cheraskin (1992). They identified three types of trust that operate in the development of a business relationship: deterrence-based trust, knowledge-based trust, and identification-based trust. Their proposal is discussed in Section 3.4.1.

Other researchers have identified swift trust as a type of trust commonly associated with short-lived teams such as virtual teams. This is explored in more detail in Section 3.4.2.1. This discussion explores the first categorization of interpersonal, institutional and dispositional trust.

The *interpersonal* category relates to trust between persons either individually or as groups. Individually the trusting entity is one person and trust is directed to another party or parties hence one person trusts another person, persons, or thing(s) in the situation. When the trusting entity is a group, two or more people (or groups) trust each other in the situation (McKnight & Chervany, 1996). Most researchers tend to view trust in terms of interpersonal relations (Deutch, 1958; Mayer, Davies, & Schoorman, 1995). *Institution-based trust* which could also be referred to as impersonal trust, describes trust constructs that relate to the organization or institution (Shapiro, 1987). Sociologists tend to see trust as an institutional phenomena (Lewis & Weigert, 1985; Shapiro, 1987). *Dispositional* trust relates to a category of trust that is based on the personality attributes of the trusting party; that is, the trustor has a general tendency to trust others across situations (Rotter, 1967). Some psychologists have viewed trust as an interpersonal attribute (Rotter, 1967).

3.4.2 Interpersonal trust

Interpersonal trust is a pervasive phenomenon in organizational life (McAllister, 1995). Rotter (1967, p. 651), defined interpersonal trust "as an expectancy held by an individual or a group that the word, promise, verbal or written statement of another individual or group can be relied upon". According to McKnight, Cummings and

Chervany (1998) interpersonal trust is a person-specific concept, in that one person is ready to depend on a specific other person. In this view McKnight, Cummings and Chervany describe a dyadic relationship. They also described interpersonal trust as a situation-specific concept; the concept is applicable to a specific situation. Interpersonal trust has also been referred to as an intentional state; the person is willing to depend on the other in a given situation (McKnight, Cummings, & Chervany, 1998).

According to Lewis and Weigert (1985, p. 970), interpersonal trust has both cognitive and affective foundations. They state that:

> "Trust is cognition-based in that we choose whom we will trust, in which respects and under what circumstances, and we base the choice on what we take to be 'good reasons,' constituting evidence of trustworthiness"

Affect-based trust, on the other hand, involves one's emotional bonds and sincere care and concern for the well-being of others (Lewis & Weigert, 1985; McAllister, 1995). In this type of trust, individuals tend to develop strong links of personal values and emotional ties toward each other. This improves their understanding of each other as individuals and creates emotional openness without much concern for vulnerability. The resulting social intimacy helps them develop shared values, perceptions and mental models (Chowdhury, 2005).

McAllister (1995) defined versions of interpersonal trust that differentiated interpersonal trust's cognitive and affective aspects. McAllister's (1995) study found evidence for a clear distinction between affect-based and cognition-based interpersonal trust in terms of distinct relationships with other concepts. He

concluded: "Thus, affect-based trust and cognition-based trust represent distinct forms of interpersonal trust." (1995, p. 49). McAllister's (1995) study was conducted in a field setting with 194 managers and professionals. Findings of the study indicate that the beliefs of managers about the trustworthiness of peers can be measured along two dimensions: the extent of affect-based trust; and the extent of cognition-based trust. In general, the study found that levels of cognition-based trust were higher than levels of affect-based trust. Cognition-based trust results from a deliberate assessment of others' characteristics and the process of weighing benefits of trusting over risks (Lewicki & Bunker, 1996). This type of trust is posited as a function of an individual's perceptions of the interacting parties' trustworthiness determined by their ability, integrity and benevolence (Mayer, Davies, & Schoorman, 1995). There is a cognitive assessment undertaken of the other party as a prerequisite to trust. If the person being evaluated meets the expectations of the person performing the evaluation, it is likely that the evaluating person will develop a high level of interpersonal trust in the evaluated person. A high level of cognition-based trust would allow the evaluating person to trust the evaluated person and actively engage in collaborative work and seek knowledge from those he or she trusts (Chowdhury, 2005).

Chowdury (2005) studied relationships between interpersonal trust and complex knowledge sharing in organizations. The study utilized a survey of 164 MBA students to collect data. Among the findings of the study are that the level of trust within dyads is a significant predictor of complex knowledge sharing. Chowdury (2005) states that trust must be developed between every member for it to improve knowledge sharing throughout the team. He concludes that teams for which

knowledge sharing is critical must focus more on developing cognition-based trust than on developing affect-based trust. This finding is in line with findings by McAllister (1995).

Paul and Rueben (2004) viewed interpersonal trust from a different perspective. Their categorization was based on four types of interpersonal trust identified as calculative, competence, relational and integrated. Paul and Rueben (2004) studied the relationship between interpersonal trust and virtual collaborative relationship performance. Their study was based on face-to-face interviews of 74 key health care professionals selected from three telemedicine networks located in the United States. Their study found support for an association between interpersonal trust and performance. *Calculative trust* is based on conceptualizing trust as a form of economic exchange (Lewicki & Bunker, 1996). *Calculative trust* has also been referred to as calculus-based trust (Lewicki & Bunker, 1996) and as rational trust (Jarvenpaa, Knoll, & Leidner, 1998). *Competence trust* is a type of interpersonal trust that is dependent on whether the other party is capable of doing what it says it will do (Mayer, Davies, & Schoorman, 1995). This type of trust is an assessment of the expertise and abilities of the other parties. *Competence trust* is required in complexity reducing collaborative efforts when the skills needed to perform a task are not found within one person. This is a case in point of a situation that exists in a virtual project where one person would not be expected to be equipped with all the skills. Instead, each member of such a team is a specialist in their own field of expertise. Members of the team are more likely to engage in a collaborative relationship if they perceive other team members as being capable.

The third type, *relational trust*, is the extent one feels a personal attachment to the other party and wants to do good by the other party, regardless of egocentric profit motives (Jarvenpaa, Knoll, & Leidner, 1998; Mayer, Davies, & Schoorman, 1995). Variations of relational trust include normative trust (Child 1998), goodwill trust (Sako 1991, 1992, 1998), affect-based trust (McAllister, 1995) and identification trust (Lewicki & Bunker, 1996). A motivation to do good by the other party is key to these definitions. The various interpretations of the concept of relational trust all include the idea of one party empathizing with the other party, and specifically exclude the notion of calculative trust. The integrated perspective of interpersonal trust combines the different types of trust. Different types of trust are related to each other, even though they are separable and vary independently of each other (Mayer, Davies, & Schoorman, 1995). Trust can take different forms in different relationships, and different forms of trust may mix together and interact in some situations. Interpersonal relationships are based on combinations of different types of trust depending on the type of relationship or stage of the relationship. This can be quite a confusing prospect when it comes to examining the various types of interpersonal trust.

As discussed above researchers have added to the confusion by identifying different sub-categories of interpersonal trust. There appear to be overlaps and contradictions in the way interpersonal trust has been conceptualized. Generally, though, it does seem to be more of a difference in labeling rather than in meaning. Different researchers have used different labels to mean the same thing. For example, while McAllister (1995) and Lewis and Weigert (1985) use the term affect-based, Paul and Rueben (2004) use the term relational. Most researchers however, use the term

benevolence to refer to a relational or affect-based type of trust. The following section discusses the most widely accepted constructs of interpersonal trust cited by researchers: trustworthiness, trusting intention and trusting behaviour.

3.4.2.1 Trustworthiness

Being trustworthy means one is able and willing to act in the other person's best interests (McLain & Hackman, 1995). Research suggests that characteristics and actions of the trustee will lead that person to be more or less trusted (Good, 1988; Johnson-George & Swap, 1982). This helps explain why some parties are more trusted than others. Conlon and Mayer (1994) found that the willingness to trust others was significantly related to the behaviour and performance of people. According to Mayer, Davies and Schoorman (1995), trust arises from attributes associated with a trustee and a trustor. The trustee attributes are his or her perceived ability, integrity and benevolence. Other studies also include the attribute honesty in their interpretation. Collectively these are referred to as trusting beliefs (McKnight & Chervany, 1996). Trusting beliefs refer to the extent to which one believes (and feels confident in believing) that the other person is trustworthy in the situation (McKnight & Chervany, 1996). The trusting beliefs construct is an interpersonal and situation specific conceptualization of trust. According to McKnight and Chervany (1995), the most prevalent (and probably the most important) trusting beliefs in the literature involve ability, integrity, benevolence and honesty. This collection of trusting beliefs are also frequently referred to as attributes of trustworthiness (Mayer, Davies, & Schoorman, 1995; McKnight & Chervany, 1995; Rempel, Holmes, & Zanna, 1985; Wrightsman, 1991). The following discusses each of these attributes.

Ability refers to the group of skills that enable a trustee to be perceived competent within some specific domain (Mayer, Davies, & Schoorman, 1995). Other researchers (Leiberman 1981; Butler and Cantrell 1984) have used the term competence to define a similar construct. Being domain or situation specific means that the attributes that the trusted person must exhibit will differ from one domain to another. A trustee perceived to have ability has a reputation for performance and results, is able to follow through work related issues and is able to obtain necessary resources required to complete a task. Ability is considered an essential element of trustworthiness (Deutsch 1960, Sitkin and Roth 1993).

Integrity is adherence to a set of principles such as study/work habits thought to make the trustee dependable and reliable, according to the trustor (Mayer, Davies, & Schoorman, 1995). Within the context of a team, a trustee who has integrity, aligns themselves with the actions and stated values of the team, stands behind the team and all its members and maintains a consistent and balanced communication with members of the team.

Benevolence is the extent to which a trustee is believed to feel interpersonal care and concern, and the willingness to do good to the trustor, beyond an egocentric profit motive (Mayer, Davies, & Schoorman, 1995). This suggests the existence of an attachment that the trustee has towards the trustor. This definition is similar to Paul and McDaniel's (2004) view of relational trust as a category of interpersonal trust. From a project manager's perspective, benevolence trust may include being perceived to be able to assist team members in situations where they experience

transitioning on and off the team so that their careers are affected positively. It may also include being perceived to be able to assist members in finding their next assignments, and generally all team members believing that other team members are able to help one another.

Honesty is the extent to which a trustee can be relied upon to tell the truth and not mislead others (Mayer, Davies, & Schoorman, 1995). Project managers may need to maintain honesty in their dealings with team members if they are to be considered trustworthy. Trustworthiness of the project manager may be severely hampered if team members experience an incident of dishonesty by the project manager. Communication on issues involving guarantees, regulations, promises, legal recourse, or other procedures may need to be handled with complete honesty on the part of the project manager and must be reciprocated by team members.

From a virtual project team's perspective, the expectancy is that each member of the team is trusted to do what is expected of them in order for the project to be successful. The extent to which each member is considered trustworthy depends on their ability, integrity, benevolence and honesty. It is common in a project that each member of the team is included in the team for the specialist skills that they bring, which are essential for the team to succeed. For example, in a virtual project team of IT experts responsible for global IT disaster recovery systems, a team member with expertise in recovering network systems is trusted by the project manager to provide accurate data in relation to network recovery systems. The project manager will not have the same expectancy from this expert as he would have from another expert that specialises in recovery of database systems. The ability of the network expert is a

vital cog in the delivery of IT disaster recovery systems. In this situation, the benevolence of this member may not be an important attribute. However benevolence may take more prominence in a different, situation which involves the same member providing emotional support to another member of the team who may be aggrieved by a personal problem. In a situation involving honouring contractual obligations between a member and his or her project manager, honesty and integrity may be more important attributes in that domain.

3.4.2.2 Trusting intention

Another construct associated with interpersonal trust is trusting intention defined as the willingness of an individual to engage in trusting behaviour towards others in a given situation. (Dobing, 1993). Trusting intention has also been defined as the extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible (Currall & Judge, 1995). Team members in a virtual environment may need to exhibit trusting intention towards each other in order to achieve success. Trusting intention involves the concept of dependence on another person (Dobing, 1993; Lewis & Weigert, 1985). Trusting intention is situational because people depend on other people in given situations. Hence as trusting intention is a willingness to depend, the party engaging in trusting intention is willing to place the other party in a situational position of dependence-based power over him or her. Trusting intention embodies five essential elements: (i) potential negative consequences (Bonoma, 1976; Gambetta, 1988); (ii) dependence (Lewis & Weigert, 1985); (iii) feelings of security (Gove, 1981); (iv) a situation-specific context; and (v) lack of reliance on control.

3.4.2.3 Trusting behaviour

Trusting behaviour is another construct that is also commonly associated with interpersonal trust. It is defined as "the extent to which one person voluntarily depends on another person in a specific situation with a feeling of relative security, even though negative consequences are possible" (McKnight & Chervany, 1996, p. 31). Trusting behaviour also takes place in the presence of little or no control. In the case of a virtual setting, one may ask, "do project managers relinquish power over to the team members when they engage in trusting behaviour and demonstrate trusting intention? This is difficult to say, as each team differs from the other".

3.4.3 Institution-based trust

The second type of trust category is referred to as institution-based trust. Institution-based trust is impersonal and is organization related. Impersonal trust, as opposed to interpersonal trust, is not based on only person-to-person relationships but is a function of organization related structures that are non-personal. Institution-based trust refers to the extent to which one believes that proper impersonal structures are in place to enable one to anticipate a successful future endeavour (Lewis & Weigert, 1985; Luhmann, 1991; Shapiro, 1987). Institution-based trust is situation specific. The situation applicable will change from organization to organization in different circumstances. Other researchers have also referred to institution-based trust as system trust (McKnight & Chervany, 1996), structural assurance (Shapiro, 1987) and situational normality (McKnight, Choudhury, & Kacmar, 2002). According to Shapiro (1987), structural assurance means that one believes that structures like guarantees, regulations, promises, legal recourse, or other procedures are in place to

promote success. For example, within a virtual project context, team members expect that employee contracts signed with the organization would be honoured and that any disputes arising would be amicably managed by the organization's legal team following existing procedures. This is applicable in situations such as when an employee, who is being overlooked possibly because of his racial or cultural background, trusts the organizational structures in place to be able to protect him against such treatment. In another view of institution-based trust, situational normality means that one believes that the environment is in proper order and success is likely because the situation is normal or favourable (Baier, 1986; Lewis & Weigert, 1985). A team member in a virtual project team who perceives high situational normality believes that the criteria used in selecting the team have been fairly implemented and that the team comprises the right combination of members skills that are capable of bringing success to the outcome of the project. In other words, the situation is seen to be normal and orderly.

Institution-based trust is seen as being able to support trusting intentions (McKnight, Cummings, & Chervany, 1998). It is likely that institution-based trust will support a willingness to depend on another because it is considered normal or proper to do so (McKnight, Cummings, & Chervany, 1998). Scott (1992) argues that organizational members are aware of some of the norms that are in practice in their organizations or in their work group. This awareness restrains people from exhibiting opportunistic behaviours (Sarker, Valacich, & Sarker, 2003). In other words, the belief that the institution demands conformity to rules from organizational members makes team members trust each other even though they may not have met each other face-to-face (Sarker, Valacich, & Sarker, 2003). Institution-based trust can be managed through

amendments of the regulations, procedures and other safeguards put in place by an organization. It is common for a member of an organization to refer to an organization's regulations or procedures in a situation where they feel aggrieved and are convinced that other members have not followed the correct procedure in dealing with them.

3.4.4 Dispositional trust

The third trust category is dispositional trust which is defined as the extent to which one has a consistent tendency to trust across a broad spectrum of situations and persons (McKnight & Chervany, 1996). In comparison to institution-based and interpersonal trust, dispositional trust is cross-situational in that it is not dependent on a specific situation. According to McKnight and Chervany (1996), a person has dispositional trust to the extent that he or she has a consistent tendency to trust across a broad spectrum of situations and persons. McKnight and Chervany (1996) offer the following explanations for expressing dispositional trust. The first reason is referred to as *belief-in-people*, a person assumes that others are generally trustworthy people, hence one should almost always trust others. The second reason is referred to as *trusting stance*, where a person assumes that irrespective of whether people are good or bad (Riker, 1971), one will obtain better outcomes by trusting them, hence, one should generally trust them. Trusting stance is a cross-situational personal strategy. Trusting stance and dispositional trust encourages one to be willing to depend on others.

3.5 Trust development

In addition to searching for commonality in the definitions of trust, another area of trust research that has invoked much discussion is how trust is developed. McAllister (1995) states that although the importance of trust has been acknowledged, the matter of how it develops and functions has received little systematic theoretical attention. This section reviews trust development in both traditional teams and virtual teams. The section introduces some of the trust theories that have been used by researchers to explain how trust develops in the two environments.

3.5.1 Trust development in the traditional environment

According to McKnight and Chervany (2005), there are two general theories of trust building given in trust research. These are known as: experiential trust building and non-experiential trust building theories. *Experiential trust building* is the most dominant general theory which posits that trust grows through positive interaction and experience with the trustee (Blau, 1964; Jarvenpaa, Knoll, & Leidner, 1998; Kramer, 1999). This theory suggests that the more people interact with each other and share experiences, the more likely trust is to develop between them. In this view, positive interaction is a key component for trust to develop. If people have negative interactions it is likely that trust will not develop and instead will lead to distrust. Factors such as shared social norms, repeated interactions and shared experiences, have been suggested to facilitate the development of trust (Lewis & Weigert, 1985; Mayer, Davies, & Schoorman, 1995). The more one interacts with another, the more information one gains about their character, their likes, dislikes and the more confidence one has about predicting their actions, which translates into the formation

of trust. It becomes possible to determine beforehand what actions are likely to be taken by the trustee when faced with a particular situation.

Time is another recognized attribute in the development of trust in the traditional environment (Blau, 1964; Lewicki & Bunker, 1996). The interaction processes that go on between two parties result in a build up over time of positive exchanges that define the relationship. The traditional model views trust as being developmental and its development is closely related to the development processes of the relationship (Lewicki & Bunker, 1996). Trust is viewed as a result of history-dependent interaction (Kramer, 1999) and is developed gradually through personal interaction and communication (Lewicki & Bunker, 1995; Mayer, Davies, & Schoorman, 1995). The accumulated knowledge about others' capabilities, values, and behaviours through interaction allows an individual to base his or her trust on cognitive assessment or affective response (Lewicki & Bunker, 1996; Lewis & Weigert, 1985; McAllister, 1995). Thus, the traditional model of trust suggests that trust is mainly built upon accumulated personal knowledge.

The second general theory, referred to as *non-experiential trust building*, posits that non-experiential factors like institutional context or personality traits are important in building trust, especially when parties are so new to each other that they have no experiential basis for trusting (McKnight, Cummings, & Chervany, 1998; Meyerson, Weick, & Kramer, 1996). Institution-based trust factors discussed earlier are important because they can be managed; for example, by creating, reviewing and revising organizational policy or regulatory documents that affect interpersonal

behaviour. In comparison, personality-based factors cannot be managed; however, project managers can take action when personality issues negatively impact a team. Hence, developing a work environment that employees feel is structurally secure and fair should increase employee trust in management (McKnight & Chervany, 2005). Managers also need to be cognizant of the effects of dispositional (personality) issues on trust. Although personality issues cannot be managed per se, the manager who is aware of their effects can take action. For example, a project manager who has to deal with a team member with a low disposition to trust will spend more time winning this member's trust.

Shapiro, Sheppard and Cheraskin (1992) proposed an alternate view of how trust develops. They proposed that three types of trust operate in the development of a business relationship: deterrence-based trust; knowledge-based trust; and identification-based trust. The first type of trust known as *deterrence-based trust* is based on an assumption that team members will do what they say they will simply because they fear they will be punished if they do not. The view is that the threat of punishment is likely to be a more significant motivator than the promise of a reward. This type of trust is also referred to as *calculus-based trust*. According to Lewicki and Bunker (1995, p. 120) "deterrence-based trust is grounded not only in the fear of punishment for violating the trust but also in the rewards to be derived from preserving it". Deterrence-based trust proposes that deterrence elements will be a more dominant "motivator" than the benefit-seeking elements. One of the conditions that Lewicki and Bunker (1995) suggest as necessary for the threat of deterrence to be effective is that of monitoring. The parties concerned must continue to monitor each other and be willing to tell each other when a trust violation has been noted.

Deterrence-based trust relies on power and control mechanisms (Lewicki & Bunker, 1995). The trustor does not really rely on trust because he or she may incorporate power-based control mechanisms to influence specific action. Hence, even though it is referred to as a type of trust, researchers McKnight and Chervany (1996) suggest that it may be more appropriate to refer to it as a form of power-based control. In the traditional environment, the project manager assumes a certain level of power, which can be used to get things done through power-based control mechanisms. McAllister (1995) believes that monitoring and defensive behaviour represent nonproductive uses of managerial resources. Managers engaging in excessive monitoring and defensive behaviour will have fewer resources remaining with which to accomplish fundamental work objectives.

The second type of trust proposed by Shapiro, Sheppard and Cheraskin (1992) is knowledge-based trust. This type of trust is grounded in behavioural predictability, a judgement of the probability of the other's likely choice of behaviours (Shapiro, Sheppard, & Cheraskin, 1992). Thus as members of a team become more and more familiar with one another, they come to know each other well enough to predict their behaviour with confidence. In knowledge-based trust, information contributes to the predictability of the other, which contributes to trust (Shapiro, Sheppard, & Cheraskin, 1992). In knowledge-based trust regular communication and courtship are key processes (Shapiro, Sheppard, & Cheraskin, 1992). These two factors are demonstrated in everyday relationships where friendships are built on regular communication. Once this communication is stopped or disturbed for an extended period the previously predictable nature of the other is no longer guaranteed. When communication is re-established, a slow build up is put in motion to reach the

previous heights of predictability and trust once built. Similarly, courtship is taken as a period of getting to know one another better with a view to understanding and finding out the trustworthiness and predictability of the other. This view of trust development is similar to the experiential view proposed by McKnight and Chervany (2005) discussed earlier.

The third type of trust proposed by Shapiro, Sheppard and Cheraskin (1992) is *identification-based trust*. Trust is built on empathy and shared values; members are able to put themselves in their teammates' place (McNamara, 1999; Shapiro, Sheppard, & Cheraskin, 1992). At this level, trust exists because the parties effectively understand and appreciate the others' wants; this mutual understanding is developed to the point that each can effectively act for the other (Lewicki & Bunker, 1995; Shapiro, Sheppard, & Cheraskin, 1992). Shapiro, Sheppard and Cheraskin (1992) mention three additional types of activities that help strengthen identification based trust: developing a collective identity (team name, project title, etc); creating joint products or services or goals; and committing to commonly shared values, such that the parties are actually committed to the same objectives and can substitute for each other in external transactions. Identification-based trust therefore develops as one both knows and predicts the other's needs, choices, and preferences and also shares some of those same needs, choices, and preferences as one's own (Lewicki & Bunker, 1996). These types of trust development rely on a traditional environment characterized by sufficient time to interact, the possibility of prior relationships, the ability to engage in face-to-face communication, the presence of physical contact and the absence of cultural diversification.

3.5.2 Trust development in virtual teams

Virtual teams present different challenges in as far as trust development is concerned. The challenges come in the following forms: lack of time to interact; lack of history; lack of physical contact; lack of face-to-face communication; lack of cultural identity; etc. Early research into temporary teams offers some insight into the explanations proposed for trust development in traditional teams which could be applicable to virtual project teams as well. According to Goodman and Goodman (1976, p. 494) a temporary system is defined as "a set of diversely skilled people working together on a complex task over a limited period of time". The attributes of temporary teams as defined by these researchers are generally in line with the project teams under investigation in this study as project teams are also temporary by definition.

The following characteristics of temporary teams listed below, have potential relevance for the formation of trust:

1. Participants with diverse skills are assembled to enact expertise they already possess.

2. Participants have limited history working together.

3. Participants have limited prospects of working together again in the future.

4. Participants often are part of limited labour pools and overlapping networks.

5. Tasks are often complex and involve interdependent work.

6. Tasks have a deadline.

7. Assigned tasks are non-routine and not well understood.

8. Assigned tasks are consequential.

9. Continuous interrelating is required to produce an outcome.

Meyerson, Weick and Kramer (1996) explain that in temporal teams it is as though trust is already present from previous interactions. Yet these are teams whose members have limited history. Temporary teams appear to be tied together by trust but it is a different type of trust than that which exists in traditional teams. Meyerson, Weick and Kramer (1996) used the early work done on temporary teams by Goodman and Goodman (1972) to explain this form of trust development. According to Meyerson, Weick and Kramer (1996), it is a unique form of trust capable of managing issues of vulnerability, uncertainty, risk, and expectations. They argue that all these issues can be managed by trusting behaviour, and when not managed, participants behave as though they were in a permanent setting rather than a temporal one.

The condition of vulnerability is presumed to be something considered undesirable and thus inviting a need to be reduced (Baier, 1986; Meyerson, Weick, & Kramer, 1996). Meyerson, Weick and Kramer (1996) suggest the following three ways that can be used to reduce conditions of vulnerability. Firstly, by reducing the dependence on others through a process of cultivating alternative partners, projects, and networks. Secondly, because interdependence may be inherent in the nature of the task, the vulnerability can be reduced by cultivating adaptability and thirdly by presuming that the other people in a particular setting are trustworthy. If one acts towards them in a trusting manner, the presumption of trust often acts like a self-fulfilling prophecy and creates the trusting behaviour that was presumed to be there (Baier, 1985). It is this presumption of trust discussed by Baier (1985) that appears

as a catalyst to the formation of a form of trust found in temporal teams. This form of trust is known as "swift trust".

