

Elements Influencing IS Success in Developing
Countries: A Case Study of Organisations in
Papua New Guinea

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Declaration

The work contained in this thesis is in its totality original, and has not been previously submitted in part or full for higher degree or diploma at any other institution.

To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: _____

Date: _____

Dedication

This thesis is dedicated to Roselyn, my companion, partner, my best and closest friend and dear wife. You believed in me and inspired me, and in you I found my strength. Together we travelled this journey.

And to my parents, Kelegai and Loeme Popeya and to Rindi my father who passed away September 2004, your wisdom I will always value.

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"I can do all things through Christ who strengthens me. "

(Philippians 4:13)

Abstract

Since the introduction of computers in to organisations in the 1950s, computer information systems have become powerful organisational instruments. The uptake of information technology including information systems (IS) and the impact of these technologies have been phenomenal, particularly in the least developed countries (LDCs). Organisations in these countries have continued to utilise IS as a development tool with the belief that it will enhance business processes, in many instances accelerated by foreign assistance. IS can have a positive effect on users, organisations and national development, measured economically or otherwise at the individual, organisational, and national levels. Yet IS implementation and the measure of its success is characterised by a high rate of failure and disagreement among scholars and practitioners.

The success of organisational IS is influenced by a fabric of many variables, including contextual elements. In this regard IS can be influenced by both the organisational context in terms of strategies, structures, politics and culture, and by the wider political socio-economic, cultural, and technological climate within which organisations exist. Understanding the contributing variables and the barriers that impede IS success, would better prepare organisations to overcome the inherent difficulties.

There is a large body of work documenting the usefulness and consequences of IS. However, these studies have been concentrated in the developed countries (DCs), hence, little is known about IS implementation in LDCs. DCs

and LDCs differ in their contextual and social settings, and a uniform analysis may not be applicable in their disparate settings. Indeed the paucity of research and data in the IS domain indicates that the study would benefit an LDC such as Papua New Guinea (PNG) and contribute to knowledge in understanding IS implementation in an LDC environment.

This thesis reports on a study that examined IS implementation success in PNG organisations in the context of an LDC. Computers were introduced to PNG in the 1960s, however, no studies have been undertaken to date in this domain that the author is aware of. Hence, the objective of this study was to provide detailed analysis of IS, the context in which it was implemented, its interaction with organisational and external settings, and elicit the underlying elements associated with its success. It also explores the emphasis placed on each of the elements and the extent to which organisations effectively addressed these elements to ensure IS success.

The exploratory study employs a multi method design – beginning in Stage 1 with case studies, followed by a survey in Stage 2. Stage 1 adopted a multiple case study approach. Eight case studies were undertaken, however, results of only four case studies are reported in this thesis. Data obtained in the case studies provide a useful basis for the survey. The study in Stage 2 consolidated and expanded on the case study findings from the perspective of a wider population. All the organisations contacted but not involved in the Stage 1 study contributed by participating in the survey.

The study identified more than fifty elements that contributed to the success of IS in PNG organisations. There were significant similarities to the findings of studies in other DCs and LDCs despite the disparate contextual conditions. Several elements, not identified in prior studies, were also revealed. Based on this study, a set of principles pertaining to IS implementation and management in PNG was postulated. Similarly a set of recommendations was also outlined.

Keywords

Information Systems (IS), Information Systems Management, Information Systems Success, Information and Communication Technology (ICT), Least Developed Countries (LDC).

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Chapter 1

Introduction

1.0 Problem Statement

Since the introduction of computer systems into corporations in 1954, computer based information systems (IS) have been firmly established as a powerful organisational instrument (Lyytinen, 1987; Ives, Hamilton & Davis, 1980; Grover, Jeong, & Segars, 1996). Over the years, the role of IS in organisations has continued to expand in scope and complexity with outcomes for both the organisations using IS and the people affected by the functioning of these organisations. IS consists of software, software tools and methodology, computers and peripherals, usually networked within an organisation and potentially connected to innumerable intra-networks. By this structure, IS can assist individuals to collate and analyse data, improve and accelerate business processes and communicate large amounts of information faster than by any other means, thus streamlining organisations and increasing productivity.

The effective implementation of IS can have a major positive impact, measured economically and otherwise, on companies and indirectly society, in the health, social science and research spheres to name a few. In this regard, IS has been successful in many organisational spheres worldwide. As just one example of the phenomenal scope and successes of IS,

organisations in both developed countries (DCs) and least developed countries (LDCs)¹ now use networked computer systems for enterprise wide financial systems that incorporate all processes of an organisation including training, communication and assessment of personnel, some separated by thousands of kilometres, to directly benefit customers.

However, in some areas there has been growing concern regarding the lack of economic and tangible benefits from IS investments and, by this definition, a high rate of IS failure (Briggs, Vreede, Nunamaker & Ralph, 2003). For instance, a Standish Group study found that more than half of the IS projects undertaken in the USA failed, either partially, completely, or were incomplete (Briggs et al., 2003). It is ironic that there is much scepticism of the benefits of IS and a high rate of failure in spite of the advances in the information technology realm. The phenomena should be of concern to researchers and practitioners because the success of IS is of vital importance to organisations, and on wider scale, the society. Hence IS success must be a topic of deep interest to IS researchers.

The literature is studded with a large body of work documenting the usefulness and consequences of IS. Yet there is little consensus among scholars and practitioners regarding IS success and the plethora of variables that influence it (Grover et al., 1996). The definition and perception of IS success, having many stakeholders, is multi-dimensional. Stakeholders

¹ LDCs are nations classified by the United Nations Development Programme (UNDP) as those without access to basic services such as health and education (Mundy, 1996) They constitute some 142 countries, with distinct differences derived from their levels, and processes of development.

include developers, users, management, governments, innovators and donor agencies. For instance, from a developer's perspective, a system completed on schedule within budget and consistent with standards and adherence to best practises may be deemed successful. Similarly, the user's perception would relate to the improvement of their performance with limited effort and resources. The multi-dimensional aspect of IS success and the complexity in addressing these dimensions is further elaborated by Seddon et al. (1998). Studies in this sphere, and particularly those in the LDCs, would increase the understanding of IS and contribute to knowledge. LDCs such as PNG can benefit from successful IS investments.

Computers have been utilised in many LDCs for decades in various capacities. For example, computers were introduced to PNG in the 1960s, not long after their introduction into other LDCs such as Iran, India and Morocco. Since then, there has been increased proliferation of IS in these countries and other LDCs, in most instances accelerated by donor countries and international aid agencies. Evidence of the impact of IS implementation as expounded by numerous authors can be seen in both the private and government organisations, for instance in the health, agricultural, banking spheres, and in government financing.

Empirical figures are scarce for the LDCs, however, available literature suggests that the failure of effective implementation of IS in LDCs is relatively high. This is of concern because IS can greatly improve efficiency in business and also non-commercial agencies, resulting in a wide range of benefits to the agency, its individuals and the public, or just measured in monetary gains.

Therefore, careful consideration of the issues impeding optimal implementation of IS is necessary in LDCs.

With the increased uptake of information technology (IT) including IS in PNG, studies in this domain are important in order to understand the impact of these technologies. However, with the paucity of IS research and data in PNG, little is known about IS in that country. The disparity in knowledge, experience and understanding can impede the decisions on how IS can be successfully adopted and managed in PNG organisations. Moreover, there are calls from numerous scholars for more work in this domain, particularly in understanding IS implementation and the elements that influence its success in organisations in LDCs. Hence, the overall question in this study was: **How can organisations in PNG successfully implement IS?**