3.5.2.1 Swift trust

Swift trust is a useful concept for the understanding of temporary teams. Members of teams that are short-lived do not have the time to develop trust in a gradual and cumulative fashion. Meyerson, Weick and Kramer (1996) used the early work done on temporary teams by Goodman and Goodman (1972) to explain this form of trust development. Meyerson, Weick and Kramer (1996, p. 170) state that:

> "to trust and be trustworthy, within the limits of a temporary system, means that people have to wade in on trust rather than wait while experience gradually shows who can be trusted and with what: Trust must be conferred presumptively or ex ante".

The notion that it is possible to wade in on trust is of interest because it suggests that there is a possibility that swift trust can be manipulated or managed or controlled. According to Meyerson, Weick and Kramer (1996) when team members do not have enough time to slowly build trust, they assume that others are trustworthy and begin to work as if trust were already in place while seeking confirming or disconfirming evidence throughout the duration of the project. This type of trust does not develop but essentially may or may not exist from the onset of the formation of a team. Meyerson, Weick and Kramer (1996) argue that "there is less emphasis on feeling, commitment, and exchange and more on action, and heavy absorption in the task" (p. 191) and "swift trust may be a by-product of a highly active, proactive, enthusiastic, generative style of action" (p. 180). They maintain that in swift trust, members make categorical judgments of others based on positive stereotypes. This suggests that swift trust may be a fragile concept that is subject to misjudgments by team

members. It would appear that, based on this paradigm, members would very easily categorize someone from a particular background and label them as untrustworthy while in reality the opposite may be true. Project managers must be wary of such issues when selecting team members.

A study by Jarvenpaa, Knoll and Leidner (1998) provides some useful insights into research on swift trust and virtual teams. Their eight-week study of 75 teams of university students each consisting of four to six members, highlighted significant differences in the behaviours and strategies between high-trust and low-trust teams and supported the existence of swift trust. In their study, they found that high-trust teams exhibited swift trust. The study also found that task orientation in the high-trust teams appeared to reinforce and strengthen trust. As a result of this finding, they note that action seems to be an important antecedent as well as an outcome of trust and state that swift trust is not an affective or cognitive type of trust but rather a form of depersonalized action. This would suggest that these researchers do not see swift trust as being an interpersonal related type of trust, but rather one that is action oriented and more likely influenced by the roles assigned to the team members. These findings are in agreement with the views of Meyerson, Weick and Kramer (1996). Meyerson, Weick and Kramer (1996) discuss how there are few purely social exchanges in temporary teams because "anything that subtracts from task performance should be a glaring threat" (p. 177).

According to Jarvenpaa, Knoll and Leidner (1998) swift trust enables members to take action, and this action will help the team maintain trust and deal with

uncertainty, ambiguity and vulnerability while working on complex interdependent tasks with strangers in a situation of high time pressure. The study by Jarvenpaa, Knoll and Leidner (1998) also found other strategies that contributed to high-trust such as clear task goals, role division, and specificity. All these strategies seemed to result in reduced vulnerability as advocated by Meyerson, Weick and Kramer (1996). The study also showed, however, that swift trust is not present in all temporary teams, as the study was able to identify teams of low initial trust.

In another study on trust, Jarvenpaa and Leidner (1999) used a case study method to study 75 virtual teams, residing in different countries, that had interacted and worked together for six weeks. Their study also found that high trust teams exhibited swift trust. These studies by Jarvenpaa, and co workers (Jarvenpaa, Knoll, & Leidner, 1998; Jarvenpaa & Leidner, 1999) provide evidence that virtual teams that are short lived are, in fact, able to develop high trust using the "swift trust" rather than the experiential type of trust in traditional trust development. Swift trust theory assumes clear role divisions among members who have well-defined specialties (Jarvenpaa & Leidner, 1999). Even though the theory was developed for a traditional setting, the concept is applicable to the virtual setting as demonstrated by these researchers.

According to a study by McNamara (1999), virtual teams with the highest levels of trust tended to share three traits. The first trait was that they began their interactions with a series of social messages before focusing on the work at hand. This series of interactions is sometimes called "electronic courtship" and appears to be particularly important in establishing knowledge-based trust. This is in agreement with the

findings by Jarvenpaa and Leidner (1999). The second trait was clear role definition, which allowed members to immediately get on with their work because each member knew what was expected of them. The third trait was that team members also consistently displayed eagerness, enthusiasm, and an intense productive action orientation in all of their message communication. A point to be aware of, however, while pursuing interactions is that there may not be sufficient time to achieve this. Usually when a project begins, there is little time for socializing, especially in short-lived projects. Another point to note is that this is only possible in situations where adequate time has been given to the project manager to assemble a team. Sometimes there is little time allocated in assembling teams because of the urgency and unexpectedness of certain projects. Virtual teams that exhibit high trusting behaviours experience significant social communication as well as predictable communication patterns, substantial feedback, positive leadership, enthusiasm, and the ability to cope with technical uncertainty (Jarvenpaa & Leidner, 1999).

Tucker and Panteli (2003) pursued a study of 18 global virtual teams within a global IT organization. The study involved interviews with individuals who were employed within a specific organization and who were a part of culturally diverse, geographically dispersed and technology-enabled global virtual teams. Furthermore, the interviewees had worked within a global virtual team for more than two months. Table 3-2 below details the common features and behaviours observed within the global virtual teams. The teams were categorized as high-trust teams and low-trust teams and are distinguished in terms of the degree of shared goals that they experienced, as well as issues of power and communication. As shown in the table, the teams with high trust displayed more positive outcomes in all the three aspects

that were studied. They were more team oriented when it came to shared goals rather than individually oriented in comparison with the low trust teams. Power struggles were prominent in the teams of low trust whereas the high trust teams minimized the effects of power issues. Lastly, the teams with high trust were more aware of using communication that suited other members by taking advantage of face-to-face meetings when possible and using synchronous communication whenever they could. The low-trust teams, on the other hand, did not place much consideration into communication and time disparities.

Table 3-2: High-trust and low-trust teams (Tucker and Pantelli, 2003)

High-trust Global Virtual Teams	Low-trust Global Virtual Teams
Factors related to Shared Goals	
Awareness of shared goals	Lack of awareness of shared goals
Time given to build shared goals	Lack of shared goals
Early and open debate of goals	Opinions of others not considered
Primacy of team-based goals	Primacy of individual goals
Factors related to Power	
Availability of facilitators	Power battles
Facilitators' focus on win-win	Coercion
Recognition of knowledge as power	Misunderstandings and conflicts of interest
Recognition that power moves; power in many places	Use of hierarchical power
Power differentials minimized	Perception of 'I have power'
Communication	
Face-to-Face where possible (computer-mediated communication)	Asynchronous CMC
Regular synchronous CMC	Adverse effects of time difference
Social interaction	Little or no social interest

Source: Tucker and Pantelli, 2003, p.91

In a similar study, Jarvenpaa, Knoll and Leidner (1998) evaluated high and low-trust teams and showed distinct differences between the two groups. The high-trust teams displayed the following characteristics: a high level of optimism and excitement; task orientation; good time management; clear sense of task goals; initiative and accountability; and engagement in frequent communication. The low-trust teams on the other hand, experienced the complete opposite of their counterparts. They engaged in very little communication, had fewer goals, and provided very little feedback to each other. The two sets of results from Pantelli and Tucker (2003) and Jarvenpaa, Knoll and Leidner (1998) show underlying differences between teams with high-trust and those with low-trust.

Generally, trust researchers agree that trust takes time to develop in the traditional environment but it can reach high levels in virtual environments that do have as much time as traditional environments. If trust development is able to reach high levels, as supported by swift trust, what happens in the case of teams that did not experience high trust at the beginning of the project? In virtual projects, the onus lies on the project manager to develop these low trust level teams to high trust level teams. Trust-building skills in virtual teams, therefore, are viewed as having an influence on trust during the project life cycle. The Standish group study (2001) concluded that one of the reasons for failed projects is insufficient collaborative working relationships (i.e. lack of trust among team members who share responsibility for project success). This finding places an enormous responsibility on team members in virtual environments to establish trust if they are to succeed. The finding suggests that when team members do not trust each other they are not able to share information or work together on tasks that are dependent on other members.

This breakdown in communication, and other activities considered vital to the successful operation of a team, makes the team dysfunctional and therefore renders it incapable of reaching its goals as a team.

As discussed in Section 3.4.1 it is possible in the traditional mode for a manager to use control and constantly scrutinize team members to ensure that the job is done. However, in virtual teams, this may not be possible and, instead, a project manager may need to rely on trust. Team members need to do what they say they will do without the imposition of pressure (Gould, 2004). Trust therefore needs to be developed within the project team. As project teams are assembled for finite periods, this can be a hindrance to trust development. Trust development requires time and while this may be abundant in other organizational settings, it is a rare resource in project teams (Gould, 2004). In addition, members of a virtual team often have little prior history of working together and may never have met face-to-face. The project manager needs to be aware of the time constraint that is applicable to project teams and how this affects development of trust. In a study on trust and collaboration in virtual teams, Holton (2001) used a participatory action research method to study a virtual team of independent consultants. Results showed that members felt that the short time factor played a role in their inability to develop trust. Some of the members expressed a strong desire to meet face-to-face for the sake of developing trust and team cohesion. The study showed that by focusing on team building, however, it is possible to establish trust within a shorter period and to improve collaboration with time. The study also showed that collaboration improved with time. A study by Gould (2004) showed that it is possible to achieve trust in virtual teams and to be able to complete projects successfully. Studies by Gould (2004) and

Jarvenpaa, Knoll and Leidner (1998) serve to confirm that, despite the challenges imposed by virtual projects such as time limitations and limited prior history between team members, trust can be achieved.

3.6 Trust Models

This section reviews trust models that have been developed by researchers to explain trust relationships. The models reviewed are: (i) Mayer, Davies and Schoorman (1995); (ii) Jarvenpaa and Leidner (1999); (iii) McKnight, Chervany and Cummings (1998); (iv) Galvin (2000); and (v) McKnight and Chervany (2005). These models are selected from the literature on trust based on their relevance to this study. Even though some of the models have not been empirically tested, they provide useful and relevant background theory.

3.6.1 Mayer Davies and Schoorman (1995) model of trust

Mayer, Davies and Schoorman (1995) developed a trust model based on a number of trustee and trustor attributes. Figure 3-1 shows the model by Mayer, Davies and Schoorman (1995). This model of trust incorporates the properties of the trustor, the attributes of the trustee, and the risk associated with the situation, and is one of the more broadly adopted traditional models of trust. In their model, trust in a dyadic work relationship is defined as an individual's willingness to be vulnerable to the actions of the other involved party based on a particular action important to the trustor, irrespective of the trustor's ability to monitor or control the trustee.
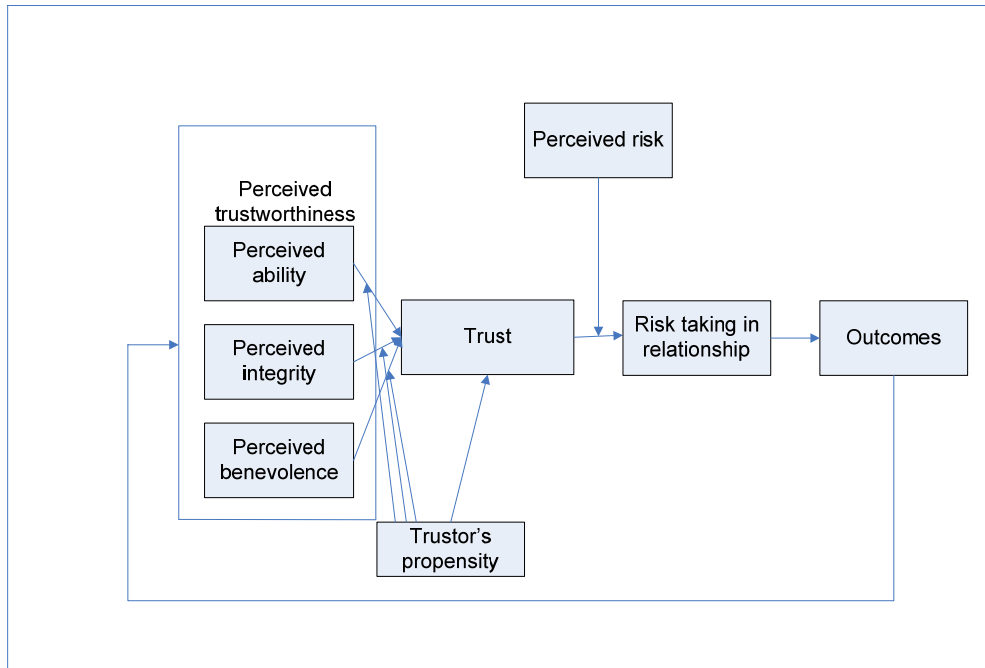
Figure 3-1: Proposed model of trust (Mayer, Davies and Schoorman 1995)

This definition highlights elements that are relevant to a virtual project environment and focuses on the behaviour of the trustor. The extent to which a person is willing to trust another person is affected by the trustor's propensity to trust and the trustor's perceptions of the trustee's trustworthiness, determined by the trustee's ability, integrity, and benevolence as perceived by the trustor (Mayer, Davies, & Schoorman, 1995). Honesty is not included in this model but other researchers, such as McKnight, Cummings and Chervany (1998), include it as part of the most common elements of trustworthiness. Based on one's belief of the involved parties' trustworthiness (i.e., the willingness to assume risk), his or her trust and subsequent trusting behaviour is further determined by the assessment of risk in the situation. The perceptions of risk come from the trustor's assessment of gains or losses outside of consideration that involves the relationship with the particular trustee. In a given situation, the level of trust is compared to the level of perceived risk. If the level of trust suppresses the threshold of perceived risk, the trustor will engage in trusting

behaviour; on the other hand, if the level of perceived risk is greater than the level of trust, the trustor will not engage in any trusting behaviour. Jarvenpaa, Knoll and Leidner (1999) tested parts of this model in their research on global virtual teams and this is discussed later in this chapter.

3.6.2 McKnight, Cummings and Chervany (1998) model of initial trust

McKnight, Cummings and Chervany (1998) proposed a model to help explain the finding of high initial trust levels in new organizational relationships (see Figure 3-2). The model was applied only to new encounters between people in a traditional setting. According to these researchers, high initial trust levels are a paradox because several trust theorists predict low initial trust. Initial trust between parties is not based on any kind of experience with, or first hand knowledge of, the other party; rather it is based on an individual's disposition to trust or on institutional cues that enable one person to trust another without firsthand knowledge. The model also proposes that cognitive processes lead to initial trust and that trust is predicted based upon specific conditions related to the antecedents of trusting intention. McKnight, Chervany and Cummings (1998) proposed that researchers should empirically test the model in laboratory settings incorporating disposition to trust and institution-based constructs as control variables. Some of the relationships in the model are worth testing empirically to determine their influence on the way trust is developed when parties meet for the first time. This model also includes the construct *trusting beliefs* which comprises a similar set of attributes collectively referred to as trustworthiness in the Mayer, Davies and Schoorman (1995) model.
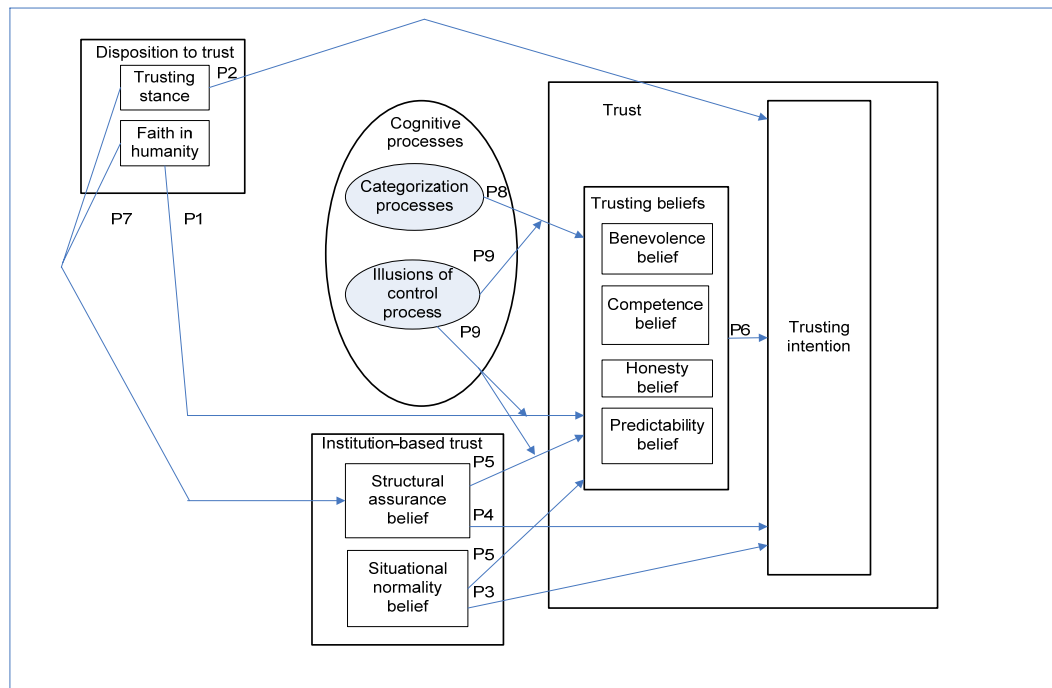
Figure 3-2: Model of initial trust (McKnight, Cummings and Chervany, 1998)

3.6.3 Jarvenpaa and Leidner (1999) model of trust

Jarvenpaa and Leidner (1999) proposed and tested the model of trust for global virtual teams shown in Figure 3-3. This model incorporates the concept of swift trust to explain how trust may develop in virtual teams. Swift trust is included as a precursor to an action-and-results-oriented attitude to achieve task goals. The action results orientation is an indirect route to achieving trust within the team. Trust is proposed to be reliant on a member's propensity to trust and the perceptions of other members' ability, benevolence and integrity. The evaluation of their model demonstrated distinct differences between high and low trust teams as discussed in Section 3.4.2.1.
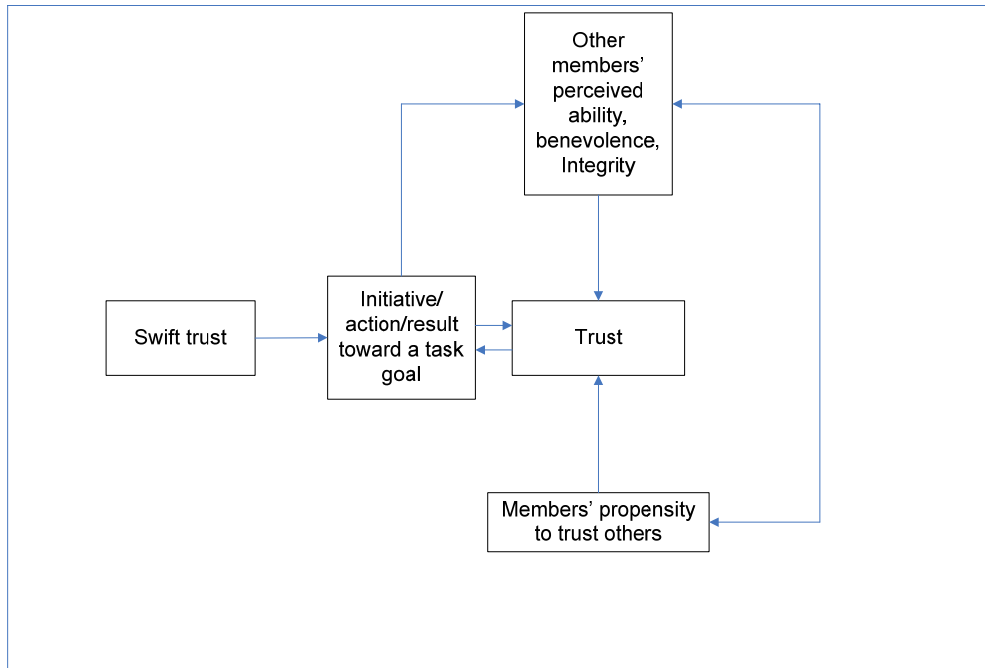
Figure 3-3: Proposed trust model for virtual teams (Jarvenpaa and Leidner, 1999)

3.6.4 Galvin (2000) virtual trust model

Galvin (2000) developed and empirically tested a model (Figure 3-4) to study the effects of individual trust on the individual's cooperation with other virtual team members. The model was based on the theory of reasoned action (TRA) (Ajzen, 1988) with additional constructs that were considered relevant to virtual teams. The study comprised a survey of 56 individuals working in 18 virtual teams in seven different companies across Europe and the US. The results indicated that trust-related behaviours are more likely to be exhibited when an individual possesses a high level of trusting beliefs and trusting intentions towards other team members. The results also demonstrated that beliefs and intentions could be influenced by personality traits and situational factors. Their model provided support for positive relationships between institution-based trust and the individual's trusting intention.

The model also provided strong support for the relationship between trusting beliefs and trusting intentions.
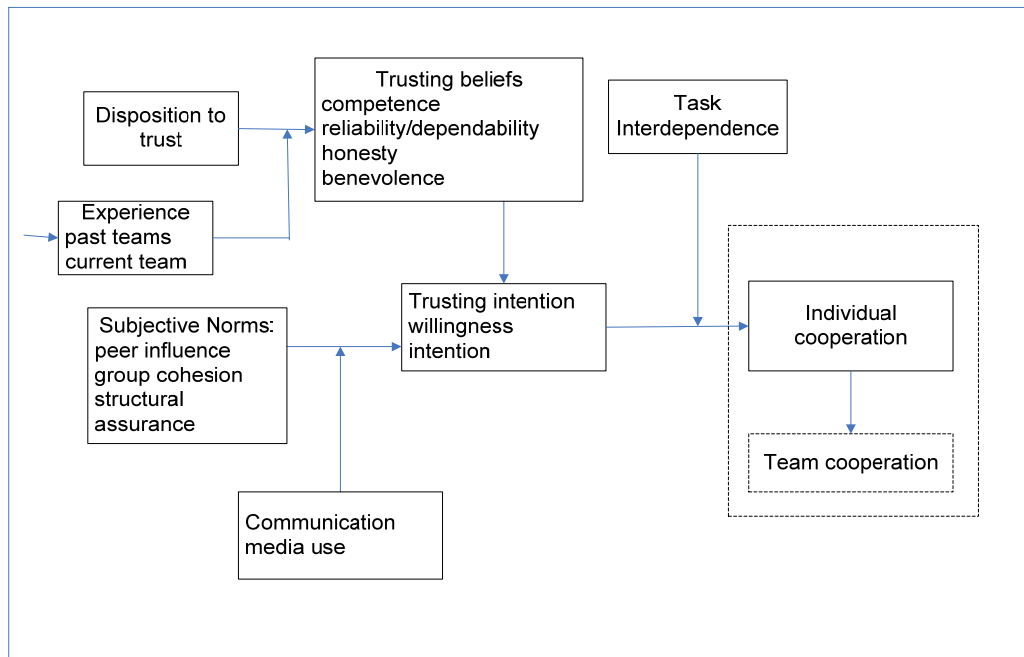
Figure 3-4: Proposed virtual trust model (Galvin, 2000)

3.6.5 McKnight, Cummings and Chervany (1998) extended model

In addition to their model of intial trust discussed in Section 3.6.2, McKnight, Cummings and Chervany (1998) also proposed another model of trust referred to as the extended trust building model (Figure 3-5). This model was empirically tested by McKnight and Chervany (2005).
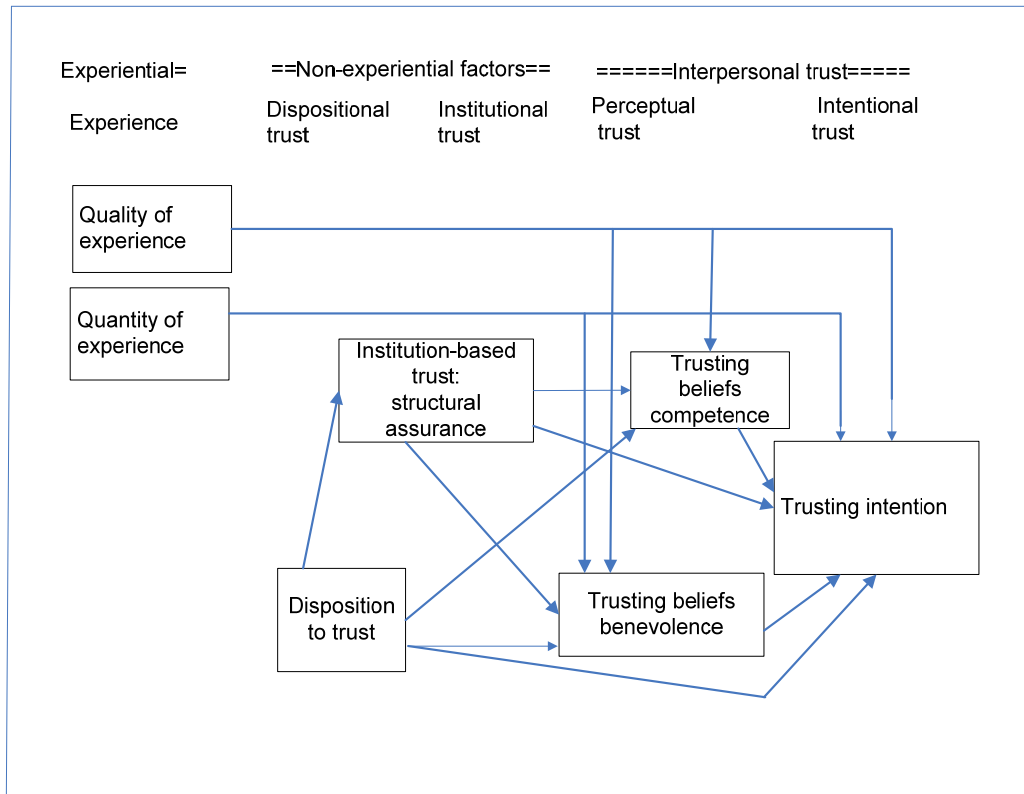
Figure 3-5: Extended trust model (McKnight, Cummings and Chervany, 1998)

They surveyed system troubleshooters and their supervisors. The researchers initially held interviews with 17 troubleshooters and their supervisors and followed this up with a survey of 115 troubleshooters to identify trust issues important to the success of troubleshooters. Their study showed that dispositional trust influenced institution-based trust, while institution-based trust influenced trusting beliefs. Trusting beliefs were also found to be strong predictors of trusting intention. The effect of disposition to trust on trusting beliefs was not found to be significant. The study also found that interpersonal trust and institution-based-trust factors were important among troubleshooters and their supervisors. As a result of the findings of their study, McKnight and Chervany (2005) suggest that managers and supervisors should

provide feedback and interact with employees in a way that positively impacts employee self-esteem. This model is of interest as it addresses three different types of trust relationships. The relationships between institution-based factors and interpersonal trust are relationships that could affect virtual projects and are therefore worth evaluating in that type of an environment. Their study provides support for the relationships between non-experiential factors and interpersonal trust.