A widely held view in the IS domain is that social contexts and organisational constraints impede IS success, particularly in LDCs (Higgo, 2003). However, the differences in environmental settings, such as in cultural, political, economic and social factors between DCs and LDCs, and the inherent impact of these forces on IS in the LDC organisations must be considered. Hence elements defined in one setting may not be appropriate to others in their disparate settings. These categories of independent variables should be seriously considered in IS success studies. Thus, a general research question that formed in light of the foregoing literature was: **What are the elements that influence the success of IS in PNG organisations?** The main factors preventing successful IS uptake and outcomes in PNG, and their relative importance, when identified and dealt with, may enable PNG to

overcome barriers and rather embrace the benefits of a modern computer-assisted society. A further question which developed was: **To what extent were the elements being dealt with to ensure IS success in PNG organisations?** Overcoming such barriers has indeed helped other LDCs in utilising IS optimally in various organisations. Other sub questions were developed that support and contribute to answering the main questions, including:

- How important are the elements for IS success in organisations?
- Do stakeholders differ in their perception of the importance of these elements?
- Do stakeholders differ in their perception of the extent to which IS success elements were addressed in organisations?
- What is the relationship between manager perceptions of the importance, and how effectively IS success elements are addressed in organisations?
- How do stakeholders attain IS related training and assistance in organisations?
- How successful is IS and what evaluative criteria are used to measure IS success in PNG organisations?

This exploratory study is as far as is known, the first attempt to provide insight into the IS domain within PNG social and organisational settings. Hence, findings in the study will lead to a better understanding of IS in PNG settings and contribute to knowledge. In addition, it can arouse debate and lead to further work in PNG and other LDCs.

1.1 Context of the Study

Despite the early introduction of computers and their rapid proliferation, little is known about the actual computer systems used in some LDCs, and the relative issues associated with IS implementation (Higgo, 2003). LDCs continue to rely on software and other technologies developed abroad in dissimilar environments, and implemented in disparate contextual settings that retard communication and further upgrades. The social, economic, political, and cultural context of the LDCs themselves may stifle the introduction and improvement of IS services.

The success of IS in bringing better productivity and economic gains, or other time-saving and useful processes to an organisation is certainly helped by the elements such as IT infrastructure, expert technical installation and management, planning and policy. However, the organisational features of IS are not the only predictors of IS success. A plethora of variables may influence the enthusiasm for uptake of information systems and success in organisations. Examples of the variables include economic and political settings, user beliefs and experience of IS, telecommunication infrastructure and the availability of IS professionals. Understanding these variables and the

barriers that impede IS effectiveness would better prepare organisations to overcome the inherent difficulties.

Although it is comparatively straightforward to identify factors that impede IS success and others that are key to success, they are context specific and somewhat subjective. Numerous studies have already been undertaken to understand these variables in both DCs and LDCs. Findings in this domain have been inconclusive and in some instances generalisation is difficult. Moreover, the majority of these investigations have been undertaken in DCs in the disparate social, economic, cultural and organisational settings disparate to that of LDCs. Hence, there is little consensus among scholars and practitioners on the elements that contribute to IS success.

The success factor approach is the main model implicitly applied in the IS success studies and has been one of the dominant approaches in IS research (Ives, Hamilton & Davis, 1980; Grover, Jeong & Segars, 1996). The success factor studies can model both user and organisational features to predict IS implementation outcomes. However, a major criticism is the inconsistency in IS elements. Nevertheless, the success factor identification and analysis is useful for this study.

The antecedents and criteria of IS success can be identified and measured at a number of dimensions. These dimensions include: cultural, environmental, structural and procedural, individual and organisational. Others have used national and technological levels. The model advanced by Ives et al. (1980) provides a useful framework for this study.

The unit of analysis for this study is the organisation information system. By evaluating IS, key issues pertaining to the domain of study can be investigated in the user, organisational, and external environments in the PNG context. Such research is useful and will enhance the understanding of IS and the way it is managed in PNG organisations. A research model depicting the research interest was developed as shown in Figure 1.1. The model posits that organisational, user and external environment elements influence IS success.

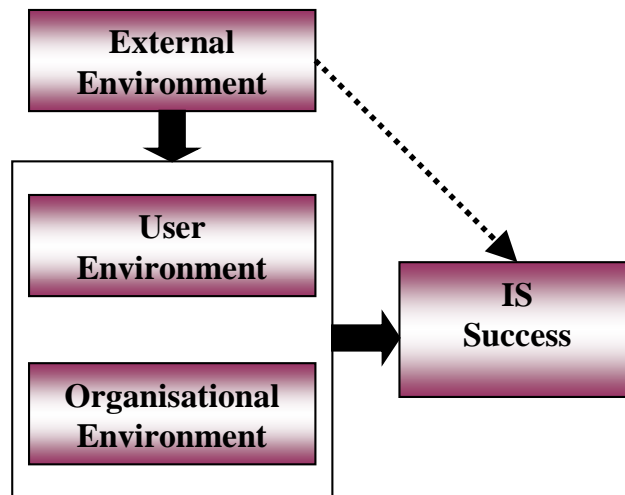


Figure 1.1: Research Framework

In this framework, user and organisational elements can collectively and/or individually influence IS success. External environment factors influence the organisation in which IS is implemented and can also directly contribute to IS success (as illustrated by the dotted lines). For example, the availability of IS professionals in the country can have an impact on the level of skilled IS staff in organisations.

1.2 Methodological Approach

The distinctive features of IS and the broad scope of the LDC environment provide challenges and opportunities for data collection. In this regard, it was imperative that implications, and the pitfalls of varying research approaches pertaining to IS studies with relevance to LDCs were illuminated and understood. Choosing the appropriate strategy of inquiry in this study required the consideration of impeding complexities, such as the context in which the study is conducted as well as forming a philosophical viewpoint.

The contextual differences between LDCs and DCs, and their implications for IS success have been highlighted in numerous studies. The growth and development of LDCs are impeded by a plethora of issues including political, economic and social instabilities, and by the inefficient infrastructure, which then contribute to a multitude of social and developmental issues, in turn affecting IS and its research. For example, compared to say Australia, a relatively high percentage of the PNG population cannot read, and for those who can, English is their 3rd or 4th language (Fleming, 2003; Bampton, 1998). Fleming (2003) and Bampton (1998) worked in PNG and observed the cultural and social impacts on IS education. They observed that students had difficulty in class participation and communication. This may be associated with their cultural upbringing. Such behaviour is also common in the workplace. Anonymous surveys in such situations are prone to inaccuracies. Similarly, in qualitative inquiries, communicating IS issues becomes difficult, particularly with participants not directly in the IS field.

In light of the foregoing discussions, it was prudent to consider the contextual implications when deciding on the appropriate research strategy for this study. For instance, Wiselker (1983) explains that Asian people are too polite to be negative to a foreigner, who “will always receive rose-tinted answers to their queries for fear of offending them” (p. 165). This is a characteristic close to collectivist society and similar to PNG settings. Thus, a research strategy for this study had to be developed that lent itself towards identifying, analysing, and making sense of critical empirical data to better understand the interplay between IS, organisations and context in PNG.

Bearing in mind the complexities of the settings and nuances of the participants, the case study approach was appropriate for this exploratory study. However, the case study-only approach was shortened due to circumstances described later in Chapter 3. Fortunately, with sufficient data, the first stage of the study became the springboard for a multi method approach where the results from the first exploratory approach guided and informed the development and implementation of Stage 2 of the research, a formal survey inquiry. Hence, a pragmatic and two-phase design approach as proposed by Creswell (1994) was adopted. Employing both qualitative and quantitative approaches in gathering data contributed to a comprehensive and more complete understanding of the phenomenon.

The Stage 1 study consists of multiple case studies of enterprises in PNG. In designing a research strategy, Marshall and Rossman (1999) state that multiple case studies, and multiple informants or triangulation greatly strengthen and enhance the study's usefulness. In addition, Yin (2003) and

Gable (1994) suggest that multiple case studies are robust and produce rich and useful data. However, Yin warns that extensive resources are required to engage in such studies. Although 20 organisations agreed to partake in this study, it was practical that eight were selected for the initial study using the sampling technique suggested by Creswell (1994) and Sarantakos (1993). Other factors that influenced the selection of case sites are discussed in Chapter 3.5.