3.7 Overview

Trust is proposed to play a critical role in the goal of attaining project success. Trust appears to influence almost all the other dimensions of virtual teams that have been reviewed such as communication, culture, and cohesion. Researchers more or less agree that trust is built differently between traditional project teams and virtual project teams. The literature is not definitive however, as to how trust is developed and maintained in virtual teams.

The concept of swift trust is one contributor to trust reviewed in the literature that needs further investigation as to how it can be achieved on a more consistent and predictable level. Trust development, as applied to the team, has been investigated by researchers but not much information is available as to how project managers can contribute to building trust within the team or how they can improve their perceived trustworthiness. The literature describes many constructs that have been used by trust researchers.

The chapter also reviewed some models used by researchers to explain trust formation in interpersonal relationships. Some models have been empirically tested while others have not been tested. Both the tested and untested models provide a theoretical foundation that is useful in investigating how trust is formed in virtual project teams. The review showed that there are still some gaps in the trust literature that are worth further investigation. Chapter 4 discusses the constructs of interest to the study and develops the research questions and hypotheses based on the review carried out in this chapter.

Chapter 4 Research Questions and Model

4.1 Introduction

This chapter presents the research questions and the research model proposed for the study. The objectives of the study introduced in Chapter 1 and the review of the literature presented in Chapters 2 and 3 provide a basis for the development of the research questions and the model that is proposed. Section 4.2 presents a background on the constructs of interest that have been identified in the literature review. Section 4.3 outlines the research questions that were developed based on the review. A research model is then proposed in Section 4.4, which also discusses the associated hypotheses.

4.2 Constructs of interest

The literature review in Chapter 3 suggests that trust develops differently between virtual teams and traditional teams (Jarvenpaa, Knoll, & Leidner, 1998; Jarvenpaa & Leidner, 1999). Traditionally trust has been assumed to develop gradually over time based on direct personal interaction and communication (Mayer, Davies, & Schoorman, 1995). The literature on trust development shows that three significant factors hinder this type of trust development in the virtual project environment: (i) the short lifespan of projects; (ii) the lack of prior history of working together between members who have never met face-to-face; and (iii) the major challenge presented to team members who primarily interact electronically (Gould, 2004). The constructs of interest in this thesis, which form the basis of the research model, are:

(i) Perceived trustworthiness; (ii) Institution-based trust; (iii) Swift trust; (iv) Deterrence-based trust; (v) Trusting intention; (vi) Perceived traditional project experiencet; (vii) Trust-building skills; (viii) Virtual team trust; and (ix) Project success. Each of these constructs is discussed in the following sections.

4.2.1 Perceived trustworthiness

Trustworthiness is seen as a critical component in virtual teams as studies have shown that trustworthiness is positively correlated to positive outcomes (Jarvenpaa, Knoll, & Leidner, 1998). A study by Jarvenpaa, Knoll and Leidner (1998) showed that when team members perceive each other as being trustworthy they tend to collaborate more on matters that are important to the team. Perceived trustworthiness is defined in this study as the team's perception that the project manager is willing and able to act in the team's interests. The above definition is adapted from McLain and Hackman (1995). According to Mayer, Davies and Schoorman (1995), trust arises from attributes associated with a trustee and a trustor. The literature refers to these attributes as trusting beliefs. The four most common attributes described in the literature are: (i) ability; (ii) integrity; (iii) benevolence and (iv) honesty (Bromiley & Cummings, 1995; Mayer, Davies, & Schoorman, 1995; McKnight, Cummings, & Chervany, 1998; Rempel, Holmes, & Zanna, 1985; Wrightsman, 1991).

Perceived ability relates to the degree to which the team considers the project manager to be competent within the specific project domain (Mayer, Davies, & Schoorman, 1995). From this study's perspective the expectancy is that members of the virtual project team can trust the project manager to do what is expected in order

for the project to be successful. *Perceived integrity* relates to the degree to which the team considers the project manager to adhere to a set of principles such as work habits, that make one dependable and reliable (Mayer, Davies, & Schoorman, 1995). The project manager is expected to maintain a high level of integrity when dealing with team members for them to perceive him or her as being trustworthy. *Perceived benevolence* is the degree to which the team considers the project manager to be caring enough to behave in the team's best interests, even in difficult situations (Mayer, Davies, & Schoorman, 1995). Perceived benevolence suggests interpersonal care and concern, and the willingness to do good for the team. *Perceived honesty* is the degree to which the team considers the project manager to be relied upon to tell the truth and not mislead the team (Bromiley & Cummings, 1995). Perceived honesty is crucial in matters involving team selection, employer employee contracts and other project communication. Trustworthiness of the project manager may be severely hampered if team members experience an incident of dishonesty by the project manager.

4.2.2 Institution-based trust

Institution-based trust is defined as the extent to which one believes that proper impersonal structures are in place (e.g. in an organization) to enable one to anticipate a successful outcome in an endeavour such as participation in a virtual project (Lewis & Weigert, 1985; Luhmann, 1991; Shapiro, 1987). Institution-based trust is organization related and revolves around a set of rules created by organizations to help them manage employee behaviour. This set of rules usually results in a commonly accepted behaviour or shared values, sometimes referred to as the culture of an organization. Institution-based trust is seen as being predictable because it can

be managed through amendments to regulations, procedures and other safeguards that have been put in place by an organization (Sarker, Valacich, & Sarker, 2003). This predictive nature of institution-based makes it a key factor in its influence on how people interact with each other.

4.2.3 Swift trust

Swift trust is a presumption that other people in a given setting are trustworthy until proven otherwise (Meyerson, Weick, & Kramer, 1996). Temporary teams are short-lived and hence members do not have the time to develop trust in a gradual and cumulative fashion. A study by Jarvenpaa, Knoll and Leidner (1999) provides some useful insights into research on swift trust and virtual teams but is inconclusive on the relationships that affect swift trust and team behaviours. Jarvenpaa and Leidner (1999) state that swift trust is not an affective or cognitive type of trust but rather a form of depersonalized action. This view of swift trust being "action oriented" is in agreement with the views of Meyerson, Weick and Kramer (1996). Swift trust is meant to help the team maintain trust and deal with uncertainty, ambiguity, and vulnerability while working on complex interdependent tasks with strangers in a situation of high time pressure.

4.2.4 Deterrence-based trust

Deterrence-based trust is a type of trust developed in traditional teams and is dependent on power and control mechanisms (Lewicki & Bunker, 1995). According to Shapiro, Sheppard, and Cheraskin (1992), deterrence-based trust is an assumption that team members will do what they say they will simply because they fear they will

be punished if they do not. Deterrence-based trust refers to a type of trust that relies on control and monitoring mechanisms (Lewicki & Bunker, 1995). Members of a team are driven to perform by the threat of punishment. The view is that the threat of punishment is likely to be a more significant motivator than the promise of a reward (Lewicki & Bunker, 1995). One of the conditions that Lewicki and Bunker (1995) suggest as necessary for the threat of deterrence to be effective is that of monitoring, a view shared by Gambetta (1988). According to Gambetta (1988), an unmonitored person will take advantage of the trust given to them and the need to monitor a trustee is imperative if issues of uncertainties of trust are to be resolved.

4.2.5 Trusting intention

Trusting intention is the extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible (Currall & Judge, 1995). Trusting intention is a cognitive-based construct in that a willingness to depend is expressed based on an evaluation of the situation. It is primarily based upon the person's cognitive beliefs about the other person (Bromiley & Cummings, 1995; Dobing, 1993). Trusting intention involves the concept of dependence on another person (Dobing, 1993; Lewis & Weigert, 1985). The above definition of trusting intention by Currall and Judge (1995) embodies five essential elements: (i) potential negative consequences; (ii) dependence; (iii) feelings of security; (iv) a situation-specific context; and (v) lack of reliance on control. Trusting intention is different from the deterrence-based trust discussed earlier that is developed in traditional teams which rely on power and control mechanisms.

4.2.6 Perceived traditional project experience

Perceived traditional project experience relates to the unique skills, methods and experience that the project manager has accumulated from managing traditional teams. While this study is focussed on virtual project teams, traditional project experience is seen as influencing the way team members perceive the project manager as being a capable person. Prior experience in teams is seen as playing a role in relationships between members (Galvin, 2000). The main reason for seeing traditional experience as being influential is that virtual projects are relatively newer than traditional projects and it is expected that the majority of project managers that are involved with virtual projects come from a traditional background. Their experience of managing traditional projects may be an advantage in the way the team perceives them as being capable.

4.2.7 Trust-building Skills

This construct attempts to conceptualize the ability of the project manager to build trust within the team. In the context of this study, the trust-building skills of the project manager are defined as the skills that contribute to the development and maintenance of trust formation throughout the lifespan of the project. Results from a study by Holton (2001) show that by focusing on team-building, it is possible to establish trust within a shorter time frame. Trust-building skills can incorporate team-building techniques to improve relationship within the team and therefore enhance trust. Trust-building is seen as being critical to the team if it is to maintain high levels of trust through the life cycle of the project.

4.2.8 Virtual team trust

This construct was problematic in its conceptualization. The main problem was how to distinguish it from the other types of trust. Researchers have struggled with this distinction. Sarker, Valacich and Sarker (2003) define virtual team trust as the degree of reliance individuals have on their remotely located team members taken collectively (i.e., as a group). In this study, the construct virtual team trust is used to define a similar concept with a slight modification. In this study, virtual team trust is defined as the degree to which virtual project team members are reliant on each other based on the expectation that each team member will perform actions beneficial to the success of the team.

4.2.9 Project success

Even though many researchers have conceptualized project success, the literature review in Chapter 2 has highlighted inconsistencies in the way project success is defined and measured. In this study, project success is defined as the successful conclusion of the project management process. This definition has been adopted based on the views held by Baccarini (1999) as discussed in Section 2.7. According to Baccarini, project managers have more control over the project management aspect than over product success and are therefore in a position to determine the success of the project within the shorter term. Project managers can influence the successful conclusion of the project management process but may not be in a position to influence the successful adoption of the product in the long run. Table 4-1

provides a summary of the constructs of interest and their associated definitions based on the literature review and the discussion above.

Table 4-1: Construct definitions

Construct	Definition
Perceived trustworthiness	The team's perception that the project manager is willing and able to act in the team's interests.
Institution-based trust	The extent to which one believes that proper impersonal structures are in place (e.g. in an organization) to enable one to anticipate a successful outcome in a virtual project.
Swift trust	A presumption that other people in a given setting are trustworthy until proven otherwise.
Deterrence–based trust	Based on an assumption that team members will do what they say they will, simply because they fear they will be punished if they do not.
Trusting intention	The extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible.
Perceived traditional project experience	Relates to the unique skills, methods and experience that the project manager has accumulated as a result of managing traditional teams.
Trust-building skills	Skills of the project manager that contribute to the development and maintenance of trust formation throughout the lifespan of the project.
Virtual team trust	The degree to which virtual project team members are reliant on each other based on the expectation that each team member will perform actions beneficial to the success of the team.
Project success	Project success is measured by the successful conclusion of the project management process.

4.3 Research questions

The aims of the research are to: (i) gain an understanding of the role of trust in virtual project team success from the perspective of project managers; (ii) explore organizational influences on swift trust and other forms of interpersonal trust; and (iii) explore the impact of trustworthiness and traditional project experience of the project manager on project success. The aims are addressed via a series of research questions which are described below.

The first research question relates to the influence of institution–based trust on interpersonal trust:

1.   Does institution-based trust influence interpersonal trust among team members in virtual projects?

This research question addresses organizational influences on some of the various forms of interpersonal trust that have been reviewed in Chapter 3. Specifically the influence of institution-based trust on swift trust, trusting intention and perceived trustworthiness is of interest. Institution-based trust is identified as playing a role in building trust. This type of trust may be a solution in situations when parties are so new to each other that they have no experiential basis for trusting (McKnight, Cummings, & Chervany, 1998; Meyerson, Weick, & Kramer, 1996). Institution-based factors are meant to give confidence to every employee that they can trust the institution. Team members may engage in trusting each other because of confidence that the organisation is looking after each employee's interests. Institution-based factors are also important because they are manageable.

Whilst swift trust is seen as a concept that cannot be managed, applying a stimulus such as institution-based trust may provide sufficient incentive for members to trust each other at the start of the project. Studies by researchers such as Jarvenpaa, Knoll and Leidner (1998) and Jarvenpaa and Leidner (1999) provide evidence in support of the existence of swift trust in virtual teams, however what is not clear from the literature is whether this type of trust can be made more predictable. This research question is concerned with how institution-based trust could be used to influence team members to engage in trusting intention and how the the team can be encouraged to perceive the project manager as being trustworthy.

The second research question relates to the role of perceived trustworthiness of project managers:

> 2.   Does the perceived trustworthiness of the project manager influence virtual team success?

This research question addresses how the qualities of the project manager are perceived by the team members and whether this perception affects the success of the project. As trust becomes the focal point in fostering team relationships (Gould, 2004; Handy, 1995), the onus is on the project manager to ensure that, even with the challenges that face trust development in virtual projects, trust is built. Not only does the project manager have to be concerned about trust building among the team members but that the team members perceive the project manager as being a trustworthy individual. It is proposed that virtual team members need to view the project manager as being a capable and trustworthy individual who is suited to lead the project to success. Without this trust it may be difficult to obtain the necessary commitment from the team members to perform to the highest degree. Following

research on trust in organisations, it has been found that generally employees are supportive of, and committed to, authorities and the institutions they represent when trust is relatively high (Brockner, Siegal, Daly, Martin, & Tyler, 1997).

The third research question addresses the role of swift trust in virtual project success:

3. Does swift trust influence project success in the virtual project environment?

This research question addresses the issue of whether initial trust formation at the commencement of a project is able to influence project success. While studies have shown the existence of swift trust this research question addresses whether trust achieved through swift trust is able to be sustained throughout the projects cycle.

The fourth research question considers the role of traditional project management experience:

4. Is traditional project management experience associated with project success?

This research question attempts to find out whether the experience gained by project managers in managing traditional projects places them at an advantage in the virtual environment. As virtual project teams are a relatively new type of organizational form, the expectation therefore is that most project managers who are currently managing virtual teams have a traditional project management experience. Even though the virtual environment poses different challenges from that of the traditional environment (Vakola & Wilson, 2004) this study explores the impact that traditional project management experience can have on project success in the virtual environment.

The fifth research question addresses the influence of trust-building as a project management skill:

5.   Is the development and maintenance of trust within the virtual environment linked to the trust-building skills of the project manager?

This research question aims to gain an insight into the role that can be played by project managers in influencing the development and maintenance of interpersonal trust within the virtual environment. The skills and competences of project managers have come under scrutiny as organizations seek to achieve a consistent level of success in the projects they authorize (Cascio, 2000). Even though issues of trust-building have taken center stage as business and researchers agree on the significant role played by trust (McKnight & Chervany, 1996), the literature suggests that project managers may lack the skills, tools and techniques to meet the new challenges posed by the virtual environment (Speechley, 2005). Research is needed to investigate whether project managers can meet the challenge of building trust within the virtual project environment.

The sixth research question considers the use of trusting intention as opposed to a control based approach:

6.   Can trusting intention compensate for deterrence-based trust when striving to achieve project success?

The need to depend on the team to perform to the best of their ability while faced with the lack of reliance on control on the part of the project manager is explored by

this research question. The literature suggests that in virtual environments project managers may find it difficult to rely on control mechanisms to get the most out of the team. Deterrence-based trust is a type of trust developed in traditional teams and is dependent on power and control mechanisms (Lewicki & Bunker, 1995). Remoteness introduces a reduced ability to monitor or control the trustees. This becomes problematic for the project manager and different mechanisms may have to be adopted to counter this vulnerability.

The final research question addresses the influence of virtual team trust on project success:

7.   Does virtual team trust influence project success?

This research question attempts to find out the impact that trust has on project success in the virtual environment. Studies have shown that high trust teams are more effective than low trust teams (Jarvenpaa, Knoll, & Leidner, 1998; Panteli & Tucker, 2003); this research question explores whether project success may be shown to be an outcome of trust.

4.4 Proposed model and hypotheses

In order to present a better understanding of the inter-relationships that exist between the different constructs, a model of trust in the virtual project setting was developed. The model was developed based on a review of trust models by Mayer, Davies and Schoorman (1995), Jarvenpaa, Knoll and Leidner (1998), McKnight, Cummings and Chervany (1998) and McKnight and Chervany (2005).

The study by Jarvenpaa, Knoll and Leidner (1998) applied a modified version of the trust model proposed by Mayer, Davies and Schoorman (1995) to global virtual teams. Their study investigated trust at a team level of analysis, and provided empirical evidence for the existence of swift trust in virtual teams. As a result of their findings, they proposed a model to explain the presence of swift trust for global virtual teams. Their model provides a starting point for this investigation of trust in virtual project teams.

4.4.1 Model of trust development in the virtual project environment

The model of trust applies to the context of a virtual project as opposed to that of a traditional setting. Figure 4-1 shows the proposed trust model.
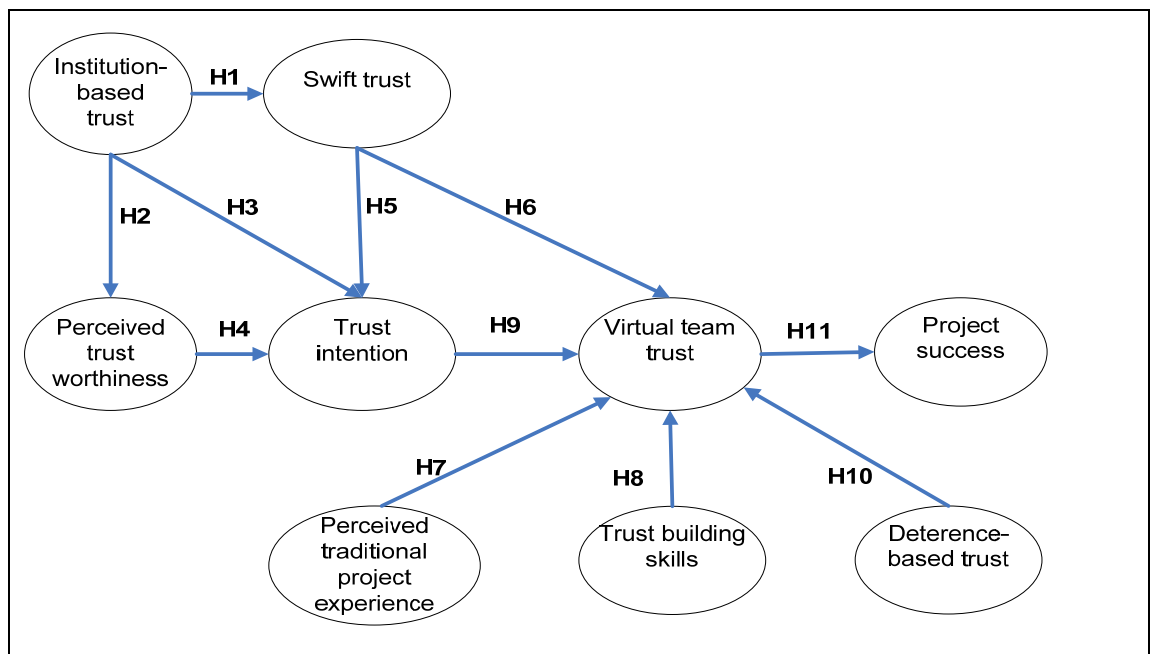
Figure 4-1: Proposed virtual project trust model

Many researchers have conceptualized institution-based trust as a construct to explain influences of impersonal trust (Galvin, Ahuja, & Agarwal, 1999; McKnight, Choudhury, & Kacmar, 2002; McKnight, Cummings, & Chervany, 1998; Sarker, Valacich, & Sarker, 2003; Shapiro, 1987). Institution-based trust is proposed to play a key role in influencing swift trust among team members. Institution-based trust can be managed by manipulating company policy, procedures and guarantees that affect all personnel and it could be a driving factor in the promotion of swift trust. For example, a policy which encourages everyone to respect fellow employees regardless of colour race or religion may act as a catalyst for team members to trust their colleagues despite meeting for the first time.

Organizations frequently adopt formal rules, contracts, or other legalistic mechanisms to promote interpersonal trust (Sitkin & Roth, 1993). To investigate Research Question 1, this study proposes that institution-based trust may be used to promote swift trust, perceived trustworthiness and trusting intention. A study by McKnight (1997), identified institution-based trust as playing a role in building trust. This type of trust may lead to employees trusting their colleagues because of confidence that the organization is looking after each employee's interests. There has been some suggestion in the literature that swift trust is not amenable to control (Meyerson, Weick, & Kramer, 1996), however, institution-based trust may play a role in trust development in situations when parties are so new to each other that they have no experiential basis for trusting (Meyerson, Weick, & Kramer, 1996).

Trustworthiness is seen as a critical component in virtual teams as a study by Jarvenpaa, Knoll and Leidner (1998) showed that trustworthiness is positively

correlated to positive outcomes. This provided evidence that when team members perceive each other as being trustworthy they tend to collaborate more on matters that are important to the team. A study by McKnight and Chervany (2005) also showed that institution-based trust influenced trustworthiness. It appears likely that institution-based trust can influence the perceived trustworthiness of project managers in the virtual environment.

Institution-based trust is proposed to influence trusting intention between team members and the project manager. According to Sitkin (1993), regulations enable people to feel assured about their expectations of the other party's future behaviour hence, institutional-based trust may lead to trusting intention. McKnight, Cummings and Chervany (1998) propose that trusting intention at the beginning of a relationship may be high because of high institution-based trust levels. A study by Galvin (2000) also provided support for positive relationships between institution-based trust and an individuals' trusting intention. The following hypotheses therefore are proposed in relation to Research Question 1.

H1: Institution-based trust will positively influence swift trust.
H2: Institution-based trust will positively influence the perceived trustworthiness of the project manager.
H3: Institution-based trust will positively influence trusting intention.

In the case of a project team there is a cognitive assessment undertaken by the team about whether they should trust the project manager. If the project manager exhibits reliability in performing complex roles and if he or she possesses outstanding professional credentials such as excellent educational qualification, special training, and relevant successful experience, it is also likely that the team will develop a high

level of trust in the trustee. A high level of cognition-based trust would allow the trusting party to trust the evaluated person and actively engage in collaborative work and seek knowledge from those he or she trusts (Chowdhury, 2005). This suggests that team work in a virtual project may be expected to reach high levels if the team trusts the project manager. This would in turn increase a willingness to depend on the project manager for guidance or directions to reach successful outcomes. The willingness to depend is a manifestation of increased trusting intention. When the project manager is considered trustworthy, the proposed overall effect of this is that trust within the team is increased because the project manager is a central figure within the team. Galvin, Ahuja and Agarwal (1999) showed a strong relationship between trusting beliefs and trusting intentions. In their study, McKnight and Chervany (2005) showed that trusting beliefs were found to be strong predictors of trusting behaviour. The following hypothesis therefore is proposed in relation to Research Question 2.

> H4: Perceived trustworthiness of the project manager will positively influence trusting intention.

In a project team, team members come into the project with varying skills specializing in a particular area of expertise that is required by the project. At the start of the project team members without prior history, may exhibit swift trust. The presumption of trust at the start is proposed to provide the momentum to engage in trusting intention as the project progresses. It is therefore proposed that high levels of swift trust will influence project success. The level of virtual team trust is also proposed to be positively influenced by swift trust over the course of the project. As the project progresses over time, trust levels are challenged. For example if a member of a team performs an action that is perceived by another to be against the

values of team spirit, this could result in a breakdown of trust. The momentum of trust levels reached at the start of a project in the form of swift trust is therefore proposed to have a significant impact on the level of virtual team trust reached amidst the challenges. Jarvenpaa, Knoll and Leidner (1998) found support for the relationship between swift trust and team trust. The high trusting teams in their study appeared to exhibit swift trust from the onset. The following hypotheses are therefore proposed in relation to Research Question 3.

> H5: Swift trust will positively influence trusting intention.
> H6: Swift trust will positively influence the level of virtual team trust.

Perceived traditional project experience relates to the unique skills, methods and experience that the project manager has accumulated as a result of managing traditional teams. Owing to the critical role performed by the project manager (Jiang, Klein, & Chen, 2001), it is important that the team perceives the project manager to be trustworthy. This perception is based on the qualities of the project manager. Perceived traditional project experience is expected to be an important quality that is likely to increase the level of trust in the team. Therefore the following hypothesis is proposed in relation to Research Question 4.

> H7: Perceived traditional project experience of the project manager will positively influence the level of virtual team trust

By applying trust-building skills, the project manager may be able to contribute to the development and maintenance of trust throughout the life cycle of the project. The proposed effect of these actions is that the level of virtual team trust may be heightened. As discussed earlier in this section, trust levels are expected to change over time and may increase or decrease over the projects life cycle. The onus for the

project manager is on how to maintain the levels such that a positive influence on project outcomes may be attained. McKnight and Chervany (1995) found support for the relationship between trust-building and trust. The following hypothesis is therefore proposed.

> H8: The trust-building skills of the project manager will positively influence the level of virtual team trust.

As a result of trusting intention being exhibited in the team, the model proposes that the project manager will tend to rely more on trusting intention rather than on control based mechanisms. Thus, trust formation and maintenance may be more reliant on trusting intention. This model proposes that the higher the trusting intention the higher the level of trust that is developed among team members. Being a control based approach, deterrence-based trust may be difficult to apply in the virtual environment owing to the limited communication modalities of the environments. According to Rolfe (2006) virtual project managers need to let go of some of the control even though this may be difficult in practice. The following hypotheses are therefore proposed in relation to Research Question 7.

> H9: Trusting intention will positively influence the level of virtual team trust.
> H10: Deterrence-based trust will have a low impact on the level of virtual team trust in the virtual environment

When the different dimensions of trust combine positively in the virtual environment, the proposed resultant effect is that the team reaches a high level of trust, which leads to an action-oriented team that promotes collaboration and teamwork. Studies by Jarvenpaa, Knoll and Leidner (1998) suggest that action,

initiative and result orientation are important outcomes of trust. The model proposes

that virtual team trust positively influences project success.

H11: Virtual team trust will positively influence project success.

Table 4-2 provides a summary of the hypotheses and the corresponding research

questions that they relate to.

Table 4-2: Hypotheses proposed

Hypothesis	Description of hypothesis
RQ1: Does institution-based trust increase interpersonal trust among team members in virtual projects?	
H1	Institution-based trust will positively influence swift trust.
H2	Institution-based trust will positively influence the perceived trustworthiness of the project manager.
H3	Institution-based trust will positively influence trusting intention.
RQ2: Does the perceived trustworthiness of the project manager influence project success	
H4	Perceived trustworthiness of the project manager will positively influence trusting intention.
RQ3: Does swift trust influence project success in the virtual project environment?	
H5	Swift trust will positively influence trusting intention
H6	Swift trust will positively influence the level of virtual team trust.
RQ4: Is traditional project management experience associated with project success?	
H7	Traditional project experience of the project manager will positively influence trusting intention.
RQ5: Is the development and maintenance of trust within the virtual environment linked to the trust-building skills of the project manager?	
H8	The trust-building skills of the project manager will positively influence the level of virtual team trust.
RQ6: Can trusting intention compensate for deterrence-based trust when striving to achieve project success?	
H9	Trusting intention will positively influence the level of virtual team trust.
H10	Deterrence-based trust will have a low impact on the level of virtual team trust in the virtual environment.
RQ7: Does virtual team trust influence project success?	
H11	Virtual team trust will positively influence project success

4.5   Overview

This chapter introduced the constructs of interest, followed by the research questions derived from the review of the literature. A model of trust in the virtual project environment was presented to support the investigation of the research questions. The original trust models by Mayer, Davies and Schoorman (1995), Jarvenpaa, Knoll and Leidner (1998), McKnight, Chervany and Cummings (1998), Galvin (2000) and McKnight and Chervany (2005) served as building blocks for the proposed model. Hypotheses were derived from the research questions to explain the development of the model and their associations in the proposed virtual trust model presented in Figure 4-1. To provide answers to the research questions and the hypotheses, a research methodology is proposed in Chapter 5.

Chapter 5 Research Methodology

5.1 Introduction

This chapter describes the research methodology used for the study. An overview of the methodology and the rationale behind the choice is given in Section 5.2. Section 5.3 discusses the population of the study and how the participants were invited to take part in the study. Section 5.4 discusses the procedures undertaken for the data collection process. Section 5.5 gives a description of how the questionnaire was developed and also describes the scales adopted and how the items to measure the constructs were selected and developed. The chapter ends with an overview in Section 5.6.

5.2 Methodology

To investigate the research questions, the study used a quantitative method of analysis. Data was collected via a web-based survey. Since the population of interest would be expected to use the web as a primary tool of communication (virtual project communication) a web-based survey was appropriate. Being a population that comprises project managers of virtual project teams, it is more likely than not that a computer, the Internet and email are part of the everyday tools used by this group. This population of interest includes project managers who already have experience in traditional environments as well as project managers without prior experience in traditional environments. In this study, the role of project manager is used as an all-encompassing term to describe the roles of those managers that are

tasked with managing virtual project teams and yet may be addressed by a different title depending on the structure of their organization.

5.3 Participants

The target population for the study is project managers with experience in managing projects in virtual environments. The primary source of participants was the PMI membership. The PMI was chosen for two main reasons. Firstly it was chosen because it is the world's leading not-for-profit project management professional association, with over 150,000 members worldwide. PMI was established in 1969 and is headquartered outside Philadelphia, Pennsylvania USA (PMI, 2004). Secondly, the PMI was chosen for the leadership role it plays in the field of project management (PMI, 2004). The PMI provides access to its members to allow them to respond to research surveys that are approved as studies that advance project management research. An approach was made to the PMI regarding hosting of the survey link on their site early on in the study and the PMI, through their research coordinator, responded favourably to the request.

The advantages of gaining access to the sample by posting on the PMI site can be summarized as follows:

- Access to a world wide population of project managers.
- Respondents are representative of the population of interest. As members of the organization should have an interest in the results of the research, there was a higher possibility of achieving a good response rate.
- The anonymity of the web makes it difficult to tell who actually completed the survey, however, in the case of the PMI site, the site contains materials

specific to project management and it is more likely than not that Internet users accessing the research area are actually members of the PMI.

The only major main disadvantage of relying on the PMI site as a primary source of participants is the difficulty of predicting the frequency with which PMI members access the site. Such information is usually private to the domain in question. Members are encouraged but not obliged to visit the PMI research page. One of the methods used to encourage members is by using a technique of profiling on the web page, which allows the members interested in research activities to access the research page first whenever they log in to the site. Therefore, it was difficult to predict the likely number of respondents.

5.4 Procedure for data collection

The survey data collection method was chosen as the primary method for this study because the aim was to solicit the views of project managers in their natural work environment as opposed to being in a controlled setting. Mayer, Davies and Schoorman (1995) and Beise (2004) suggest the use of the survey method or similar to measure trust. Surveys are particularly useful when researchers are interested in collecting data on aspects of behaviour that are difficult to observe. The processes that go on in a project team and the interactions that occur between the project manager and the team members are types of behaviour that are difficult to observe. The study did not involve direct observation but instead inferences about trust behaviour were made based on the data that was collected via the research method. Results from the study should be more representative of the wider project

management population than would be expected in a case study, for example. Research methods using survey techniques introduce the benefit of being able to collect a large quantity of data although this may not always be true. The survey method also presented a much easier means of administration (Shapiro, Bessette, Baumlin, Ragin, & Richardson, 2004).

Survey data collection methods do, however, have some limitations. Some of these include poor return rates, reaching the desired respondents and convincing respondents to commit time (Roster, Rogers, Hozier, Baker, & Albaum, 2007). Other limitations include sampling and population representativeness, technology issues, privacy/security issues and a perception that the approach is impersonal (Evans & Mathur, 2005). The major limitation of the survey method is that it relies on a self-report method of data collection. Intentional deception, poor memory, or misunderstanding of the question can all contribute to inaccuracies in the data. A similar quantitative approach to that used in this study was used by Trautsch (2003) in his study of the management of virtual teams. Other researchers such as Beise, Niederman and Mattord (2004) used a qualitative approach which included interviews as a data collection method to study aspects of virtual team project management. Beise (2004) has suggested using a similar approach but on a wider scale rather than studying a small number of practitioners within a single company.

5.4.1 Web-based survey

To assist in the administration of the survey and to make it readily accessible via the web, an Internet survey creation package was used in the study. In a study of online

surveys, Evans and Mathur (2005, pp. 196-201) indicate that the major potential strengths of online surveys are many, including, but not limited to, global reach, flexibility, applicability in both business-to-business (B2B) and business-to-consumer (B2C) settings, speed and timeliness, respondent convenience, ease of data entry and analysis and low administration costs. Though there are a number of web-based packages available, a program known as Survey Crafter Professional was reviewed and selected. Survey Crafter (http://www.survey.com) offered a web-based solution with a capability to automate the survey process. The program was used to design, create and administer the survey. In addition, the program features useful analytical tools, some of which were used in the study. Other features offered by the program include the ability:

- to use the Data window to edit, import, export, validate and clean respondent data; and

- to use analysis wizards to generate frequency tables, cross tabulations, correlation matrices, descriptive statistics, bar charts, pie charts, 3-dimensional area charts, and more.

The survey was then published and tested using different browsers. The published survey and the associated script files were then uploaded to the School of IT website.

5.4.2 Pilot study

A pilot study was conducted with the primary aim to test and solicite feedback on the survey. The survey was tested using a convenience sample of eight project manager practitioners. The sample in the pilot study were work colleagues, faculty members and graduate students all of whom had traditional as well as virtual project

management experiences. The participants were approached to provide feedback on the questionnaire before it could be adopted for the study. The exercise was relevant to the study in that it assisted in testing the validity of the questionnaire items. Based on the responses from participants in this exercise, areas that needed modifications and refinement were identified and where necessary, changes were made to the questionnaire. Some of the changes included rephrasing some questions, adding, and removing some of the questions. This pilot phase was also conducted to test and verify that the data collection script was able to collect the data entered on the web site.

On completion of the pilot phase, the survey was made accessible to the population of interest via a URL on the PMI web site. The PMI web site provides access to its members to a research area where researchers may post links to research material that is ongoing as well as completed. Research areas specifically relate to research activities in the field of project management and are bound by guidelines of conduct. Links to other research surveys and questionnaires can also be accessed via this site. PMI has a set of established guidelines that govern the posting of such links. The PMI were specific regarding the issue of protecting the confidentiality of their membership. On their website, the PMI has also published policy documents that list a set of guidelines describing the selection criteria, conditions and procedures for temporarily creating survey links on their site. A brief overview of some of the important policy documents and their related links is given in Appendix A. Data submitted by respondents was captured into a data file using a script that automated the data collection process and was initially analysed using SPSS.

5.5 Development of the questionnaire

This section discusses the steps involved in the development of the questionnaire. A definition of the constructs of interest is given before the discussion of how the measurement items were selected or developed. A review of existing instruments in the field of trust research was conducted to utilize items that are applicable to this study and whose validity had previously been tested. Some of the items, however, have been developed to be more representative measures of the constructs within the context of this study. This is especially evident in the constructs that relate directly to the perceptions of the project manager. A complete copy of the questionnaire as it appeared on the web is given in Appendix B. Items on the questionnaire are scored on a 7-point Likert scale where (1) is labeled "strongly disagree" and (7) is labeled "strongly agree". A 7-point Likert scale was preferred because of its ability to capture smaller differences and it is seen as achieving a higher reliability (Nunnally, 1978). The following sections discuss the development of each of the measurement scales in relation to the constructs in the model that was introduced in Section 4.4.1.

5.5.1 Swift Trust

Swift trust relates to temporary teams whose existence is formed around a clear purpose and common task with a finite life span. Its elements include a willingness to suspend doubt about whether others, who are "strangers", can be counted on in order to get to work on the group's task. It is built and maintained by a high level of activity, responsiveness and a positive expectation that the group activity will be beneficial. Swift trust is a specialized form of trust formed in project groups of members that may or may not have had prior history. As discussed in Chapter 3 swift trust works on the presumption that the other people in a given setting are

trustworthy until proven otherwise. If one acts towards them in a trusting manner, the presumption of trust often acts like a self-fulfilling prophecy and creates the trusting behaviour that was presumed to be there (Baier, 1986). Swift trust relies on factors such as role clarity at the start of the project.

Researchers such as Mayer, Davies and Schoorman (1995) and Jarvenpaa, Knoll and Leidner (1998), have discussed the existence of swift trust in teams but have not measured swift trust as a construct. Much of the work has referred to trust as an all-encompassing construct thereby using the terms trust and swift trust almost interchangeably. For example, the work done by Jarvenpaa, Knoll and Leidner (1998) provides trust researchers with an instrument to measure trust in virtual teams but it does not measure swift trust as a construct even though reference is made to swift trust in the study. This has been apparent throughout the review of the literature, and instruments specifically measuring swift trust have not been identified.

Based on the review on swift trust seven items have been devised that provide a measure of swift trust and its related characteristics (Table 5-1). These characteristics are believed to come into being without following the traditional pattern of trust development.

Table 5-1: The items used to measure swift trust

- The existence of high levels of trust was evident at the start of the project.
- At the start of the project the team considered me to be trustworthy.
- At the start of the project I considered the team members to be trustworthy.
- At the start of the project, team members felt they could rely on me.
- At the start of the project I considered the team members to be reliable.
- Team members behaved as though trust was already in place at the start of the project.
- At the start of the project team members were positive towards each other.

5.5.2 Institution-based trust

As discussed in Chapter 3, institution-based trust is defined as the extent to which one believes that proper impersonal structures are in place (e.g. in an organization) to enable one to anticipate a successful outcome in an endeavour such as participation in a virtual project. Institution-based factors are meant to give confidence to every employee within the project team that they can trust the institution that they are representing or working for and that the organization is looking after each employee's interests.

The items used to measure this construct (Table 5-2) are taken from an instrument used by Galvin (2000), who based his instrument on earlier work done by McKnight (1997). The study reported a Cronbach alpha of 0.95, so no modifications were made to the items used by Galvin (2000).

Table 5-2: The items used to measure institution-based trust

- My organization has processes that assure that all team members will be treated fairly and equitably.
- I work in an environment in which good procedures make things fair and impartial.
- Fairness to employees is built into how issues are handled in my work environment.
- In my workplace, sound practices exist that help ensure fair and unbiased treatment of all team members.

5.5.3 Trustworthiness

This section describes the development process for the measures of the attributes of trustworthiness (also collectively referred to as trusting beliefs in the literature). The items that were used to measure this construct are aimed at providing information from the project manager about the degree to which the team considers him or her to be willing and able to act in the team's interests. Perceived trustworthiness was measured from the perspective of the project manager. This was necessary because only access to project managers, and not the whole team was possible. The measures of trustworthiness used include the dimensions of ability, benevolence, integrity and honesty.

5.5.3.1 Perceived ability

Perceived ability, an attribute of trustworthiness, is defined as an individual's feeling that others have the necessary skills for accomplishing domain specific interdependent tasks or goals (Mayer, Davies, & Schoorman, 1995). For this study, perceived ability refers to the group of skills that enable a project manager to be perceived as being competent within the specific project domain. This element of trustworthiness is worth noting in that it suggests a perception that team members are more likely to trust the project manager if they perceive him or her to be competent.

The project manager must be perceived to have a reputation for performance and results, and to be able to follow through work related issues and be able to obtain necessary resources required to complete a task. Ability is considered an essential element of trust (Sitkin & Roth, 1993).

The items for this measure (Table 5-3) were adapted from a scale by Galvin (2000) who used the scale to measure competence and reported a Cronbach alpha of 0.94. The measures were modified slightly to reflect the project manager as the unit of analysis rather than the team as measured by Galvin (2000). Galvin (2000) measured the teams' ability while the items in Table 5-3 measure the perceived ability of the project manager.

Table 5-3: The items used to measure perceived ability

- In general, my team members perceived me as being skillful and effective in my work.
- In general, my team members were satisfied with my performance as a project manager.
- Overall, my team members viewed me as a capable and experienced project manager.
- Overall, my team members perceived me as being competent.

5.5.3.2 Perceived integrity

Perceived integrity, an attribute of trustworthiness, is defined as an adherence to a set of principles, such as work and study habits, thought to make the trustee dependable and reliable, according to the trustor (Currall & Judge, 1995). Perceived integrity of the project manager is defined as a perception of adherence to a set of principles

such as work habits that are thought to make the project manager dependable and reliable according to team members.

Items for this construct (Table 5-4) are designed to measure the perceived integrity of the project manager. These items are adapted from an instrument by Jarvenpaa, Knoll and Leidner (1998) who reported a Cronbach alpha of 0.92.

Table 5-4: The items used to measure perceived integrity

- I was able to demonstrate my fairness in dealing with each member of the team.
- Team members were aware of my strong sense of commitment.
- Team members were never in doubt about my intentions.
- Team members were aware of my solid work ethic.

5.5.3.3 Perceived benevolence

Perceived benevolence, an attribute of trustworthiness, is defined as the degree to which the team considers the project manager to be caring enough to behave in the team's best interests, even in difficult situations. The measures for this construct have been modified to reflect the project manager's perception of how the team views him or her to care enough to be behave in the teams best interests.

The items for this measure (Table 5-5) were adapted from an instrument by Galvin (2000) to measure benevolence, and whose study reported a Cronbach alpha of 0.92. These items measure whether the project manager feels that he or she demonstrated

evidence or signs in their behaviour to assure the team that he or she would necessarily show a caring attitude in the best interests of the team. The measures were modified slightly to reflect the project manager as the unit of analysis rather than the team as measured by Galvin (2000). The items are derived from the project manager's perspective rather than the team's perspective.

Table 5-5: The items used to measure perceived benevolence

- When it came to the team's well being, my team members knew that I really cared about what happened to them.
- If they required help, my team members were aware that I would care enough to help them.
- I believe that my team members were aware that I cared enough to act in the team's best interest.
- I believe that my team members were aware that I cared enough to act in the team's best interest.

5.5.3.4 Perceived honesty

Perceived honesty, an attribute of trustworthiness, is defined as the degree to which the team considers the project manager to be relied upon to tell the truth and not mislead the team (Bromiley & Cummings, 1995). Team members need to be confident that the project manager is a person who is honest in his or her dealings with the team. Issues such as contract negotiations arise in project teams and organizations and the honesty of the project manager can enhance or destroy trust relationships.

For this study, the items adopted measured the project manager's perception that he or she could be relied upon to tell the truth and not mislead the team. The items for

this measure (Table 5-6) were adapted from a scale by Bromiley and Cummings (1996) in combination with the work done by Galvin (2000).

Table 5-6: The items used to measure perceived honesty

- I feel that I was honest in dealing with the team at all times.
- I feel that I negotiated fairly with my team members.
- I feel that at no time did I mislead my team members.

The items used in the original organization trust inventory (OTI) scale, by Bromiley and Cummings (1996) were designed to measure trust between organization units. These items were adapted by Galvin (2000) to measure trusting beliefs between team members but have been slightly modified to reflect the project manager as a unit of analysis rather than the team. Galvin's (2000) study reported a Cronbach alpha of 0.89.

5.5.4 Trusting intention

Trusting intention is defined as the extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible (Currall & Judge, 1995; McKnight, 1997). In the context of a virtual project team, trusting intention reflects the degree to which the project manager is willing to depend on the team members to perform tasks or duties that will ensure success for the project. Despite the fact that these characteristics come from studies in traditional environments not necessarily related to project settings, they are just as applicable to the virtual project setting and they distinguish

the behavioural processes that operate within the virtual project environment from those of the traditional project environment.

Trusting intention is a willingness to depend on project team members to do what they have agreed to do. Within the context of the virtual environment, trusting intention then becomes a crucial component for the development of trust and for achieving project goals. This construct aims to find out the extent to which project managers are willing to depend on team members to achieve project goals.

The items to measure this construct (Table 5-7) were based on an instrument used by Galvin (2000). The items adapted were slightly modified to suit the current study. Two of the items used by Galvin (2000), which were specific towards measuring performance evaluation issues of the team leader, were modified to reflect measurement of trusting intention within the context of overall team performance and project success. A fourth item was included to relate trusting intention to a willingness to depend, regardless of the lack of control. The study by Galvin (2000) reported a Cronbach alpha of 0.9.

Table 5-7: The items used to measure trusting intention

- I feel that I could depend on my team members even on difficult and crucial project tasks.
- I was willing to depend on my team despite the inability to monitor their activities.
- My team members were individuals on whom I felt I could rely on when faced with a project issue important to the overall team's performance.
- I could rely on my team members concerning project activities that were important for the success of the project.

5.5.5 Virtual team trust

For this study the construct *virtual team trust* is defined as the degree to which virtual project team members are reliant on each other based on the expectation that each team member will perform actions beneficial to the success of the team (Sarker, Valacich, & Sarker, 2003).

The items for this construct (Table 5-8) were developed to obtain the perceptions of the participants on their awareness of the presence of virtual team trust and the team members' reliance and dependence on each other.

Table 5-8: The items used to measure virtual team trust

- Trust played a significant role in the overall outcome of the project.
- Team members were able to rely on each other with confidence.
- Team members showed a willingness to depend on each other.
- Team members acted with fairness towards each other.

5.5.6 Deterrence-based trust

Deterrence-based trust refers to a type of trust that relies on control and monitoring mechanisms (Lewicki & Bunker, 1995). Members of a team are driven to perform by the threat of punishment. This type of trust construct describes situations where team members will do what they say they will simply because they fear they will be punished if they do not.

For this study, items from an instrument developed by Jarvenpaa, Knoll and Leidner (1998) to measure the construct trust have been used. In the context of this study

however, the items bear a closer relationship to the description of deterrence-based trust. One of the conditions that Lewicki and Bunker (1995) suggest as necessary for the threat of deterrence to be effective is that of monitoring. The items from the Jarvenpaa, Knoll and Leidner (1998) trust instrument are used in this study (Table 5-9) to measure aspects of deterrence.

Table 5-9: The items used to measure deterrence-based trust

- If I had my way, I would not have let the other team members have any influence over issues that were important to the project.
- I was comfortable giving the other team members complete responsibility for the completion of the project.
- I wished I had better methods to oversee the work of the other team members on the project.
- I was comfortable giving the team members a task or problem that was critical to the project, even if I could not monitor them.

For example, the items relate to the team leader's ability to monitor or directly influence the team members as they perform duties important to the project. The items also relate to whether the project manager is comfortable with this situation knowing that control mechanisms cannot be used to make the team members do what is expected of them. No other modifications have been made to the items used.

5.5.7 Trust-building skills

This construct attempts to conceptualize the ability of the project manager to build trust within the team. In the context of this study, trust-building skills of the project

manager are defined as the skills that contribute to the development and maintenance of trust formation throughout the lifespan of the project.

A review of the literature showed that this construct has not been defined in this way previously nor have any indicators been used to measure it in similar studies. Five items were developed to measure the project manager's perceptions on whether they had an influence on the development of trust (Table 5-10). The items measure the level of trust building within the team.

Table 5-10: The items used to measure trust-building skills

- Trust was an important factor in the team's overall performance.
- It was possible to influence the formation of trust.
- I was able to influence whether team members perceived each other as being trustworthy.
- I was able to influence whether team members viewed each other in a positive manner.
- Overall there was a continual improvement in the way team members worked with each other.

5.5.8 Perceived influence of traditional project experience

The perceived influence of traditional project experience construct relates to the skills, methods and experiences that the project manager has accumulated as a result of managing traditional teams. This construct has been defined based on ideas from a scale by Galvin (2000) who used a construct referred to as prior team experience. In his study, the items for this construct were designed to measure the cumulative experience of having worked on teams previously and how this may affect working with team members in a present setting. Modifications were made to the items to suit

this study and the construct was redefined to be specific in terms of measuring perceived traditional project management experience (Table 5-11).

Measures for this item were developed with a view to solicit information that will assist in gaining a deeper understanding of the influence of traditional project experience in managing projects in the virtual environment. Project managers were asked to provide information on whether they perceived the experience they gained in managing traditional projects played a key role in virtual environments in terms of preparedness and ensuring successful outcomes.

Table 5-11: The items used to measure perceived traditional project experience

- Previous experience in managing traditional project environments increases the likelihood of success in managing virtual teams.
- Previous experience in managing traditional project environments increases the likelihood of being viewed as being more competent to manage a virtual project team.
- The experience gained from managing traditional environments does not count for much in managing virtual teams.

5.5.9 Project success

As discussed in the literature review in Chapter 2, the criterion for project management success continues to be debated by project management researchers. Some of these differences in opinion were highlighted in Section 2.7. This study does not draw any conclusions on this aspect but instead embraces the different criteria with a view to study the role and impact of trust on achieving desired outcomes. The measures for this construct account for the more commonly cited

definitions of project success as viewed from the traditional as well as the virtual perspective.

Some of the items for this scale were adopted from the project implementation profile (PIP), a 12-item scale by Pinto and Slevin (1986). Although the PIP has been empirically tested and shown to be reliable (Mahaney & Lederer, 2006), not all of the items of the PIP were suitable for this study and thus 5 of the original items were omitted. The rest of the items were included with a view to cover a more general spectrum of project types and industries that the project managers may represent. A wide coverage of success criteria is necessary so that the meaning of project success is captured and is inclusive of the many types of projects managed. Table 5-12 contains all the items used to measure project success.

Table 5-12: The items used to measure project success

- The project was completed on time.
- The project was completed within budget.
- The project was completed to specification.
- The project outcomes satisfied the stakeholders.
- Overall the client was satisfied with the outcome of the project.
- The project was viewed as a success by the team members and the sponsors of the project.
- Overall the project management process was completed successfully.

5.5.10   Demographic data

The last part of the questionnaire obtained demographic information from the participants of the study. Such information included background data such as gender, age and education. This data was collected for each of the participants with a view to create a description and a profile of the participants and the organizations they represented. Project managers have varying skills and experiences and collection of

this information helps to understand the unique nature of the participants' profiles. Table 5-13 lists the background information that was collected.