Stage 2 of this study was a formal survey that enabled the consolidation of Stage 1 findings and generalisation from the perspective of a wider population. Results from the Stage 1 study contributed to the development of the survey instruments in Stage 2 (see Part II of Chapter 3).

1.3 Contribution to Knowledge

Despite the introduction of IS since the 1960s, there is no similar study on IS in PNG in this domain to the best of the author's knowledge apart from work by Sinebare (1999). Sinebare (1999) investigated the provision of private IT training in PNG. Sinebare's work is useful because it established a number of factors important to IS success. These factors include the availability of IS professionals and need for IS training and national policy direction.

This exploratory study revealed more than fifty elements that are contributors to IS success in PNG organisations. Four new elements were identified in this study and the rest were present in prior studies. The findings can be useful for investigating IS in other LDC settings. The outcome of the study is useful to managers, trainers, planners and researchers in both private and public sector

organisations in PNG and other LDCs. Experiences revealed can be useful to other LDCs with similar cultural, economic and political environments, such as the Pacific Island Nations (PINs).

A multitude of IS success studies have been conducted over the years. However, these studies have been concentrated in the DCs as compared to research activity in this domain in LDCs with dissimilar cultural, educational, organisational, political and economic conditions. This study focuses on individuals from a community with limited IS literacy and knowledge of computers. The individuals come from cultures that have diverse beliefs and values. Therefore, the study will also contribute to cross-cultural IS success studies from an LDC perspective.

1.4 Significance of the Study

This study is important because it will contribute to a broader understanding of IS implementation and the elements that influence its success in the context of LDCs, in particular PNG. It will also significantly contribute to IS research in PNG and the surrounding PINs. This pioneering study encourages insight, and injection into a domain that has until now been unexplored in PNG.

IS success factor studies have been dominant, however this study was important for PNG for the following reasons. First, the dissimilar political, social and economic settings between DCs and LDCs, and between LDCs themselves. Studies undertaken elsewhere may not be applicable in the PNG context. Second, attachments to national cultural and religious belief may

have varying influence on IS acceptance, implementation and success in varying settings.

1.5 Research Limitations

The study limitations are presented in detail in Chapter 7. 3 and these issues were evident prior to the study. The first limitation is the lack of literature on IS research in PNG. The second limitation is the limited case study time for each case, and availability of resources. The final limitation is that organisations in only two centres were investigated in Stage 1 study.

1.6 Thesis Structure

This thesis is structured as follows:

Chapter 2: In this Chapter, prior work from the literature relevant to the research domain is examined. A summary of the contextual settings in which IS is embedded and the appropriateness of the conditions are outlined. The understanding of IS success and its dimensions and the debate on the elements that contribute to IS success and the appropriate success criteria are discussed. Success models relevant to the domain of study are also outlined.

Chapter 3: In Chapter 3, the research strategy adopted for the study is described and discussed. The multi method study employs a case study method followed by a survey and is

described in 2 parts. Part I describes the case study strategy, design, case study protocol and good design principles. Validity and reliability issues, case selection criteria, are also presented. It illuminates the data collection techniques followed by discussions on data management and analysis. In Part II the survey and the analytical methods are described.

Chapter 4: This Chapter presents a cross analysis of the multiple case studies. Analysis of the data gathered for the case studies identifying the IS success elements are described and discussed. The elements are grouped into the user, organisational and external environments. New elements identified in this study are presented and discussed. Results show that organisational and external factors have a strong influence on IS in the organisations.

Chapter 5: In Chapter 5 the results of the Stage 2 study is presented and discussed. Descriptive analysis of the responses is initially presented. These include rank order of the mean scores of respondent perception of how important the elements are and how effectively they are addressed in organisations. Differences and relationships between various variables and between respondent categories are explored. The provision of IS training, assistance and

respondent perception of the IS success criteria in organisations are also discussed.

Chapter 6: Chapter 6 provides an analysis and discussions of the findings from the multi method study. The general status of IT in PNG is initially discussed. The key findings in this study are outlined and discussed and areas of relevant similarity between findings are explored. Results attained are compared with those of other similar studies identified in the literature.

Chapter 7: The final Chapter summarises the main findings of the study, and research questions. The set of principles proposed as an outcome of this study is outlined and discussed. The potential implications as well as the limitations of the study are also discussed. A set of recommendation is also outlined. Further areas of research directions that might be useful to build on this study are suggested.

1.7 Chapter Summary

The research problem investigated in the study was outlined in this Chapter. IS can be a useful instrument for organisations when successfully implemented. However, there are a plethora of issues that can influence its success, and how IS success is measured. Understanding these issues,

particularly in an LDC setting, are useful contributions to knowledge. The multi method approach employed in this study can answer the two main research questions advanced in the study. In doing so this study will contribute to an area that has until now been unexplored in PNG.

The research framework developed is a useful guide for this exploratory study. The framework is grounded in the model developed by Ives et al. (1980). In a similar vein the success factor identification and analysis provides a guideline to the multi method study.

The study is useful and will contribute to a better understanding of IS implementation and related issues in LDCs and to general knowledge in this domain.

A review of the literature of the research topic is presented in the next Chapter.

Chapter 2

Related Literature

2.0 Introduction

Chapter 1 presented an introduction to this thesis, highlighting the context of the study, the research problem and research strategy. The purpose of this Chapter is to provide an overview of the literature relevant to this research project. Available literature was sought to place the current study in context with regard to prior and ongoing research in related fields. It also illuminates the methods and data that are available from prior studies. The review also assists in pointing to the gaps and clarifying the research questions.

The Chapter is structured as follows. Section 2.1 discusses in particular the contextual settings in an LDC environment in which IS is embedded. In section 2.2, literature on IS success including IS implementation theory useful to this study is outlined and presented. The general scope of IS in PNG is presented in section 2.3. Attitudinal theories useful to establish user behaviour are discussed in sections 2.4 and 2.5. The Chapter concludes with a summary and brief observation of the literature.

2.1 IS in LDCs

2.1.1 Literature on IS in LDCs

There has been an increase in innovation and diffusion of IS, particularly for the LDCs in the last decade (Heeks, 2002; Jayasuriya, 1999; Al-Abdul-Gader, 1999). Indeed IS was introduced to some LDCs in the 1960s soon after it was first introduced into organisations in DCs in 1954. For instance, computer systems were first introduced to PNG in the late 1960s (Sinebare, 1998), not long after its introduction in Iran, India and Morocco (Heeks, 2002). For these economies, IS is seen as a tool that will enhance the developmental process, alleviate poverty, and reduce the gap between the DCs and LDCs.

IS can positively influence organisations and the way they do business. The usefulness and impact of IS has been widely discussed and is evident in many organisations. For instance, in PNG the impact of IS can be seen in the financial, revenue collection, health and education sectors. Thus, organisations in these countries are increasingly implementing IS with the belief that these technologies will bring about improved services by enhancing the business process, and ultimately increasing productivity.

However, LDCs rely on technologies transferred from the Western countries. The appropriateness of these technologies, and their usefulness in bringing about the essential changes for LDCs have been disputed by many scholars (see for example Heeks, 2001; Odedra et al., 1998). These technologies are often unsuitable, and costly to implement and maintain within the social, economic, political, and cultural context of the LDCs.

Most LDCs are debt riddled, and in terms of innovation and technology, most are passive adopters. In contrast, these capabilities are readily addressed and available in DCs where IS is modelled, designed and developed. DCs often fail to understand these disparities, particularly the environmental factors that influence IS success (Al-Abdul-Gader, 1999). In this regard, there is a far better chance of success if there is a fit between IS and the contextual setting in which it is embedded.