Table 5-13: Demographic items

- Age in years
- Gender
- The highest level of formal education attained
- The position in the organization
- The number of years of experience in traditional project management
- The number of years of experience in virtual project management
- The size of the organization represented
- The range of size of projects managed as measured in monetary terms
- The size of last project as measured in monetary terms
- The number of team members that comprised the project team
- The geographical dispersion of the team in terms of the number of work sites
- The number of times the team had met face-to-face in the same physical location
- The occurrence of a face-to-face meeting at the beginning of the project
- The history of team members. This questioned whether any of the team members had worked together on previous projects
- The geographical dispersion of the team in terms of the number of countries
- The number of ethnic backgrounds within the team
- The type of projects the project manager is mainly involved in

In addition to the demographic items listed above, the questionnaire provided a section for project managers to give feedback and comments on the study and on project management in the virtual environment.

5.6 Overview

This chapter described the research methodology used for the study. The primary method of data collection was a web-based survey, which was hosted on the PMI site. Project managers in the virtual environment comprised the population of study and the participants were drawn from this population. The chapter explained the reasons for the selection of the methods and the participants. The chapter also explained the development process of the questionnaire and how the measurement items were selected for the study. The next chapter discusses how the data were analyzed.

Chapter 6 Data Analysis

6.1 Introduction

This chapter decsribes the data analysis techniques chosen to support the research. The chapter begins by introducing the data analysis technique, including a discussion of the sample size. The chapter also introduces the use of partial least squares (PLS), which was used for the analysis. The chapter then outlines the criteria used in the development of the measurement model as well as the approach taken to the development of the structural model. An analysis of descriptive statistics concludes the chapter.

6.2 Data analysis technique

Data analysis was carried out using a form of structural equation modeling (SEM). SEM techniques provide researchers with a comprehensive means for assessing and modifying theoretical models and have become increasingly popular in information systems research as they offer great potential for furthering theory development (Gefen, Straub, & Boudreau, 2000). SEM requires a minimum sample size of 200 (Hair, Anderson, Tatham, & Black, 1998). Due to small numbers of virtual team project managers, a small sample size was anticipated. To counter this, a decision was made to use partial least squares (PLS). PLS is a components-based structural equation modeling technique that has the ability to model latent constructs under conditions of non-normality and small to medium sample data sets (Chin, 1998). PLS copes well with common research issues such as missing values and the

presence of multi-collinearity (Chin, 1998; Gefen, Straub, & Boudreau, 2000). PLS was developed in the late 1970's by Wold (1975). The PLS method is designed to maximize prediction rather than fit. The pattern of loadings of the measurement items on the latent construct is specified explicitly in the model. The fit of the pre-specified model is examined to determine its convergent and discriminant validities. PLS is considered well suited to explain complex relationships (Fornell & Larcker, 1981).

SmartPLS, a software application for path modelling with latent variables, was used to carry out the data analysis for this research. SmartPLS is developed by a team sited in the School of Business at the University of Hamburg (Germany) (Ringle, Wende, & Will, 2005). An inspection of the raw data showed that some of the respondents had left some items unanswered. The SmartPLS program requires that all missing values are replaced with a coded value prior to processing. Thus all blank items were replaced with the mean of the values for that item (Tabachnick & Fidell, 1989).

The analysis of the measurement model is based on the reflective indicators used in the model. Reflective indicators are used when the items or indicators used to measure the latent variable are viewed as being affected by the same underlying concept (Jarvis, MacKenzie, & Podsakoff, 2003). Reflective indicators are typical of classical test theory and factor analysis models; they are invoked in an attempt to account for observed variances or covariances. Reflective indicators of a principal factor latent construct should be internally consistent and, because all the measures

are assumed to be equally valid indicators of the underlying construct, any two measures that are equally reliable are interchangeable. The direction of flow for reflective indicators is from the construct to the measures. Formative indicators, in contrast, are not designed to account for observed variables (Jarvis, MacKenzie, & Podsakoff, 2003). Rather, it is assumed that the measures all have an impact on (or cause) a single construct. The direction of causality therefore flows from the indicators to the latent construct, and the indicators, as a group, jointly determine the conceptual and empirical meaning of the construct.

The survey was completed by 65 respondents. According to Chin, Marcolin and Newsted (1996, p. 39) for PLS "a standard rule of thumb suggests that the sample size should be equal to the larger of the following: (i) ten times the scale with the largest number of formative (i.e., causal) indicators (note that scales for constructs designated with reflective indicators can be ignored); or (ii) ten times the largest number of structural paths directed at a particular construct in the structural model". This study used reflective indicators (see measurement model in figure 7-1), hence rule number 2 was deemed more appropriate (Aubert & Kelsey, 2003; Chin, 1998; Gefen, Straub, & Boudreau, 2000). The minimum acceptable sample size was 50, derived because the largest number of structural paths directed at the construct virtual team trust is 5. The sample (65 respondents) was therefore considered sufficient to use with PLS because it met the requirements of rule number 2 and because one of the major strengths of PLS is its ability to handle small sample sizes.

A two-step approach (Hair, Anderson, Tatham, & Black, 1998) commonly used in SEM techniques was applied in this study. The approach involves: (i) estimating the measurement model; and (ii) 'fixing' the measurement model when the structural model is estimated. Hair, Anderson, Tatham and Black (1998) recommend this approach to be adopted when faced with measures that are less reliable or theory that is only tentative, with a view to maximize the interpretability of both measurement and structural models.

6.3   Development of the measurement model

The measurement (outer) model consists of the relationships between the indicators and the construct which they measure. In the measurement model the researcher specifies which indicators define each construct (Hair, Anderson, Tatham, & Black, 1998). Hence the indicators in the measurement model are used to measure, or indicate, the latent constructs (Hair, Anderson, Tatham, & Black, 1998). The measurement model can be used to assess the contribution of each scale item as well as to incorporate how well a scale measures a concept into the estimation of relationships between latent variables (Hair, Anderson, Tatham, & Black, 1998).

6.3.1 Confirmatory factor analysis

PLS was used in the study to perform a confirmatory factor analysis (CFA). In CFA the goal is to test specific theoretical expectations about the structure of a set of measures (Gefen, Straub, & Boudreau, 2000). The pattern of loadings of the measurement items on the constructs were specified explicitly in the model. Then,

the fit of the pre-specified model was assessed to determine its construct validity. Construct validity seeks agreement between a theoretical concept and a specific measuring device or procedure (Jarvis, MacKenzie, & Podsakoff, 2003). Construct validity can be broken down into two sub-categories: convergent validity and discriminant validity. The onus is to provide evidence for construct validity by demonstrating that there is sufficient evidence for both convergent and discriminant validity. The model was run several times and the measurement items that did not load satisfactorily were dropped from the model in the final run.

6.3.1.2 Convergent validity

Convergent validity is shown when each measurement item correlates strongly with its assumed theoretical construct (Gefen & Straub, 2005). This provides evidence of the theory that the items are related to the same construct. A number of criteria are used to assess convergent validity. When the conditions set by these criteria are met, it can be deduced that the items in question are converging on the same latent construct. Using SmartPLS 2.0 the criteria listed in Table 6-1 were used to assess convergent validity.

Table 6-1: Measures of convergent validity of the measurement model

Item loadings	> 0.70 (Hulland, 1999)
Internal composite reliability (ICR)	> 0.70 (Hair, Anderson, Tatham, & Black, 1998)
Average variance extracted (AVE)	> 0.50 (Hair, Anderson, Tatham, & Black, 1998)
Cronbach alpha coefficient	> 0.70 (Nunnally, 1978)
t-values on outer loadings	> 1.96 (Gefen & Straub, 2005)

The first criterion was an assessment of the outer model loadings of the indicators. The outer model loadings were tested against a pre determined condition that each indicator must show an outer loading greater than 0.7 (Hulland, 1999) on the construct being measured. Following the assessment of the first criterion, a rerun of the measurement model was done after eliminating the indicators that did not meet the condition set. The next criterion was based on an assessment of the ICR, which tests the internal consistency of the measurement model. ICR values greater than 0.7 were expected in this analysis. The third criterion used was the AVE. The AVE, proposed by Fornell and Larcker (1981), is used as a measure of the shared or common variance in a latent variable. In different terms, AVE is a measure of the error-free variance of a set of items (Fornell & Larcker, 1981). The fourth criteria was Cronbach's alpha, which is a commonly used measure of the inter-correlation among items in a group indicating the extent to which the group can be seen as measuring a single latent variable. Values range between 0 and 1.0, with higher values indicating higher reliability of the measure. Cronbach has been included in the analysis only for comparison. In PLS, ICR is used instead of Cronbach's alpha.

The fifth criteria was the assessment of t-values outer loadings. Convergent validity is shown when each of the measurement items loads with a significant t-value on its latent construct (Gefen & Straub, 2005). Typically, the p-value of the t-value should be significant at least at the 0.05 alpha level, this equates to a t-value of at least 1.96 (Gefen & Straub, 2005).

6.3.1.3 Discriminant validity

Discriminant validity is shown when each measurement item correlates weakly with all other constructs except for the one to which it is theoretically associated. If there is discriminant validity, the relationship between measures from different constructs should be very low (cross-construct correlations should be very low). The correlations provide evidence that measures of different concepts are distinct (Guss, 1998).

In PLS, discriminant validity is tested by comparing AVE and inter-construct correlation. To assess discriminant validity, the following two procedures were used, as proposed by Gefen and Straub (2005):

1. a comparison of item cross loadings to construct correlations; and
2. an examination of the ratio of the square root of the AVE of each construct to the correlations of this construct with all the other constructs.

In the first procedure, the indicators must load more strongly on their corresponding construct than on any other constructs in the model. In the second procedure, the PLS standard is that each latent variable correlation should be lower than the square root of the AVEs of the two variables correlated (Gefen & Straub, 2005). If these conditions are met then the measurement model meets the requirements of discriminant validity (Chin, 1998).

6.4   Development of the structural model

The structural (inner) model relates the constructs to each other. The structural model can be described as a set of one or more dependence relationships linking the model constructs (Gefen, Straub, & Boudreau, 2000). SmartPLS 2.0 was used to evaluate the structural model. The structural model was evaluated using the following criteria:

- ability to explain variance; and

- significance of path coefficients.

The first criterion considered was the ability of the model to explain the variance in the dependent variables. The dependent variables in the trust model are perceived trustworthiness, trusting intention, virtual team trust, swift trust and project success. An estimate of variance explained is provided by the squared multiple correlations (R^2) of the structural equations for these variables (Hair, Anderson, Tatham, & Black, 1998). The R^2 is a measure of what proportion of the variability of a dependent variable is explained by the independent variables.

The second criterion was the significance of the path coefficients. The structural model was tested on whether it was a valid representation of trust dynamics in virtual projects by assessing the significance of the t-values of the proposed relationships. All of the hypotheses except one specify a direction for the proposed relationship so a one-tailed t value of 1.64 indicates significance at the $p<0.05$ level (Hair, Anderson, Tatham, & Black, 1998).

In addition to the criteria used in the development of the structural model, an assessment of the strength of the relationships between the constructs was made. For this research, the following categization was applied when assessing the strength of relationships: correlations of less than 0.2 were considered weak; correlations between 0.2 and 0.5 were considered moderate; and conditions greater than 0.5 were considered strong. The categorization is adapted from Cohen (1988).

6.5 Descriptive statistics

This section presents the descriptive statistics of the study. The section provides an insight to participants individual profiles and the type of organizations they represented. A total of 65 participants responded to the survey. There were 50 male participants' and 15 females. Table 6-2 shows the age distribution of the respondents. Their ages ranged from 24 to 57 with an average age of 41. The most common age group was 36-45 and the least common age groups were under 25 years and over 56. This is an expected distribution in that it shows that for one to be considered ready to take on project management duties a requisite number of years of experience in the industry is required after graduating from university or college. It is possible that the small number over the age of 56 is due to the demanding job of project management which may not suit older workers. Another reason could be that working with the latest communication technology tools could pose a greater challenge for older workers than it would for younger employees.

Table 6-2: Age distribution of participants

Age distribution	Number	Percentage
20-25	1	2%
26-35	13	20%
36-45	33	52%
46-55	14	23%
56 and over	2	3%

Table 6-3 shows the educational background of the participants. The largest grouping (52%) held a Masters degree. In total 97% of all respondents had degrees. This suggests a trend towards gaining formal project management qualifications either through a Masters in project management or through a Doctorate qualification.

Table 6-3: Educational background

Educational background	Number	Percentage
Associate degree	7	11%
Bachelor degree	22	35%
Masters degree	32	52%
Doctorate	1	2%

Table 6-4 lists the positions held by the respondents. The results show that several titles and positions were representative of the role of project manager. Of the respondents sampled, 53% held the position of Project Manager. This was followed by the position of IT Manager at 27%. IT Managers usually take on many roles including that of managing projects. The position of Construction Manager reflected 6% of the sample. The Program Manager title reflected 5% of the sample. These

respondents could be part of an organization that has a project management office overseeing multiple projects. The position of Director was held by 4% of the respondents.

Table 6-4: Positions held by the sample

Title	Number	Percentage
Project Manager	34	53%
IT Manager	17	27%
Construction Manager	4	6%
General Manager	3	5%
Program Manager	3	5%
Director	2	4%

Table 6-5 lists the respondents' years of experience in managing traditional project teams. The years varied from one to 32 years with an average 8.51. The table shows that the largest group of the sample, representing 40% of the total, had managed traditional projects for 5 to 9 years. This was followed by 23% of those sampled who had managed traditional projects for 10 to 14 years. The third largest group at 22% had managed traditional projects for less than 5 years. The sample included a reasonably large group that had managed traditional projects for more than 15 years. The results are generally expected because traditional projects have been adopted by organizations for a longer period in comparison to virtual projects.

Table 6-5: Number of years of managing traditional project teams

Years of experience	Number	Percentage
1-4	13	22%
5-9	24	40%
10-14	14	23%
More than 15 years	9	15%

In contrast to their experience in the traditional environment, the sample had less experience managing virtual teams. The years varied from one to 15 years with an average 3.21 years. Table 6-6 shows that 45% of the respondents had virtual project management experience of only 1 to 2 years. This was followed by 32% of the respondents who had 3 to 4 years experience and 16% had managed virtual project teams for 5 to 6 years. It was interesting to see that 7% of the sample had more than 7 years of experience in managing virtual project teams. This is possibly representative of corporations that began operating globally at an early stage.

Table 6-6: Number of years of managing virtual project teams

Number of years	Number	Percentage
1-2	25	45%
3-4	18	32%
5-6	9	16%
More than 7 years	4	7%

Table 6-7 lists the size of organizations represented by the participants, measured in terms of staff numbers. The table shows that the largest group of respondents came from large organizations with more than 500 staff members (39%). This was followed by 22% of the sample, whose organizations had 50 to 100 staff, and 20%

who worked for organizations of more than 100 but less than 500 staff. The smallest group (19%) belonged to small business operations of less than 50 staff.

Table 6-7: Size of organizations

Size of organization (staff numbers)	Number	Percentage
Less than 50 staff	11	19%
50-100 staff	13	22%
100-500 staff	12	20%
More than 500 staff	23	39%

The number of work sites was also considered (see Table 6-8). The largest group of respondents (37 %) managed project teams spread over 4 to 5 work sites. This was followed by 33% whose teams were spread over 3 or less work sites. A sizable group of 30 % managed projects teams spread over more than 6 work sites.

Table 6-8: Number of work sites

Number of work sites	Number	Percentage
1-3	19	33%
4-5	21	37%
6-10	12	21%
11-15	2	4%
16-20	3	5%

Table 6-9 shows the distribution of projects managed by the respondents according to the monetary value (USD) of the project. The most common project size was

$100,000 - $500,000 (41%). This was followed by projects valued at more than $1,000,000 (23%). Of those sampled, 20% worked with smaller projects of less than $100,000 while 16% worked with projects of $500,000–$1,000,000.

Table 6-9: Size of projects managed in monetary value

Size of projects	Number	Percentage
Less than $100,000	34	25%
$100,000-$500,000	44	32%
$500,000-$1,000,000	34	25%
More than $1,000,000K	26	18%

Project team size was also of interest and is shown in Table 6-10. The most common team size was 6 to 10 (38%). Larger teams of more than 25 members were managed by 18% of the respondents.

Table 6-10: Project team size (number of members per team)

Number of team members	Number	Percentage
2-5	8	13%
6-10	23	38%
11-15	10	17%
16-20	4	7%
21-25	4	7%
More than 25	11	18%

Of the project managers surveyed, 75% indicated that team members of the projects they managed had a prior history of working together. This is in contrast to 25% whose team members had never worked together before the project.

Table 6-11 lists the frequency of the teams' face-to-face meetings. From the table we can see that the most common number of face-to-face meetings was two to three times over the length of the project. Some of the respondents had managed teams that had never met face-to-face. Of the respondents surveyed, 75% stated that their teams had an initial face-to-face meeting, while 25% stated that their teams had not had an initial face-to-face meeting.

Table 6-11: Frequency of face-to-face meetings

Number of Face-to-face meetings	Number	Percentage
None	7	12%
1	9	15%
2-3	22	37%
More than 4	21	36%

Table 6-12 shows the distribution of projects at a country level. This is related to the number of work sites except that in this case we find out how many countries the project was spread over. Most commonly, the projects managed by the respondents were within the same country (32%). This is expected of large countries such as the US or Australia. This was followed by 29% whose projects were spread over two countries. The next largest group (24%) managed projects over three countries while 15% managed projects spread over more than three countries.

Table 6-12: Distribution of projects at country level

Number of country sites	Number	Percentage
1	19	32%
2	17	29%
3	14	24%
4	3	5%
5	3	5%
6	3	5%

The teams represented in the study covered a range of ethnic backgrounds. The most common range was one to three different ethnic backgrounds (44%) as depicted in Table 6-13. This was followed by 33% who had a higher diversity with four to six different backgrounds. Another group (7%) of the sample showed a large diversity of more than 10 different ethnic backgrounds.

Table 6-13: Number of ethnic backgrounds represented in project teams

Number of ethnic backgrounds	Number	Percentage
1-3	20	44%
4-6	15	33%
7-9	7	16%
More than 10	3	7%

Table 6-14 shows the types of projects represented. The most common types of projects were information technology projects at 65% and civil engineering projects at 17%. Civil engineering projects are sometimes spread over many work sites for

long periods. The introduction of virtual projects adds a welcome dimension to this industry.

Table 6-14: Types of projects represented

Project Types	Number	Percentage
Information Technology	40	65%
Civil Engineering	10	17%
Engineering and Mining	4	7%
Market Research	3	5%
Defence Computing	2	4%
Human Resources	1	2%

6.6 Overview

This chapter presented the methods used in the analysis of the data. The chapter described the approach taken to develop the measurement model. A description of PLS and the reasons behind its selection for the analysis was presented. In the discussion on the measurement model, the criteria that were used to assess convergent and discriminant validity were presented. The chapter then described the specification of the structural model. This section included the various criteria used to evaluate the structural model. These criteria included the ability to explain the variance in the dependent variables, significance of the model coefficients and the correlations between the constructs. Finally, the descriptive characteristics of the sample were presented. The average age of participants was 41 years. They were highly educated, had substantial traditional project management experience, but, not surprisingly, tended to have less experience managing virtual teams. The project sizes managed ranged from $100,000 to over $1,000,000 and the most common team

size was 6 to 10 members. Of the project managers surveyed, the majority indicated

that team members of the projects they managed had prior history of having worked

together previously.

Chapter 7 Results

7.1 Introduction

This chapter reports the results of the data collection and analyses as described in Chapter 6. The measurement model is first presented. As described in Chapter 6, construct validity is then tested. The assessments of convergent validity are first presented and explained. This is followed by the presentation of the results of the final run of the measurement model. The final run is followed by the results of assessments of discriminant validity of the measurement items. The structural model is then assessed and the results of the hypotheses are presented. The analysis of total effects is also presented followed by the discussion of the feedback and comments provided by the respondents.

7.2 Measurement model

SmartPLS 2.0 was used to test the measurement model. Figure 7-1 shows the measurement model that was used for the calculations. The criteria discussed in Chapter 6 were used to validate the measurement model. A complete list of measurement item labels that were used in the assessment is presented in Appendix C. In PLS, all second order constructs are modelled as first order constructs with their respective items as reflective indicators. Reflective indicators are viewed as being affected by the same underlying concept (i.e., the latent variable) (Chin, 1998). In this case, the multiple dimensions of perceived trustworthiness of ability, integrity, benevolence and honesty all represent the same construct.

Figure 7-1: The measurement model

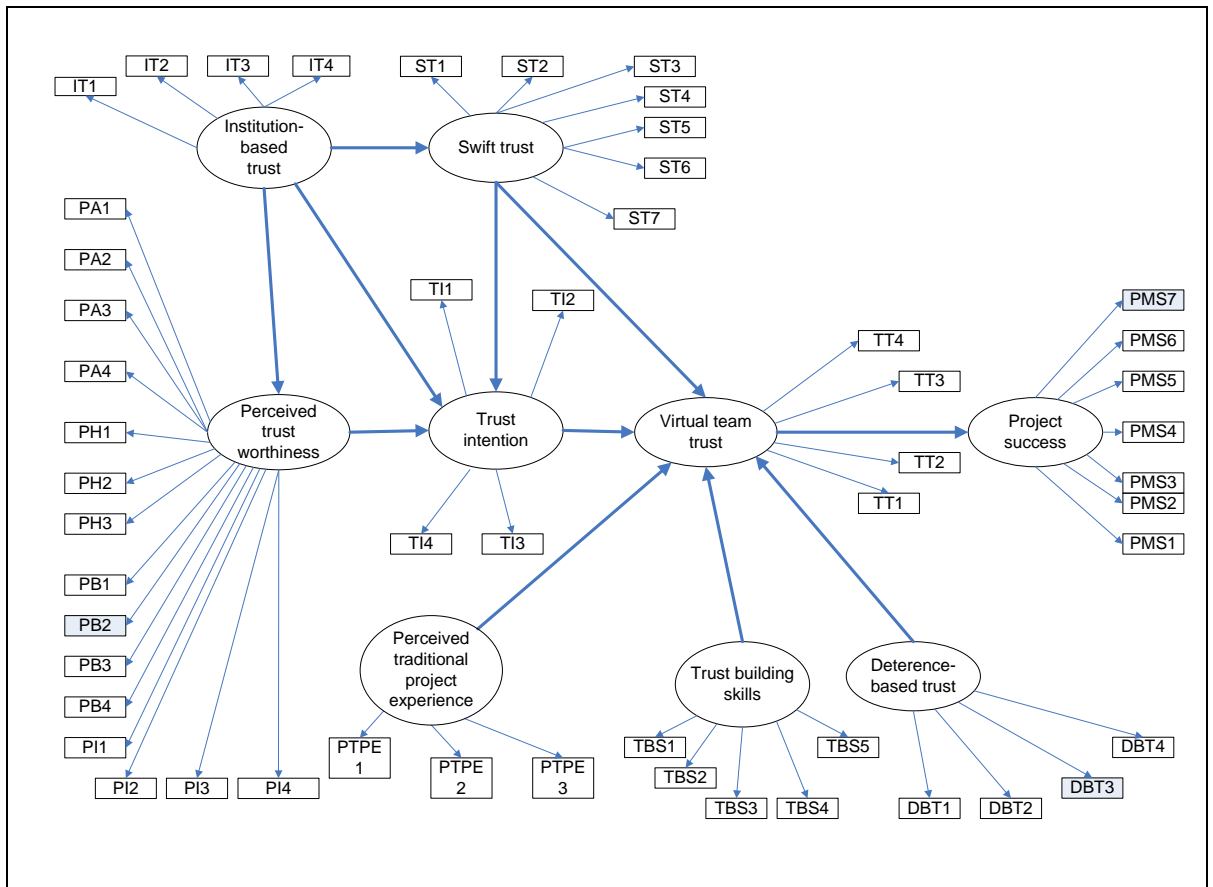## 7.2.1 Convergent validity

Convergent validity was assessed in five ways as described in Section 6.3.1.2. The first assessment was done on the outer loadings. The loadings of items against the construct being measured were tested against the value 0.7 (Hulland, 1999) on the construct being measured. Table 7-1 shows the output results obtained for the loadings in relation to the latent variables.

Table 7-1: Initial values of outer loadings

Item	Loading	Item	Loading	Item	Loading	Item	Loading
IT1	0.93	PA1	0.25	VTT2	0.74	ST4	0.77
IT2	0.96	PA2	0.51	VTT3	0.90	ST5	0.87
IT3	0.953	PA3	0.57	VTT4	0.77	ST6	0.70
IT4	0.91	PA4	0.43	TI1	0.90	ST7	0.74
DBT1	-0.08	PB1	0.78	TI2	0.58	PTPE1	0.97
DBT2	0.83	PB2	0.79	TI3	0.93	PTPE2	0.96
DBT3	0.21	PB3	0.76	TI4	0.85	PTPE3	-0.27
DBT4	0.81	PH1	0.52	TBS1	0.66		
PS1	0.79	PH2	0.65	TBS2	0.78		
PS2	0.69	PH3	0.68	TBS3	0.84		
PS3	0.72	PI1	0.64	TBS4	0.91		
PS4	0.64	PI2	0.44	TBS5	0.73		
PS5	0.64	PI3	0.36	ST1	0.63		
PS6	0.74	PI4	0.31	ST2	0.80		
PS7	0.80	VTT1	0.75	ST3	0.82		

Institutional-based trust

Based on the criteria that item loadings greater than 0.70 are generally considered acceptable (Hulland, 1999), all four measures of institution-based trust are therefore deemed to show evidence of converging on the construct of institution-based trust.

Deterrence-based trust

Analysis of the deterrence-based trust construct shows that items DBT2 and DBT4 have loadings greater than 0.70 and are therefore acceptable, but DBT1 and DBT3 are much lower than acceptable (DBT1 is even negative). These two items were dropped from the final model.

Project success

Analysis of the project success indicators showed that most of them were above the acceptable value of 0.70. The indicator PS5 was below 0.7. Indicator PS2 was marginal but was retained. The indicators PS5 and PS4 were dropped from the final model. All the other indicators were considered acceptable to measure the construct.

Perceived trustworthiness

Of the perceived trustworthiness items measured, only PB1, PB2 and PB3 showed loadings greater than 0.70 while PH2 (0.65) and PH3 (0.68) had marginal outer loadings. These five indicators appear to be the best indicators of the construct and were retained. The results of the perceived trustworthiness construct were unexpected.

Virtual team trust

All item loadings of virtual team trust were above 0.70, the items are thus considered good indicators of virtual team trust.

Trusting intention

The trusting intention construct items TI1, TI3 and TI4 have outer loadings greater than 0.70 and are thus acceptable. However, TI2 loaded below 0.7 and was considered unacceptable and was therefore dropped from the final analysis.

Trust-building skills

Analysis of the trust-building skills construct showed that most of the indicators had loadings above 0.7 with TBS1 being marginal (0.66). The indicators were considered acceptable to measure trust-building skills and all retained.

Swift trust

Analysis of the swift trust construct shows that item ST1 was below the accepted loading of greater than 0.70. The rest of the items are considered satisfactory. Item ST1 was left out of the final analysis.

Perceived traditional project experience

Loadings for PTPE1 and PTPE2 are well above 0.70. In comparison, PTPE3 was very much below the acceptable loading. Thus, PTPE3 is not an acceptable indicator on the construct and was left out of the final analysis.

7.2.2 Assessment of final model

Once all the items that did not load satisfactorily had been removed, the model was rerun. Figure 7-2 shows the results of testing the measurement model in the final run.
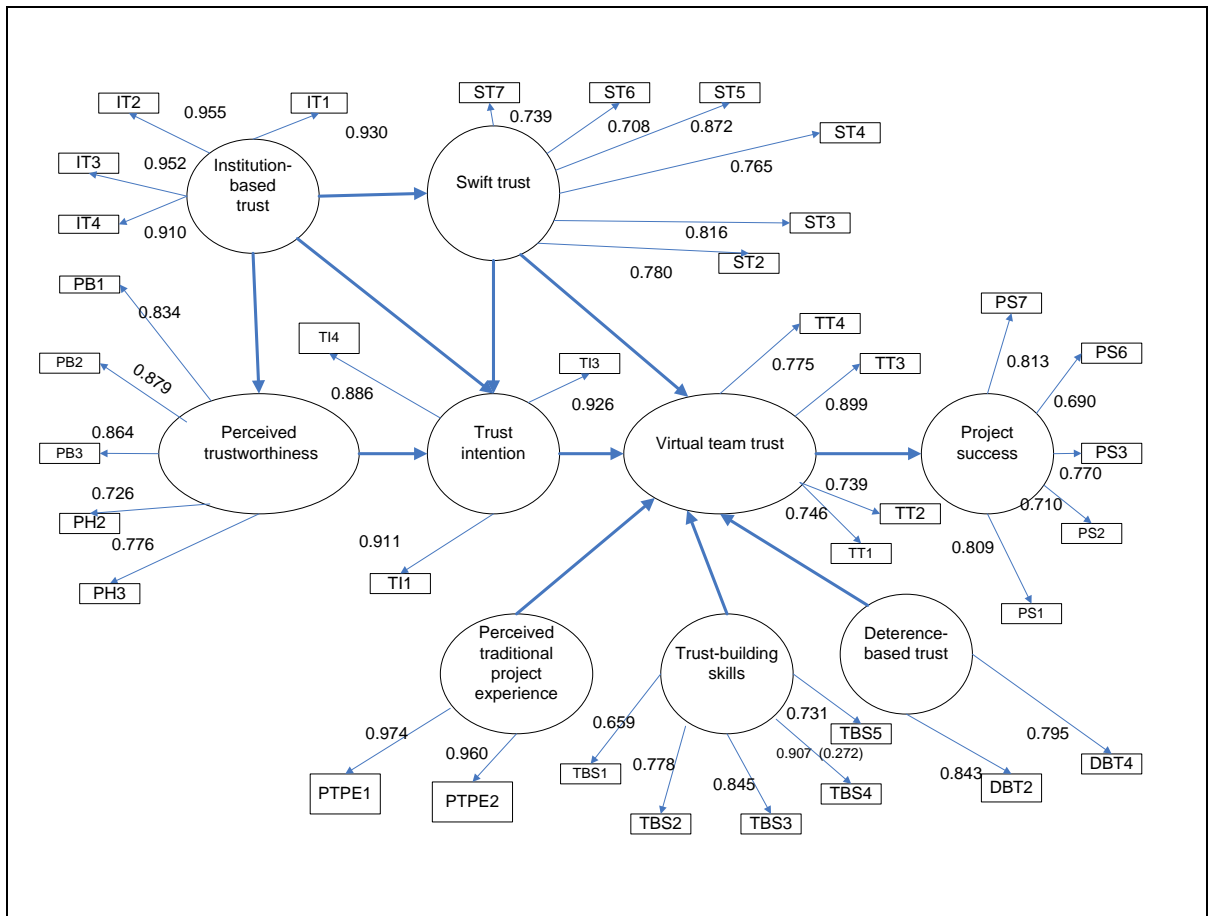
Figure 7-2: PLS model results of final run

Table 7-2 shows the values obtained from the final run. The results obtained provide evidence of the first criteria for convergent validity. All outer loadings were close to or above the recommended value of 0.7. This demonstrates that the items in question are related to the construct they are intended to measure and are therefore accepted as showing evidence of convergence on the construct they are measuring.

Table 7-2: Final values of outer loadings

Item	Loading	Item	Loading	Item	Loading
IT1	0.93	PH3	0.78	ST4	0.77
IT2	0.96	VTT1	0.75	ST5	0.87
IT3	0.95	VTT2	0.74	ST6	0.71
IT4	0.91	VTT3	0.89	ST7	0.74
DBT2	0.84	VTT4	0.77	PTPE1	0.97
DBT4	0.79	TI1	0.91	PTPE2	0.96
PS1	0.81	TI3	0.93		
PS2	0.71	TI4	0.89		
PS3	0.77	TBS1	0.66		
PS6	0.69	TBS2	0.77		
PS7	0.81	TBS3	0.84		
PB1	0.83	TBS4	0.91		
PB2	0.88	TBS5	0.73		
PB3	0.86	ST2	0.79		
PH2	0.73	ST3	0.82		

The other criteria for convergent validity were then assessed. The second criterion for convergent validity was based on an assessment of the ICR. All values of ICR shown in Table 7-3 met or exceeded the accepted level of 0.7 therefore demonstrating the internal consistency of the measurement model. The third criterion assessed was the AVE, all values of AVE were greater than 0.5 therefore show evidence of common variance in the constructs. The fourth criterion was Cronbach's alpha. Most of the values of Cronbach, except for deterrence-based trust, showed a value greater than 0.7 therefore indicating that the items in each group could be seen as measuring the same construct.

Table 7-3: Convergent validity measures

	ICR	AVE	Cronbach
Deterrence-based trust	0.80	0.67	0.51
Institution-based trust	0.97	0.88	0.95
Perceived traditional project experience	0.97	0.94	0.93
Perceived trustworthiness	0.91	0.67	0.88
Project trust	0.87	0.58	0.82
Swift trust	0.90	0.61	0.88
Virtual team trust	0.87	0.63	0.79
Trusting intention	0.93	0.82	0.89
Trust-building skills	0.89	0.62	0.85

The fifth criterion was the assessment of t-values. The t-values were obtained using the bootstrap method in SmartPLS. Table 7-4 shows that the t-values for the outer model loadings are all above 1.96 and therefore significant.

The analysis of the five criteria showed that the constructs demonstrated evidence of convergent validity thereby indicating that the items in each group were converging on the same latent construct. This section completes the assessment of the first category of construct validity. The second category, discriminant validity, follows in the next section.

Table 7-4: Outer loadings derived from bootstrap analysis

Item	Loading	SD	T value	Item	Loading	SD	T value	Item	Loading	SD	T value
DBT2	0.84	0.30	2.77	PTPE1	0.97	0.01	76.94	TI3	0.93	0.03	30.11
DBT4	0.79	0.18	4.41	PTPE2	0.96	0.03	30.73	TI4	0.89	0.04	20.05
IT1	0.93	0.03	32.51	ST2	0.79	0.06	13.87	VTT1	0.75	0.08	8.99
IT2	0.96	0.02	61.92	ST3	0.82	0.05	16.04	VTT2	0.74	0.18	4.12
IT3	0.95	0.01	102.84	ST4	0.77	0.06	12.79	VTT3	0.89	0.04	22.68
IT4	0.91	0.05	20.01	ST5	0.87	0.02	32.13	VTT4	0.77	0.07	10.72
PB1	0.83	0.06	14.15	ST6	0.71	0.09	7.13				
PB2	0.88	0.07	13.17	ST7	0.74	0.08	9.71				
PB3	0.86	0.07	12.13	TBS1	0.66	0.10	6.45				
PH2	0.73	0.18	3.96	TBS2	0.77	0.25	3.16				
PH3	0.78	0.18	4.27	TBS3	0.84	0.09	9.68				
PS1	0.81	0.07	11.82	TBS4	0.91	0.24	3.86				
PS2	0.71	0.09	7.31	TBS5	0.73	0.24	3.06				
PS3	0.77	0.09	8.95	TI1	0.91	0.03	32.38				
PS6	0.69	0.15	4.47	TI3	0.93	0.03	30.11				
PS7	0.81	0.06	14.00	TI4	0.89	0.04	20.05				

7.2.3 Discriminant validity

As discussed in Section 6.3.1.3 two procedures were used to assess discriminant validity. The first procedure for testing discriminant validity was to assess the indicator loadings on their corresponding construct. The results of the cross loadings from the initial run are shown in Appendix D (Table D-1).

A look at the cross loadings of the final run in Table 7-5 shows that the loadings (shaded) are larger than the other values in the same rows. This shows that the loadings are higher than the cross loadings. All the item loadings in the final run met the requirements of the first procedure in the assessment of discriminant validity.

Table 7-5: Table of cross loadings

	Deterrence-based trust	Institution-based trust	Perceived traditional pjt exp	Perceived trust worthiness	Project success	Swift trust	Virtual team trust	Trusting intention	Trust-building skills
DBT2	0.84	0.35	0.34	0.29	0.22	0.47	0.36	0.47	0.23
DBT4	0.79	0.40	0.45	0.34	0.15	0.49	0.32	0.44	0.28
IT1	0.36	0.93	0.22	0.42	0.30	0.29	0.41	0.61	0.23
IT2	0.47	0.96	0.26	0.36	0.15	0.35	0.38	0.53	0.24
IT3	0.46	0.95	0.27	0.41	0.23	0.36	0.46	0.57	0.33
IT4	0.41	0.91	0.273	0.46	0.27	0.31	0.39	0.55	0.31
PB1	0.40	0.43	0.30	0.83	0.43	0.19	0.53	0.54	0.42
PB2	0.33	0.38	0.31	0.88	0.55	0.11	0.39	0.49	0.33
PB3	0.22	0.39	0.35	0.86	0.44	0.00	0.46	0.47	0.26
PH2	0.36	0.27	0.33	0.73	0.25	0.06	0.28	0.46	0.12
PH3	0.26	0.31	0.32	0.78	0.43	0.07	0.34	0.43	0.16
PMS1	0.30	0.31	0.24	0.42	0.81	0.33	0.52	0.60	0.36
PMS2	0.10	-0.12	0.09	0.09	0.71	0.32	0.31	0.25	0.28
PMS3	0.07	0.12	0.14	0.25	0.77	0.28	0.46	0.32	0.46
PMS6	0.14	0.19	0.19	0.53	0.69	-0.02	0.27	0.44	0.23
PMS7	0.22	0.35	0.04	0.62	0.81	0.10	0.53	0.56	0.52
PTPE1	0.50	0.28	0.97	0.40	0.22	0.45	0.30	0.27	0.05
PTPE2	0.42	0.25	0.96	0.35	0.12	0.33	0.25	0.24	-0.04
ST2	0.45	0.07	0.14	-0.03	0.16	0.79	0.22	0.21	0.26
ST3	0.47	0.34	0.34	0.03	0.21	0.82	0.34	0.30	0.39
ST4	0.34	0.16	0.30	0.09	0.24	0.77	0.30	0.27	0.14
ST5	0.44	0.40	0.39	0.13	0.43	0.87	0.42	0.48	0.31
ST6	0.50	0.26	0.36	0.15	0.08	0.71	0.28	0.29	0.09
ST7	0.56	0.26	0.29	0.11	0.03	0.74	0.31	0.16	0.32
TBS1	0.35	0.34	0.08	0.36	0.38	0.22	0.52	0.51	0.66

TBS2	0.20	0.23	-0.02	0.23	0.30	0.17	0.30	0.22	0.78
TBS3	0.19	0.14	-0.08	0.16	0.33	0.25	0.38	0.16	0.85
TBS4	0.27	0.22	-0.03	0.28	0.44	0.33	0.42	0.26	0.91
TBS5	0.15	0.19	0.06	0.21	0.53	0.30	0.38	0.24	0.73
TI1	0.57	0.59	0.27	0.55	0.57	0.45	0.63	0.91	0.35
TI3	0.52	0.49	0.27	0.57	0.53	0.30	0.63	0.93	0.38
TI4	0.40	0.57	0.18	0.48	0.49	0.31	0.50	0.86	0.30
VTT1	0.27	0.36	0.17	0.55	0.46	0.16	0.75	0.49	0.62
VTT2	0.39	0.33	0.17	0.21	0.36	0.53	0.74	0.49	0.49
VTT3	0.35	0.45	0.25	0.44	0.48	0.28	0.90	0.64	0.32
VTT4	0.30	0.23	0.32	0.34	0.53	0.37	0.77	0.43	0.24

The second procedure assessed AVE and the associated correlations. Table 7-6 shows that the square root of the AVE for institution-based trust (0.94) is larger than the correlation of institution-based trust and deterrence-based trust (0.45). The square root of the AVE for perceived traditional project management (0.97) is larger than the correlation of perceived traditional project management with deterrence-based trust (0.48) and institution-based trust (0.27). Similarly, for the construct perceived trustworthiness, the square root of the AVE (0.82) is larger than its correlations with deterrence-based trust (0.39), insititution-based trust (0.44) and perceived traditional project experience (0.39). For the construct project success, the square root of the AVE is larger than its correlations with deterrence-based trust (0.23), institution-based trust (0.26), perceived traditional project experience (0.18) and perceived trustworthiness (0.52). For the construct swift trust, the square root of the AVE is larger than its correlations with deterrence-based trust (0.58), institution-based trust (0.35), perceived traditional project experience (0.41), perceived trustworthiness (0.11) and project success (0.28). Likewise, for virtual team trust, trusting intention and trust-building all the square roots of their AVE values are much larger than any correlation with other constructs. The results of both procedures in the final run therefore show evidence of discriminant validity.

By demonstrating evidence of both convergent and discriminant validity, we can therefore state that there is sufficient evidence for construct validity.

Table 7-6: Correlation of constructs and other statistics

	Mean	SD	ICR	AVE	√AVE	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Deterrence-based trust	-0.08	0.11	0.80	0.67	0.82	1								
2. Institution-based trust	0.44	0.12	0.97	0.88	0.94	0.45	1							
3. Perceived traditional project experience	0.37	0.11	0.97	0.94	0.97	0.48	0.27	1						
4. Perceived trustworthiness	0.34	0.13	0.91	0.67	0.82	0.39	0.44	0.39	1					
5. Project success	0.17	0.10	0.87	0.58	0.76	0.23	0.26	0.18	0.52	1				
6. Swift trust	0.31	0.21	0.90	0.61	0.78	0.58	0.35	0.41	0.11	0.28	1			
7. Virtual team trust	0.09	0.11	0.87	0.63	0.79	0.41	0.44	0.29	0.49	0.58	0.42	1		
8. Trusting intention	0.28	0.14	0.93	0.82	0.91	0.55	0.60	0.27	0.59	0.59	0.39	0.65	1	
9. Trust-building skills	0.58	0.08	0.89	0.62	0.79	0.31	0.30	0.01	0.33	0.52	0.33	0.53	0.38	1

7.3 Structural model evaluation

After validation of the measurement model was completed, the structural model was assessed. The model and associated hypotheses are shown in Figure 7-3. This section evaluates the model based on the criteria in Section 6.4.
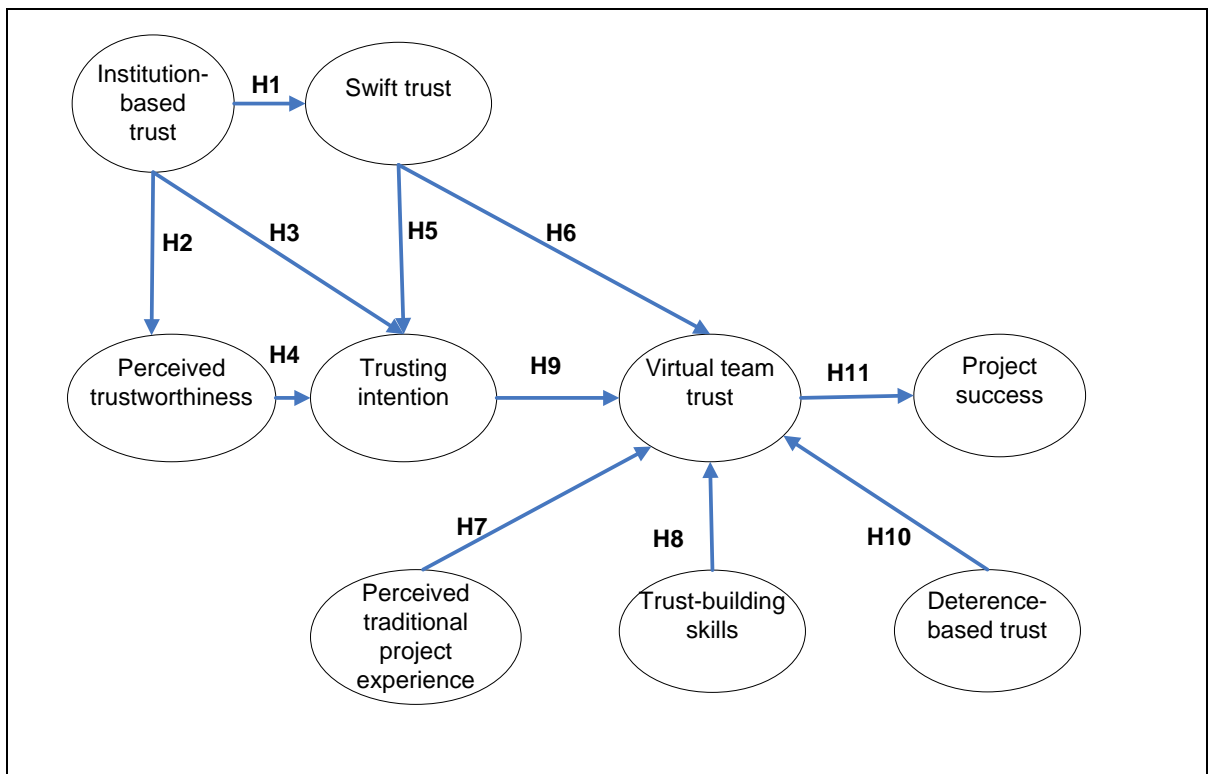
Figure 7-3: Model showing hypotheses to be tested

7.3.1 Variance explained

As described in Section 6.4, the ability to explain variance in the constructs of interest was one of the criteria for evaluating the model. From the results shown in Table 7-7, and the structural model in Figure 7-4, it can be seen that the R^2 values showed acceptable results. R^2 values for virtual team trust, trusting intention and project success were very strong. We can see that 34% of the variance in project

success is explained by the influence of virtual team trust, while 54% of the variance in virtual team trust is explained by the influence of trusting intention, deterrence-based, trust-building skills, perceived traditional project experience and swift trust. Also 20% of the variance in perceived trustworthiness is explained by institution-based trust, while 54% of the variance in trusting intention is explained by perceived trustworthiness, institution-based trust and swift trust. Only 12% of the variance in swift trust is explained by institution-based trust.

Table 7-7: R^2 values

Construct	R^2
Perceived trustworthiness	0.20
Project success	0.34
Swift trust	0.12
Virtual team trust	0.54
Trusting intention	0.54
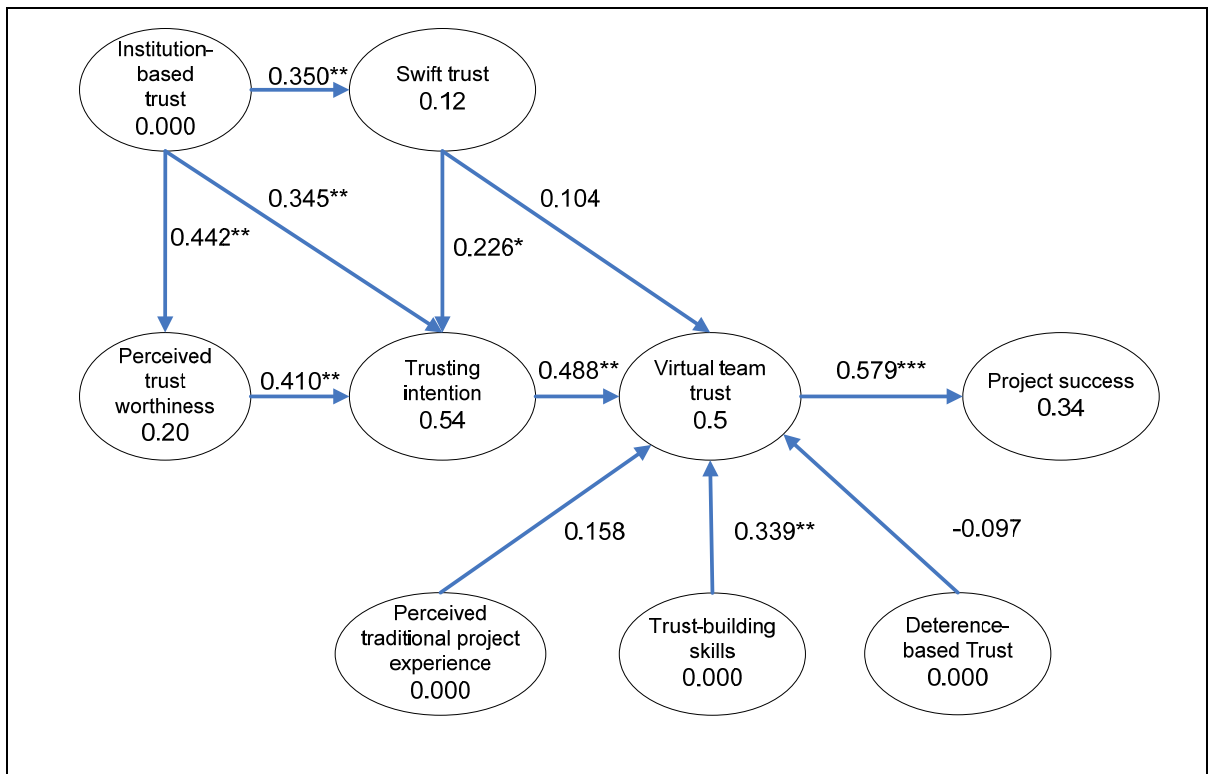
Figure 7-4: Structural model
* p<.05 **, p<.01, *** p<.001

7.3.2 Assessment of path coefficients

Table 7-8 shows the results of the calculations for significance of path coefficients. The significance of the path coefficients was determined using t-statistics calculated using the bootstrap technique. As can be seen from the table some of the paths were not significant. These are swift trust to virtual team trust, perceived traditional project experience to virtual team trust, and deterrence-based trust to virtual team trust.

Table 7-8: Significance of path coefficients derived from bootstrapping analysis

	Path Coefficient	SD	T value
Institution-based trust to Perceived trustworthiness	0.44	0.12	3.56**
Institution-based trust to Swift trust	0.35	0.11	3.13**
Institution-based trust to Trusting intention	0.35	0.13	2.74**
Perceived trustworthiness to Trusting intention	0.41	0.21	1.99**
Swift trust to Virtual team trust	0.10	0.11	0.98
Swift trust to Trusting intention	0.23	0.14	1.64*
Trusting intention to Virtual team trust	0.49	0.10	4.74**
Perceived traditional project exp to virtual team trust	0.16	0.10	1.54
Trust-building skills to Virtual team trust	0.34	0.10	3.36**
Deterrence-based trust to Virtual team trust	-0.10	0.11	0.82
Virtual team trust to Project success	0.58	0.08	6.82***

*p <0.05 (one-tailed test)
**p <0.01 (one-tailed test)
***p <0.001 (one-tailed test)

7.3.3 Hypotheses

As can be seen from the T-values in Table 7-8, eight significant values were found. The results of the PLS structural model tests for each of the hypothesis are stated below.

H1: Institution-based trust will positively influence swift trust.

Institution-based trust demonstrated a significant positive influence on swift trust. Therefore, this hypothesis was supported.

H2: Institution-based trust will positively influence the perceived trustworthiness of the project manager.

Institution-based trust demonstrated a significant positive influence on perceived trustworthiness. Therefore, this hypothesis was supported.

H3: Institution-based trust will positively influence trusting intention. Institution-based trust demonstrated a significant positive influence on trusting intention. Therefore, this hypothesis was supported.

H4: Perceived trustworthiness of the project manager will positively influence trusting intention.

Perceived trustworthiness demonstrated a significant positive influence on trusting intention. Therefore, this hypothesis was supported.

H5: Swift trust will positively influence trusting intention.

Swift trust demonstrated a significant influence on trusting intention. Therefore, this hypothesis was supported.

H6: Swift trust will positively influence the level of virtual team trust.

Swift trust did not demonstrate a significant influence on virtual team trust. Therefore, this hypothesis was not supported.

H7: Perceived traditional project experience of the project manager will positively influence trusting intention.

Perceived traditional project experience did not demonstrate a significant influence on virtual team trust. Therefore, this hypothesis was not supported.

H8: The trust-building skills of the project manager will positively influence the level of virtual team trust.

Trust-building skills demonstrated a significant positive influence on virtual team trust. Therefore, this hypothesis was supported.

H9: Trusting intention will positively influence the level of virtual team trust.

Trusting intention demonstrated a significant positive influence on virtual team trust. Therefore, this hypothesis was supported.

H10: Deterrence-based trust will have less impact on the level of virtual team trust in the virtual environment.

Deterrence-based trust did not demonstrate a positive influence on virtual team trust. Therefore, this hypothesis was strongly supported.

H11: The level of virtual team trust will positively influence project success.

Hypothesis 11: Virtual team trust demonstrated a significant positive influence on project success. Therefore, this hypothesis was supported.

7.3.4 Assessment of relationship strength

The correlations provided in Table 7-6 (Section 7.2.3) showed that there was a strong relationship between:

- Virtual team trust and project success;

The following relationships were considered moderate strength:

- Trusting intention and virtual team trust;

- Institution-based trust and perceived trustworthiness;

- Perceived trustworthiness and trusting intention;

- Institution-based trust and swift trust;

- Institution-based trust and trusting intention;

- Trust-building skills and virtual team trust;

- Swift trust and trusting intention.

7.3.5 Assessment of total effects

In addition to the direct relationships reported on in Table 7-8 and Figure 7-4, relationships may be indirect, such that the relationship between two constructs in a model is mediated by one or more intervening variables. Table 7-9 below reports the total effects (direct plus indirect) estimated for the model. Institution-based trust had a significant total effect on team trust and project success. Swift trust had a significant total effect on team trust and project success. Trusting intention had a significant total effect on team trust and project success. Perceived trustworthiness also had a significant total effect on team trust and project success. Perceived traditional project experience however did not have a significant total effect on either team trust or project success. Trust-building skills had a significant total effect on

team trust and project success. As expected deterrence-based trust did not have a significant total effect on either team trust or project success.

Table 7-9: Significance of total effects on dependent variables

	Virtual team trust		Project success	
	Total effects	T-value	Total effects	T-value
Institution-based trust	0.33	4.28***	0.19	3.30**
Swift trust	0.21	1.66*	0.12	1.69*
Trusting intention	0.49	4.74***	0.28	3.50**
Perceived trustworthiness	0.20	1.88*	0.12	1.65*
Perceived traditional project experience	0.16	1.54	0.09	1.49
Trust-building skills	0.34	3.36**	0.20	2.84**
Deterrence-based trust	-0.10	0.82	-0.06	0.81

*p <0.05 (one-tailed test)
**p <0.01 (one-tailed test)
***p <0.001 (one-tailed test)
Note: Table shows total effects of each construct listed on the left hand column on each of the two constructs across the top of the table.

7.4 Feedback section

The feedback section of the questionnaire drew some interesting contributions from the respondents. The first issue was that of awareness of trust. Some of the respondents expressed their lack of awareness of the existence of trust in the teams they managed. These project managers stated that they had not paid sufficient attention to trust issues within the group. They had relied, instead, on each member to be more focused and be able to concentrate on their tasks and just let others get on with their tasks. They concluded however that they would pay more attention to trust

issues in future projects as one respondent stated, "It looks like I may have to pay more attention to trust related issues in future projects. This was never a focus in previous projects".

Another issue was that of levels of trust varying between certain periods of the project life cycle. This is reflected in a comment from one of the respondents; "trust was not an issue until the team came to deliver its first milestone". This suggests that during certain periods of the project trust issues became salient while at other times they were deemed as less important.

The third issue related to the important of being cognizant of the amorphous nature of virtual teams. One of the respondents highlights this issue by stating that: "the team cannot be expected to exhibit equal levels of thresholds in their behaviour towards each other". The team therefore does not express equal levels of trust or communication behaviours and instead more than likely exhibits different thresholds in their behaviour.

Another issue that arose was that project managers appear to prefer face-to-face meetings whenever the possibility arises. As one respondent commented, "to be successful in virtual projects I think I would plan for several workshops during the projects where people should be physically in the same location". This confirms that managing issues of trust in a virtual environment remains a challenge for some project managers and they would rather deal with it by planning for face-to-meetings.

7.5 Overview

This chapter reported the results of the data analysis undertaken to test the proposed model. The chapter presented the assessment of the measurement model, which included the results of confirmatory factor analysis, and assessment of construct validity. Construct validity was demonstrated using convergent and discriminant validity. The chapter then presented the evaluation of the structural model against the criteria established in Chapter 5 and the results of the tests of the hypotheses were presented. Contributions made to the feedback section of the questionnaire were also presented. Chapter 8 discusses the results that have been presented in this chapter.

Chapter 8 Discussion

8.1 Introduction

This thesis is concerned with understanding the role of trust in virtual projects and the influence that trust has on project success. The study set out to answer seven research questions as outlined in Chapter 4. Hypotheses were proposed to answer the research questions and a model of trust was tested to investigate the hypotheses. The results of the study were presented in Chapter 7. This chapter presents a discussion of the results and offers an explanation for the findings. The chapter also discusses how the research questions have been answered by the study. Assessments of the implications of the study for research followed by the implications for practice are then given. A discussion of the limitations of the study is also provided.

8.2 Discussion of hypotheses

This section discusses the results of tests of the hypotheses. Table 8-1 shows the proposed relationships and whether they were supported or not. The strength of each relationship is also shown.

Each of the hypotheses is discussed and an explanation is offered for the results of the relationship. The results are also compared with previous research where applicable.

Table 8-1: Results of hypothesis testing

Relationship	Support	Relationship strength
Institution-based trust influences perceived trustworthiness	Supported	Moderate
Institution-based trust influences swift trust	Supported	Moderate
Institution-based trust influences trusting intention	Supported	Moderate
Perceived trustworthiness influences trusting intention	Supported	Moderate
Swift trust influences trusting intention	Supported	Moderate
Swift trust influences virtual team trust	Not supported	
Trusting intention influences virtual team trust	Supported	Moderate
Perceived traditional project experience influences virtual team trust	Not supported	
Trust-building skills influences virtual team trust	Supported	Moderate
Deterrence-based trust has a low influence on virtual team trust	Supported	
Virtual team trust influences project success	Supported	Strong

8.2.1 Institution-based trust influences swift trust

Hypothesis H1, that institution-based trust will positively influence swift trust, was supported. The results suggest that when a virtual project team is assembled, their belief that the organization has proper guarantees, policies and procedures in place, will provide them with sufficient incentive to presume that other team members can be considered trustworthy. Institution-based trust is a key element in trust models because it can be managed (McKnight & Chervany, 2005). This means that

organizations can make amendments to policies and procedures to promote interpersonal trust including swift trust. Organizations can also ensure that not only are proper structures in place but that employees are aware of the structures that have been set up to provide them with security from discrimination or any other forms of injustice.

8.2.2 Institution-based trust influences perceived trustworthiness

Hypothesis H2, that institution-based trust will positively influence perceived trustworthiness, was supported. This result is in line with previous findings that have shown that institution-based trust does influence various forms of interpersonal trust relationships (McKnight & Chervany, 2005). A team that is secure in the knowledge that their organization follows proper procedures in dealing with its employees has a better chance of perceiving the project manager, who is appointed by the organization, as a trustworthy candidate capable of leading the team to success.

8.2.3 Institution-based trust influences trusting intention

Hypothesis H3, that institution-based trust influences trusting intention, was supported. The results are consistent with proposals made in an earlier study by McKnight, Cummings and Chervany (1998) that trusting intention at the beginning of a relationship may be high because of high institution-based trust levels. The existence of structural safeguards such as regulations, guarantees, and legal recourse can play a significant role in assuring trustors that the environment is supportive of, and encourages, trusting behaviours. It is interesting that institution-based trust

influences trusting intention both directly and indirectly through perceived trustworthiness. This is in contrast to McKnight and Chervany's (2005) results. Their study did not find any support for the relationship between institution-based trust and trusting intention, even though the constructs were correlated.

8.2.4 Perceived trustworthiness influences trusting intention

Hypothesis H4, that perceived trustworthiness will positively influence trusting intention, was supported. The result is in agreement with findings by Galvin, Ahuja and Agarwal (1999) and McKnight and Chervany (2005) whose studies also showed that trusting beliefs are strong predictors of trusting intention. The virtual project team is more likely to engage in trusting intention when they perceive the project manager to be trustworthy.

8.2.5 Swift trust influences trusting intention

Hypothesis H5, that swift trust would influence trusting intention, was supported. The intention to trust other members is therefore expected to benefit from the initial trust formed at the commencement of the project. The relationship strength was moderate although it was expected to be stronger. A possible explanation for this could be that when project team members are assembled for the first time they engage in swift trust but as they get to interact more they soon find out who is really worthy of their trust and who is not. This introduces a bearing on their intention to trust. Trust levels begin to fluctuate as team members start to trust based on emotions, stereotyping or task interactions. Therefore, several factors come into play and the picture is no longer as clear as expected.

8.2.6 Swift trust does not influence virtual team trust

Hypothesis H6, that swift trust influences virtual team trust, was not supported. This is an unexpected finding considering that, if a team attains swift trust, one would expect the momentum of that trust gained to carry through the project cycle and influence the level of trust attained by the team. This result is in contrast to Jarvenpaa, Knoll and Leidner's (1998) finding that teams with high levels of trust exhibited swift trust from the onset. According to the results of the total effects analysis swift trust has a significant effect on project success although this is indirectly through trusting intention and not through virtual team trust.

8.2.7 Perceived traditional project experience does not influence virtual team trust

Hypothesis H7, that perceived traditional project experience of the project manager influences virtual team trust, was not supported. A strong relationship was expected for this hypothesis. One would expect that a project manager with traditional project management experience would be considered more trustworthy and therefore more likely to achieve success in the virtual environment than one without this experience. However, the result suggests that the experience gained from managing traditional projects does not have an influence on increasing the levels of trust in the team. A possible explanation for this could be that the autonomous nature of virtual project team members prevents that background and experience being a main factor in the relationship. Workers in such an environment are much more independent and the influence of the project manager may not be as strong as it would in the traditional

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environment. However, this is not to say that members of a virtual project team do not adhere to the project plan or that they do not meet their schedules. It could be that team members just get on with their tasks and do not necessarily view the previous experience of the project manager as a factor in developing trust relations. Another explanation is that the dynamics of the virtual environment are just different from the traditional and as a result, methods, which were applicable in the traditional environment, may not be applicable in the virtual environment.

8.2.8 Trust-building skills influences virtual team trust

Hypothesis H8, that trust-building skills will influence virtual team trust, was supported. This result provides evidence that trust-building skills are crucial tools that project managers need in order to be successful in the virtual project environment. The results obtained are encouraging and are consistent with a study by Jarvenpaa, Leidner and Knoll (1998). Team support mechanisms, such as team-building exercises, may be utilized to speed up the process of trust development during these short-lived projects. Project managers cannot expect to rely on the gradual development of trust that is experienced in traditional teams because of time constraints. Communication strategies may be employed to build trust. Such communication actions include proactive and task output orientations, explicit time and process management, and frequent and predictive communication, which will facilitate the development and maintenance of trust in mediated communication environments (Jarvenpaa, Knoll, & Leidner, 1998; Jarvenpaa & Leidner, 1999).

8.2.9 Trusting intention influences virtual team trust

Hypothesis H9, that trusting intention will have a significant positive effect on virtual team trust, was strongly supported. This result provides evidence that when members of a virtual project team engage in trusting behaviour towards one another the level of trust within the team will increase. Thus, trust formation and maintenance is reliant on trusting intention. The results of total effects analysis show that trusting intention is a more important contributor to virtual team trust than any other form of trust.

8.2.10 Deterrence based trust does not influence virtual team trust

Hypothesis H10, that deterrence-based trust would have a low impact on virtual team trust in the virtual environment, was supported. Techniques using control and monitoring based mechanisms that are characteristic of deterrence-based trust found in traditional environments, are less likely to succeed in the virtual environment. In the virtual environment, team members need to be more independent and work in a more autonomous environment. The result provides evidence for project managers that they need to rely more on trust and less on control when it comes to the virtual environment.

8.2.11 Virtual team trust influences project success

Hypothesis H11, that virtual team trust will have a significant positive effect on project success was strongly supported. The result is encouraging and provides evidence that project success is an outcome of trust. This result is in agreement with

a study by Jarvenpaa, Knoll and Leidner (1998) who found significant positive relationships between trust and team performance. This result differs from findings by Aubert and Kelsey (2003) whose study found that the level of team trust had a negligible effect on team performance. If team members trust each other and trust in the project manager it is more likely that they will be able to perform better because barriers of communication and information sharing are less of an issue and members become task orientated. This result provides evidence for project managers who have been tasked to manage virtual project teams that they need to pay attention to issues of trust as they strive to attain project success.

8.3 Model discussion

The model developed in Chapter 4 was devised as a means to provide answers to the research questions. The model has shown acceptable quality although some of the hypothesized paths were not supported (Figure 8-1), these have been omitted from the figure. The model developed is offered as a step towards the development of trust models targeted for use by virtual project teams.
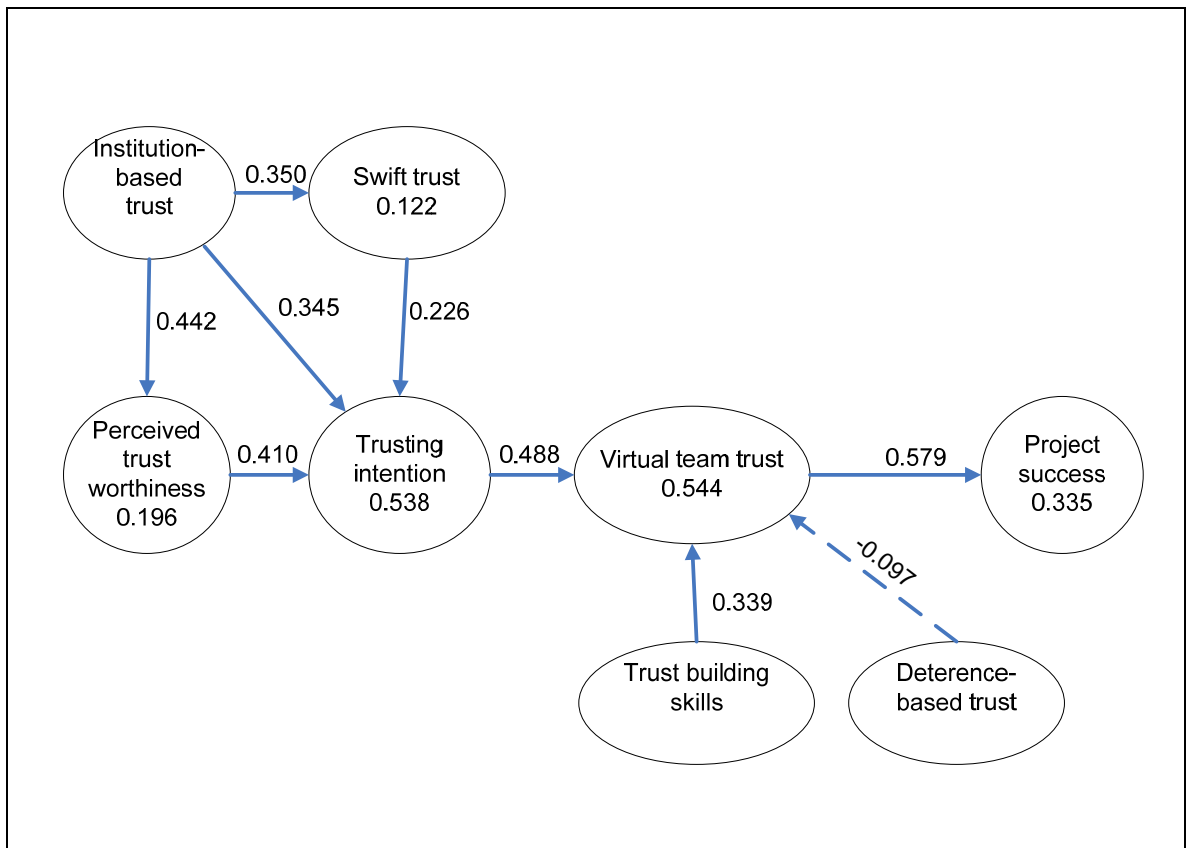
Figure 8-1: Virtual project trust model showing supported paths

The model reflects different phases that maybe experienced by a virtual project team. During the initiating phase of the project, team members are assembled and institution-based trust factors begin to play a role. Members are involved in contracts and agreements which spell out what is expected of them as well as what they can expect from the sponsors of the project. During this time, a project manager is appointed by the sponsoring organization and soon is involved in the selection of a team based on the skill requirements for the project. As team members are introduced to each other virtually or through an intial fac-to-face meeting, swift trust starts to play a role and thus members may experience high or low levels of trust almost immediately. As members are introduced to the project manager, they begin to make judgements or decisions to trust based on the background of the project

manager and the factors introduced by institution-based trust. How the team members perceive the project manager becomes a crucial element in raising the trust levels of the team. Team members then begin to interact and engage in trusting intention as the project progresses. If the manager is seen to be less than trustworthy, the project faces an uphill battle from the onset. On the other hand, if the project manager is perceived to be trustworthy then the project has a much better chance of succeeding.

The project manager plays a pivotal role in getting the team to work as a unit and thus focus on achieving the goals of the task at hand. As the project progresses the team experiences challenges which test the trust levels. Team members make their own cognitive assessments how to manage these challenges and it is up to the project manager and the organization (institution-based trust factors) to find ways of keeping the team focused and motivated. During this period, trusting intention becomes pivotal and the project manager becomes more and more accepting of the autonomous nature of the team. The team continues to strive to attain its highest level of trust as the project progresses. The project manager is then required to apply trust-building techniques to the team either individually or as a group. The team has a higher chance of achieving success as the trust levels are raised to the highest possible levels.

8.4 Research questions

Chapter 4 posed the research questions to be answered. This section assesses the findings of the study in relation to the research questions.

The first research question for the thesis was:

> Does institution-based trust influence interpersonal trust among team members in virtual projects?

Interpersonal trust (Section 3.3.2) is trust between persons either individually or as groups and includes swift trust, perceived trustworthiness and trusting intention. Hypotheses H1, H2 AND H3 relate to this research question. The results showed strong support for the following relationships: (H1) institution-based trust influences swift trust; (H2) institution-based trust influences perceived trustworthiness; and (H3) institution-based influences trust and trusting intention. Institution-based factors can give confidence to employees that they can trust the institution. This confidence may translate to trusting behaviour towards other team members at the start of the project. Institution-based factors are important because they are manageable and predictable. Whilst swift trust, on the other hand, has been seen as unmanageable. Applying a stimulus such as institution-based trust may provide sufficient incentive for members to trust each other at the start of the project. The study has also shown that institution-based trust can be used to give confidence to the team that the project manager that has been selected by the organization can be considered trustworthy. Institution-based trust was also proposed to influence trusting intention and this has been demonstrated. Team members selected to participate in a virtual project may show an intention to trust from the onset as a result of institution-based factors. The answer to this research question therefore is

that institutional-based trust does increase interpersonal trust between team members in virtual projects.

The second research question for the thesis was:

Does the perceived trustworthiness of the project manager influence project success?

This research question addressed the influence of the perceived trustworthiness of the project manager on virtual team success. The results showed support for the proposed relationship (H4) between perceived trustworthiness and trusting intention. The results of the total effects analysis (Table 7-9) also provided evidence that perceived trustworthiness indirectly influences project success. The study proposed that project managers need to be perceived as being trustworthy if they are to expect levels of commitment from the virtual team members that they are managing. Without this level of commitment, team members may not perform to the highest degree in order to achieve project success. The answer to this research question therefore is that the perceived trustworthiness of the project manager does influence project success.

The third research question for the thesis was:

Does swift trust influence project success in the virtual project environment?

This question addressed the role of swift trust in project success. Hypotheses H5 and H6 relate to this research question. Results did not provide a clear picture of the role played by swift trust. Hypothesis H5 proposed that swift trust would influence trusting intention. The relationship was found to be of moderate strength. On the

other hand, H6 proposed that swift trust would influence virtual team trust. The relationship was not found to be significant. Total effects analysis however shows that the indirect influence of swift trust on project success is significant. Therefore, the expectation that a team that experiences swift trust would reach higher levels of trust and thus have a higher chance of achieving project success has been demonstrated. The answer to the research question therefore is that swift trust does influence project success indirectly through trusting intention. Further research is need to explore the influence of swift trust.

The fourth research question for the thesis was:

Is traditional project management experience associated with project success?

This research question aimed to find out whether the traditional project management experience gained by project managers is a valuable influence in achieving project success in the virtual environment. However, the results of hypothesis H7 showed that perceived traditional experience did not have an influence on virtual team trust and hence had no influence on project success. Evidence for this conclusion has been shown through the results of the total effects analysis, which showed that effect of perceived traditional experience on project success was not significant. The result suggests that a project manager with traditional experience is no more likely to have an advantage in their quest to achieve success than one without this experience. The model shows that perceived traditional experience does not influence project success via virtual team trust. This could possibly mean that because of the different dynamics in a virtual environment compared to a traditional environment, project managers have to approach these projects with a completely fresh attitude and

preparedness. The answer therefore to this question is that traditional project management experience is not associated with project success.

The fifth research question for the thesis was:

Does virtual team trust influence project success?

This research question addressed the influence of virtual team trust on project success. Hypothesis H8 was used to investigate this question and the results show support for the relationship. This suggests that when a project team reaches a high level of trust they have a better chance of achieving positive outcomes from their project. The answer to this research question therefore is that virtual team trust does influence project success.

The sixth research question was:

Can trusting intention compensate for deterrence-based trust when striving to achieve project success?

This research question explores the influence of trusting intention and deterrence-based trust on project success within the virtual environment. Through hypothesis H9, the study found support for the influence of trusting intention on virtual team trust. The study also found that deterrence-based trust did not influence virtual team trust (H10). The results of total effects analysis showed that the relationship between trusting intention and project success is significant while the relationship between deterrence-based trust and project success is not significant. These results provide evidence that trusting intention plays a more influential role in achieving project success in the virtual environment than deterrence-based trust. The results therefore suggest that trusting intention may be used to overcome a reliance on a control-based

approach. This is the expected result as the virtual project environment makes it difficult to use control and monitoring activities. The answer to this research question therefore is that trusting intention is more influential in virtual environments in comparison to deterrence-based trust.

The seventh research question was:

> Is the development and maintenance of trust within the virtual environment linked to the trust-building skills of the project manager?

This research question addresses whether project managers need to have trust-building skills that could be used in the development and maintenance of trust. The study has provided evidence that trust influences project success. The development and maintenance of trust is therefore an important aspect of virtual project teams. Without the development of trust, it is more than likely that trust will break down and will no longer influence project success. This study has found support for the influence of trust-building skills on virtual team trust. This finding is in line with suggestions by McKnight and Chervany (1996) that issues of trust-building have taken center stage as business and researchers agree on the significant role played by trust. Project managers must invest in new skills that can play an influential role in the development and maintenance of trust. The answer to this research question therefore is that the development and maintenance of trust is linked to the trust-building skills of the project manager.

8.5 Limitations of the study

There are several limitations of the research that need to be considered. One of the limitations of the study is that the responses and views expressed are all from a

project manager's perspective. Obtaining the perspectives of the other team members of the teams may yield different results.

The study targeted project managers involved with virtual projects from any industry. This may have a bearing on the results because it may be difficult to observe patterns that are specific to an industry.

The data collection method used for the study may also have been a limitation of the study. While the target population was large, the web-based survey was not able to reach a very large sample. It was not possible to direct potential participants to the survey instead it was up to the PMI members to choose to visit the research site or not. Those PMI members who visited the research site, and responded to the questionnaire may be amongst the most motivated and capable members. The method used therefore may have imposed unforeseen restrictions on the study. Another limitation was the period of time allocated to data collection. A longer period may have resulted in more respondents but the period had to fit within the conditions of the PMI as well as the time allowed for the doctoral program.

To overcome the limitations some alternative methods were considered. A combination of email addressing and web-based survey was considered but it was not possible to get access to any email addresses from the PMI. Emailing possible participants and directing them to access the survey link would have increased the number of respondents. Other methods for finding participants such as directly

approaching organizations or individuals involved with virtual projects were also considered and pursued but without success considering the time factor.

8.6 Implications for research

This study makes several contributions to scholarly knowledge by extending previous research done by other trust researchers on the multi dimensional characteristics of trust. An insight into the dynamics of trust within a virtual project setting and how this differs in comparison to that of a traditional project setting has also been provided. New scales were developed to measure constructs that could be used in future research on trust. These include scales for swift trust, trust-building skills and deterrence-based trust. These scales were developed specifically for the study since none existed in the literature.

The research has introduced a model for the measurement of trust in the virtual project environment by using previously developed constructs as well as newly developed constructs. Future researchers may be able to make use the measurement items for the newly developed constructs. The study has contributed to trust research in the virtual project team environment by proposing that trusting intention may be used to overcome the need to rely on deterrence-based trust. It was demonstrated that deterrence-based trust does not have an impact on the development of trust within the project and therefore does not promote success directly or indirectly. Trusting intention has been shown to play an influential role in achieving virtual project success. It was interesting that the assessement of the perceived influence of the project manager's previous experiences with managing traditional teams did not find

support for this influence. This is a finding that needs further investigation in future research.

The study has also provided a response to calls by Jarvenpaa and Leidner (1999) and Jarvenpaa, Knoll and Leidner (1998) to verify the findings on trust and vigorously assess swift trust and the means to maintain it. By developing a scale to measure swift trust, a starting point has been made for future researchers to build on. Swift trust did not demonstrate the expected influence on virtual team trust. Future research may investigate this finding.

The study has investigated trust-building skills from a project manager's perspective in relation to the promotion of swift trust and the maintenance of a high level of trust throughout the life cycle of the project. The results have shown that trust-building skills exerted influence on virtual team trust to a large extent. Trust-building skills have been previously investigated by other researchers but not in relation to this environment.

8.7 Implications for practice

The study has highlighted the importance of trust as a vehicle to promote project success in the virtual environment. The findings show that project managers must be aware of both interpersonal as well as organizational factors of trust as they plan for project success. The findings provide evidence for the significant influence of institution-based trust on perceived trustworthiness, swift trust and trusting intention.

These findings imply that project managers must ensure that both they and the team are fully conversant with the organization's guarantees, policies, processes and procedures that can potentially make a difference to the development of trust and therefore the team's functioning. Additionally they should reassess their preparedness for the virtual project environment. A team member who is secure in the knowledge that the organization has policies that will protect their rights against issues of discrimination, for example, is better placed to exhibit an intention to trust the project manager as well as fellow team members.

In line with suggestions from previous studies, this thesis investigated the role of swift trust in virtual project teams and explored how it can be promoted on a more consistent level. Institution-based trust factors are expected to play a role in promoting swift trust.

Perceived traditional project experience did not play a role in influencing trust among team members. This was a surprising finding and implies that a project manager without any experience in managing traditional projects has as much chance of achieving virtual project success as one with that type of experience. This means that project managers may need to pay close attention to the dynamics of virtual environments and be prepared to learn new skills and adopt new attitudes that are more relevant to the virtual environment. Trust-building skills are expected to stand out as a crucial skill and project managers will do well to look at this aspect.

The role of trust is sometimes taken for granted and yet this study has shown that it plays a significant role in the achievement of project success. In the virtual environment, project managers must rely on trust rather than on power and control mechanisms that are characteristic of deterrence-based trust. The threat of punishment is no longer a significant motivator to perform when it comes to the virtual environment. Team members in the virtual environment are more independent and autonomous, and self managed to a large extent, even though they report to a project manager. Understanding the significance of trusting intention could be very useful in that project managers that are tasked with managing virtual teams may need to review their attitudes in preparation for such challenges.

The comments made by the respondents (Section 7.4) highlighted some interesting issues that are worth discussing. The first comment highlights a lack of awareness of the existence of trust in teams. Trust could mean the difference between success and failure. The results show that trust significantly affects success and therefore it could be predicted that the more trust a virtual project team achieves the more likely they are to achieve success.

The comment by one of the respondents that trust had not been an issue until the team came to deliver its first milestone implies that trust issues seemed to matter more to the team during more challenging times of the project. Project managers must remain attentive to issues of trust throughout the lifespan of the virtual project including those times when it does not seem to play a significant role. A loss of trust at any stage of the project may prove to be difficult to rebuild.

Another issue was that of the amorphous nature of teams. The implication for practice is that project managers must pay attention to harnessing virtual team trust while observing individuality. This can be done by channeling trust-building efforts towards each team member and playing a mentoring role that demonstrates to team members that though they are part of a team, their individual role and identity is also key to the success of the team. Therefore, trust-building skills must be oriented not only towards the team specifically but towards the individual as well. By providing individual counsel and assistance to each member there will be a tendency by members to feel successful and confident, and consequently give rise to the strengthening of trust.

The last issue raised was the preference for face-to-face meetings. If the resources are available to overcome the constraints of a truly virtual team then face-to-face meetings should be considered a viable option. However, in the event that a team is spread such that the option of face-to-face meetings becomes prohibitive the onus lies with the project manager to seek innovative methods to make the team effective. Methods that involve building high levels of trust will more than likely play a pivotal role in the success of the team. The study encourages project managers to reflect on their experiences and therefore prepare for future virtual projects armed with the knowledge that there is a need to pay more attention to trust issues.

8.8   Directions for future research

There are a number of issues that have arisen in the study, which may need further investigation. The dimensions of perceived trustworthiness were one of the issues that yielded unexpected results. Most of the items for this construct did not meet the criteria set by confirmatory factor analysis. PLS analysis showed that ability, and integrity indicators did not load well, instead only the indicators for honesty and benevolence loaded well on the construct trustworthiness. Considering that the indicators were taken from previously validated scales, this was a surprise result and is worth investigating further.

It would be worth finding out what the effect of a larger sample size would be on the study. As the study achieved a sample size of less than 100 it would be worthwhile to test the model with a much larger sample size. Future researchers could use other data collection methods to reach a larger sample.

The effect of swift trust on virtual team trust was expected to be stronger than was found. This was unexpected and is worth investigating further. Swift trust developed at the outset of the project was expected to be highly influential in increasing the level of virtual team trust. A possible explanation could be that the scale used to measure swift trust may need to be reviewed considering that it was developed specifically for the study. The scale however was tested in the pilot study and therefore provides researchers with a starting point.

The results also showed that traditional project management experience did not have any influence on project success. This was unexpected and may be a candidate for further investigation. It is possible that traditional project management experience may influence project success through a different route than the one investigated in this study.

8.9 Overview

This chapter discussed the results that were presented in Chapter 7. The chapter began with a discussion of the hypotheses. The chapter then discussed the model and the paths that were supported by the study. Most of the paths were supported except for the path linking swift trust to virtual team trust and the path linking perceived traditional project experience to virtual team trust. Therefore, Hypotheses H6 and H7 were not supported. The role of swift trust was of particular interest in the study. Whilst institution-based trust was found to influence swift trust, the role of swift trust in virtual team trust was less clear. The test of the proposed model provided evidence for the significant role played by trust in project success. The research questions were then reviewed so as to find out whether the study had answered the questions presented in Chapter 4. The review found that the questions had been addressed and answered. Next, the chapter highlighted the limitations of the study. Of major concern was the sample size, which could have been higher if more participants from the PMI had been directed to the survey. The chapter then discussed the implications of the study for research. This was followed by a discussion on the study implications for practice. The last section of the chapter discussed the directions for future research.

Appendices

Appendix A: PMI research survey policy documents

 Policy title: Providing hyperlinks to research surveys from the PMI Web site.

This policy document governs the selection criteria, conditions and procedure for temporal creation of survey links. The guidelines stipulates among other things that the survey must be judged as research that is deemed useful to the advancement of the project management body of knowledge and related topics and specifically not to be seen as purely motivated by commercial gain. The document also provides guidelines against publishing offensive content.

Document

URL: http://www.pmi.org/info/PP_ResearchSurveyPolicy.pdf

IT/MIS policy document

Policy title: IT/MIS.

This document is a policy that establishes the guidelines and rules, which govern the conduct and use of PMI Electronic Systems and Communications. The IT/MIS usage refers to all background IT or MIS processes that together permit a researcher to take advantage of this and other facilities provided by the PMI.

Document URL:

http://www.pmi.org/info/AP_PMIElectronicUsePolicy.pdf .

Survey link agreement document

The PMI has drawn up an agreement entitled, the survey link agreement, which has to be entered into between the two parties being the PMI on the one hand and the

researcher on the other. The agreement is a legal document that shows that the researcher has requested permission to post a link to a survey. The link is to be hosted on the www.pmi.org site in the research department section, and that he or she is has agreed to abide by the guidelines contained in the document.   The document stipulates the rights and obligations of both parties and the specific terms and conditions to adhere to. The document URL is:

http://www.pmi.org/info/PP_ResearchSurveyLink.pdf

As the period stipulated in the "Obligations of the parties" section of the agreement states that the link shall be active for a maximum of 60 days, there is therefore a limit to how long the link can remain active on the site. Special permission has to be granted to extend this period.

Appendix B: Actual questionnaire used in the study

School of Information Technology

An investigation of the role of trust in virtual project management success.

Thank you for taking the time to respond to this survey on the role of trust in virtual project management success. Understanding this vital issue should provide knowledge that will contribute to more effective virtual project teams.

For the purposes of this study a virtual project team is a group of people, working on the same project, that is spread over more than one work site, and whose members rely heavily on electronic communications, technology and means other than face to face meetings at one physical location.

Should you require any assistance in responding to the questionnaire please e-mail c.mumbi@murdoch.edu.au or T.McGill@murdoch.edu.au .

As you ponder each group of questions, consider the last complete virtual project for which you were the project manager.

The following questions refer to trust amongst your project team.

		Strongly disagree						Strongly agree
1.	The existence of high levels of trust was evident at the start of the project.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
2.	At the start of the project, the team considered me to be trustworthy.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
3.	At the start of the project, I considered the team members to be trustworthy.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
4.	At the start of the project, team members felt they could rely on me.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
5.	At the start of the project I considered the team members to be reliable.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
6.	Team members behaved as though trust was already in place at the	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
	start of the project.							

		Strongly disagree						Strongly agree
7.	At the start of the project team members were positive towards each other.	⊙	⊙	⊙	⊙	⊙	⊙	⊙

		Strongly disagree						Strongly agree
8.	Overall, the people in my group were very trustworthy	⊙	⊙	⊙	⊙	⊙	⊙	⊙

		Strongly disagree						Strongly agree
9.	We were usually considerate of one another's feelings on the team.	⊙	⊙	⊙	⊙	⊙	⊙	⊙

		Strongly disagree						Strongly agree
10.	The people in my group were friendly.	⊙	⊙	⊙	⊙	⊙	⊙	⊙

		Strongly disagree						Strongly agree
11.	There was a noticeable lack of confidence among my team members.	⊙	⊙	⊙	⊙	⊙	⊙	⊙

		Strongly disagree						Strongly agree
12.	In general, my team members perceived me as being skillful and effective in my work.	⊙	⊙	⊙	⊙	⊙	⊙	⊙

		Strongly disagree						Strongly agree
13.	In general, my team members were satisfied with my performance as a project manager.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
14.	Overall, my team members viewed me as a capable and experienced project manager.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
15.	Overall, my team members perceived me as being competent.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
16.	When it came to the team's well being, my team members knew that I really cared about what happened to them.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
17.	If they required help, my team members were aware that I would care enough to help them.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
18.	I believe that my team members were aware that I cared enough to act in the team's best interest.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
19.	I was able to demonstrate my	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
	fairness in dealing with each member of the team.							

		Strongly disagree						Strongly agree
20.	Team members were aware of my strong sense of commitment.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
21.	Team members were never in doubt about my intentions.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
22.	Team members were aware of my solid work ethic.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
23.	I feel that I was honest in dealing with the team at all times.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
24.	I feel that I negotiated fairly with my team members.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

		Strongly disagree						Strongly agree
25.	I feel that at no time did I mislead my team members.	⬚	⬚	⬚	⬚	⬚	⬚	⬚

The following questions refer to the influence of trust on project outcomes.

		Strongly disagree						Strongly agree

| 26. | Trust played a significant role in the overall outcome of the project. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

		Strongly disagree						Strongly agree
27.	Team members were able to rely on each other with confidence.	○	○	○	○	○	○	○

		Strongly disagree						Strongly agree
28.	Team members showed a willingness to depend on each other.	○	○	○	○	○	○	○

		Strongly disagree						Strongly agree
29.	Team members acted with fairness towards each other.	○	○	○	○	○	○	○

		Strongly disagree						Strongly agree
30.	I feel that I could depend on my team members even on difficult and crucial project tasks.	○	○	○	○	○	○	○

		Strongly disagree						Strongly agree
31.	I was willing to depend on my team despite the inability to monitor their activities.	○	○	○	○	○	○	○

		Strongly disagree						Strongly agree
32.	My team members were individuals on whom I felt I could rely on when faced with a project issue important to the overall team's performance.	○	○	○	○	○	○	○

		Strongly disagree						Strongly agree
33.	I could rely on my team members concerning project activities that were important for the success of the project.	☐	☐	☐	☐	☐	☐	☐

The following questions relate to team trust and responsibilities of team members.

		Strongly disagree						Strongly agree
34.	If I had my way, I would not have let the other team members have any influence over issues that were important to the project.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
35.	I was comfortable giving the other team members complete responsibility for the completion of the project.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
36.	I wished I had better methods to oversee the work of the other team members on the project.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
37.	I was comfortable giving the team members a task or problem that was critical to the project, even if I could not monitor them.	☐	☐	☐	☐	☐	☐	☐

The following questions relate to your influence on trust.

		Strongly disagree						Strongly agree

38.	Trust was an important factor in the team's overall performance.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
39.	It was possible to influence the formation of trust.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
40.	I was able to influence whether team members perceived each other as being trustworthy.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
41.	I was able to influence whether team members viewed each other in a positive manner.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
42.	Overall there was a continual improvement in the way team members worked with each other.	☐	☐	☐	☐	☐	☐	☐

The following questions refer to your opinion on what determined project management success.

		Strongly disagree						Strongly agree
43.	The project was completed on time.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
44.	The project was completed within budget.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
45.	The project was completed to specification.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
46.	The project outcomes satisfied the stakeholders.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
47.	Overall the client was satisfied with the outcome of the project.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
48.	The project was viewed as a success by the team members and the sponsors of the project.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree
49.	Overall the project management process was completed successfully.	☐	☐	☐	☐	☐	☐	☐

The following refer to processes within your organization.

		Strongly disagree						Strongly agree
50.	My organization has processes that assure that all team members will be treated fairly and equitably.	☐	☐	☐	☐	☐	☐	☐

		Strongly disagree						Strongly agree

No.	Question	Strongly disagree						Strongly agree
51.	I work in an environment in which good procedures make things fair and impartial.	○	○	○	○	○	○	○

No.	Question	Strongly disagree						Strongly agree
52.	Fairness to employees is built into how issues are handled in my work environment.	○	○	○	○	○	○	○

No.	Question	Strongly disagree						Strongly agree
53.	In my workplace, sound practices exist that help ensure fair and unbiased treatment of all team members.	○	○	○	○	○	○	○

The following questions refer to your opinion on the importance of traditional project experience.

No.	Question	Strongly disagree						Strongly agree
54.	Previous experience in managing traditional project environments increases the likelihood of success in managing virtual teams.	○	○	○	○	○	○	○

No.	Question	Strongly disagree						Strongly agree
55.	Previous experience in managing traditional project environments increases the likelihood of being viewed as being more competent to manage a virtual project team.	○	○	○	○	○	○	○

No.	Question	Strongly disagree						Strongly agree
56.	The experience gained from managing traditional environments does not count for much in managing virtual teams.	○	○	○	○	○	○	○

The following questions ask about your background.

57.	How old are you?		Years

58.	What is your gender?	◯ Male	◯ Female

		High school graduate	College graduate	Associate degree	Bachelors degree	Masters degree	Doctorate	Other
59.	What is the highest level of formal education that you have attained?	◯	◯	◯	◯	◯	◯	◯

60.	What is your position in the organization?

61.	How many years of experience do, you possess in traditional project management?		Years

62.	How many years of experience do, you possess in virtual project management?		Years

		Less than 50 staff	50-100	100-500	500+
63.	What is the size of your organization?	◯	◯	◯	◯

For question below K denotes $1000

		Less than 100K	100K-500K	500K-1000K	1000K+
64.	What is the range of size of projects that you have managed as measured in monetary terms? Select all that apply.	☐	☐	☐	☐

For question below K denotes $1000

		Less than 100K	100K-500K	500K-1000K	1000K+
65.	What was the size of your last project as measured in monetary terms?	◯	◯	◯	◯

66.	How many team members comprised the project team you were responsible for?		

67.	Had any of the team worked together in the past?	⊙	Yes	⊙	No

68.	How many times had the team met face to face in the same physical location?		times

69.	Was there a face-to-face meeting at the beginning of the project?	⊙	Yes	⊙	No

70.	Relating to the geographical dispersion of the team, how many work sites were the team spread over?	

71.	Over how many different countries was the team spread over?	

72.	How many ethnical backgrounds were within the team?	

73.	What type of projects are you mainly involved in? (Example Information Technology, Civil Engineering).

Please use the following optional comment box to provide comments or any additional feedback in relation to the study.

74.	Comments	

Thank you for your time.

Submit

Appendix C: Questionnaire item labels used in analysis

Table C-1: Item labels used in study calculations

Item code	Item wording
Swift trust	
ST1	The existence of high levels of trust was evident at the start of the project
ST2	At the start of the project the team considered me to be trustworthy
ST3	At the start of the project I considered the team members to be trustworthy
ST4	At the start of the project, team members felt they could rely on me
ST5	At the start of the project I considered the team members to be reliable
ST6	Team members behaved as though trust was already in place at the start of the project
ST7	At the start of the project team members were positive towards each other
Perceived ability	
PA1	In general, my team members perceived me as being skilful and effective in my work
PA2	In general, my team members were satisfied with my performance as a project manager
PA3	Overall, my team members viewed me as a capable and experienced project manager
PA4	Overall, my team members perceived me as being competent
Perceived benevolence	
PB1	When it came to the team's well being, my team members knew that I really cared about what happened to them
PB2	If they required help, my team members were aware that I would care enough to help them
PB3	I believe that my team members were aware that I cared enough to act in the team's best interest
Perceived integrity	
PI1	I was able to demonstrate my fairness in dealing with each member of the team
PI2	Team members were aware of my strong sense of commitment
PI3	Team members were never in doubt about my intentions
PI4	Team members were aware of my solid work ethic
Perceived honesty	
PH1	I feel that I was honest in dealing with the team at all times
PH2	I feel that I negotiated fairly with my team members

PH3	I feel that at no time did I mislead my team members
Virtual team trust	
VTT1	Trust played a significant role in the overall outcome of the project
VTT2	Team members were able to rely on each other with confidence
VTT3	Team members showed a willingness to depend on each other
VTT4	Team members acted with fairness towards each other
Trusting intention	
TI1	I feel that I could depend on my team members even on difficult and crucial project tasks
TI2	I was willing to depend on my team despite the inability to monitor their activities
TI3	My team members were individuals on whom I felt I could rely on when faced with a project issue important to the overall team's performance
TI4	I could rely on my team members concerning project activities that were important for the success of the project
Deterrent based trust	
DBT1	If I had my way, I would not have let the other team members have any influence over issues that were important to the project
DBT2	I was comfortable giving the other team members complete responsibility for the completion of the project
DBT3	I wished I had a better way of overseeing the work of the team members on the project
DBT4	I was comfortable giving the team members a task or problem that was critical to the project, even if I could not monitor them
Trust-building skills	
TBS1	Trust was an important factor in the team's overall performance
TBS2	It was possible to influence the formation of trust
TBS3	I was able to influence whether team members perceived each other as being trustworthy
TBS4	I was able to influence whether team members viewed each other in a positive manner
TBS5	Overall there was a continual improvement in the way team members worked with each other
Project management success	

PMS1	The project was completed on time
PMS2	The project was completed within budget
PMS3	The project was completed to specification
PMS4	The project outcomes satisfied the stakeholders
PMS5	Overall the client was satisfied with the outcome of the project
PMS6	The project was viewed as a success by the team members and the sponsors of the project
PMS7	Overall the project management process was completed successfully
Institutional trust	
IT1	My organization has processes that assure that all team members will be treated fairly and equitably
IT2	I work in an environment in which good procedures make things fair and impartial
IT3	Fairness to employees is built into how issues are handled in my work environment
IT4	In my workplace, sound practices exist that help ensure fair and unbiased treatment of all team members
Perceived importance of traditional project experience	
PPTE1	Previous experiences in managing traditional project environments increases the likelihood of success in managing virtual teams?
PPTE2	Previous experience in managing traditional project environments increases the likelihood of being viewed as being more competent to manage a virtual project team.
PPTE3	The experience gained from managing traditional environments does not count for much in managing virtual teams.

Appendix D: PLS results

Cross loading assessment

Table D-1: Table of cross loadings in initial run

	Deterrence-based trust	Institution-based trust	Perceived traditional pjt exp	Perceived trust worthiness	Project success	Swift trust	Virtual team trust	Trusting intention	Trust-building skills
DBT1	-0.08	0.02	-0.06	-0.20	-0.18	0.06	-0.01	-0.06	0.22
DBT2	0.83	0.35	0.34	0.33	0.19	0.47	0.36	0.47	0.23
DBT3	0.21	0.10	0.01	-0.04	-0.14	0.07	0.06	0.22	0.03
DBT4	0.80	0.40	0.45	0.43	0.14	0.48	0.32	0.49	0.29
IT1	0.36	0.93	0.22	0.45	0.30	0.28	0.41	0.60	0.23
IT2	0.47	0.96	0.26	0.43	0.15	0.34	0.38	0.54	0.24
IT3	0.47	0.95	0.27	0.49	0.24	0.34	0.46	0.56	0.33
IT4	0.41	0.91	0.27	0.50	0.29	0.30	0.39	0.57	0.37
PA1	0.32	0.18	0.25	0.29	0.15	0.45	0.11	0.12	0.10
PA2	0.28	0.01	0.29	0.51	0.30	0.39	0.29	0.21	0.15
PA3	0.19	0.11	0.18	0.57	0.49	0.36	0.49	0.37	0.41
PA4	-0.06	0.16	0.16	0.43	0.32	0.28	0.23	0.17	0.19
PB1	0.39	0.43	0.30	0.78	0.43	0.18	0.53	0.54	0.42
PB2	0.32	0.38	0.31	0.79	0.54	0.10	0.39	0.50	0.33
PB3	0.21	0.39	0.35	0.76	0.44	-0.02	0.46	0.49	0.26
PH1	0.29	0.21	0.40	0.52	0.08	0.14	0.20	0.29	0.05
PH2	0.39	0.27	0.33	0.65	0.25	0.05	0.28	0.52	0.12
PH3	0.25	0.31	0.32	0.68	0.44	0.06	0.34	0.46	0.16
PI1	0.36	0.28	0.32	0.64	0.40	0.34	0.33	0.48	0.14
PI2	-0.00	0.11	0.24	0.44	0.37	0.23	0.15	0.09	0.10
PI3	-0.11	0.04	0.15	0.36	0.33	0.14	0.28	0.14	0.17
PI4	-0.16	0.08	0.26	0.31	0.10	0.08	0.18	0.02	0.12

	Deterrence-based trust	Institution-based trust	Perceived traditional pjt exp	Perceived trust worthiness	Project success	Swift trust	Virtual team trust	Trusting intention	Trust-building skills
PMS1	0.28	0.30	0.24	0.52	0.79	0.33	0.52	0.56	0.36
PMS2	0.09	-0.12	0.09	0.24	0.69	0.33	0.31	0.20	0.28
PMS3	0.05	0.11	0.14	0.33	0.72	0.27	0.40	0.29	0.46
PMS4	0.04	0.15	0.31	0.37	0.66	0.09	0.24	0.30	0.10
PMS5	-0.01	0.17	0.21	0.42	0.64	0.07	0.23	0.31	0.08
PMS6	0.14	0.19	0.19	0.50	0.74	-0.03	0.27	0.42	0.23
PMS7	0.20	0.35	0.04	0.58	0.80	0.10	0.53	0.54	0.52
PT1	0.25	0.22	0.38	0.31	0.20	0.55	0.30	0.21	-0.01
PT2	0.25	0.41	0.17	0.48	0.27	0.35	0.40	0.29	0.16
PT3	0.35	0.46	0.38	0.48	0.33	0.42	0.35	0.32	0.29
PT4	0.05	0.01	-0.04	0.08	0.10	0.06	-0.05	0.03	0.22
PTPE1	0.49	0.28	0.97	0.52	0.23	0.44	0.30	0.27	0.05
PTPE2	0.42	0.25	0.96	0.44	0.17	0.32	0.25	0.25	-0.04
PTPE3	-0.04	0.13	-0.27	-0.06	0.02	0.17	-0.01	0.09	0.31
ST1	0.30	0.00	0.12	-0.06	0.14	0.63	0.16	0.15	0.21
ST2	0.44	0.07	0.13	0.14	0.12	0.80	0.22	0.19	0.26
ST3	0.46	0.34	0.34	0.24	0.18	0.82	0.34	0.28	0.39
ST4	0.35	0.16	0.29	0.31	0.21	0.77	0.30	0.25	0.14
ST5	0.43	0.40	0.39	0.34	0.43	0.87	0.45	0.44	0.31
ST6	0.50	0.26	0.36	0.34	0.08	0.70	0.28	0.24	0.09
ST7	0.56	0.26	0.29	0.31	0.02	0.74	0.31	0.18	0.32
TBS1	0.36	0.34	0.07	0.46	0.38	0.21	0.52	0.52	0.66
TBS2	0.18	0.23	-0.02	0.21	0.23	0.18	0.29	0.23	0.78
TBS3	0.19	0.14	-0.08	0.17	0.26	0.26	0.39	0.16	0.84
TBS4	0.26	0.22	-0.03	0.27	0.38	0.34	0.42	0.26	0.91
TBS5	0.13	0.18	0.06	0.23	0.51	0.30	0.38	0.21	0.73

	Deterrence-based trust	Institution-based trust	Perceived traditional pjt exp	Perceived trust worthiness	Project success	Swift trust	Virtual team trust	Trusting intention	Trust-building skills
TI1	0.57	0.59	0.26	0.62	0.55	0.44	0.63	0.90	0.35
TI3	0.53	0.49	0.27	0.57	0.53	0.30	0.63	0.93	0.38
TI4	0.42	0.57	0.18	0.53	0.50	0.30	0.50	0.85	0.30
VTT1	0.27	0.36	0.17	0.52	0.45	0.15	0.75	0.49	0.62
VTT2	0.38	0.32	0.17	0.38	0.35	0.53	0.74	0.45	0.49
VTT3	0.37	0.45	0.25	0.47	0.46	0.27	0.90	0.63	0.32
VTT4	0.29	0.23	0.32	0.49	0.49	0.36	0.77	0.44	0.24

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