DCs and LDCs differ in the organisational and contextual settings in which IS is embedded. The literature is abound with studies relating to the contextual differences such as cultural, political, economic and social settings between DCs and LDCs, and the inherent impact of these forces on IS in the organisations (Odedra et al., 1998; Heeks, 2001; Montealegre, 1998; Madon, 1992). For instance, Madon and Lewis in Higgs (2003) stated that, "*the information system is influenced by both the organisational context in terms of its strategies, structures, politics and culture, and by the wider political socio-economic, cultural, and technological climate within which organisations exist*" (p.2). Palvia (1998) concluded that these categories of independent variables should be seriously considered in IS success studies. An understanding of the context in which IS is embedded is important and must be seriously considered because environmental forces influence the success or failure of IS (Enns & Huff, 1999; Palvia, 1998).

While the external environment forces are just as significant for DCs as LDCs, these forces are increasingly evident for LDCs due to the inherent political, social and economic difficulties.

Although LDCs are faced with similar contextual issues, diversity within each country does not allow for a uniform analysis, thus, results from studies in a particular environment are not necessarily applicable in other similar settings. However, what appears to be quite common among LDCs is that contextual conditions are not conclusive for IS growth in most instances.

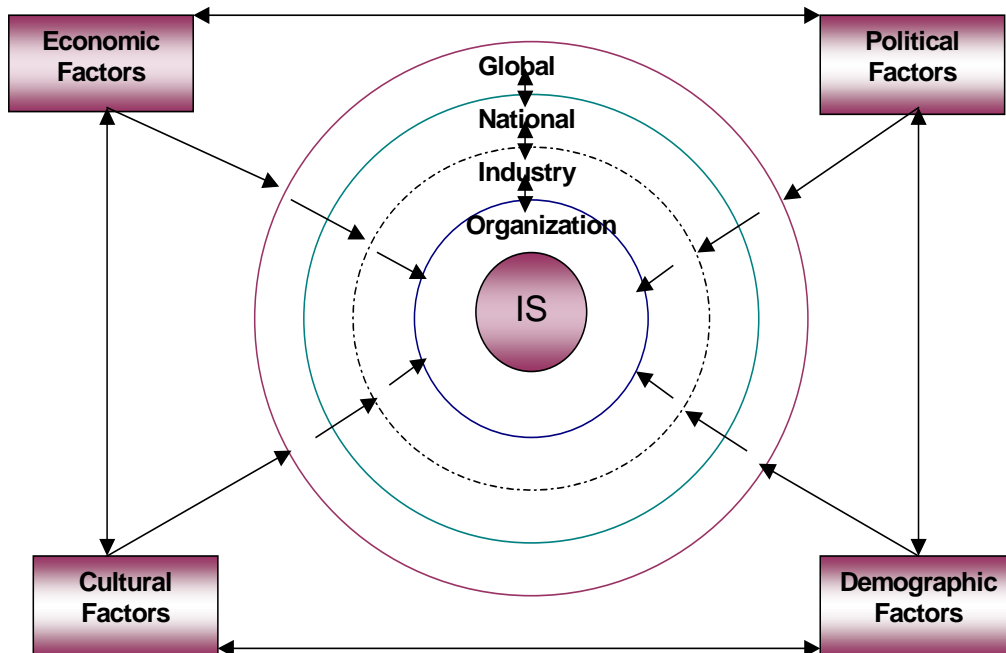


Figure 2.1: Environmental Analysis Framework (Austin, 1990)

This study adopts the modified version of the environmental model advanced by Austin (1990) (see Figure 2.1) as a framework to analyse the environmental settings. The model depicts the contextual settings in LDCs and illustrates the interplay of the cultural, political, economic and demographic factors. The major factors are described in the following sections.

2.1.1.1 Economic Factors

The majority of the LDC economies are agriculturally based. The growth in relation to the economy in these countries is relatively slow, and is impeded by the limited capabilities such as that in human resource, IT infrastructure, policy and legal framework (Al-Abdul-Gader, 1999). It is also impeded by political and social instabilities. A 2001 United Nations Development Program [UNDP, 2001] report on PNG suggested a 3.3 percent growth rate in the economy between 1985 and 2001. This rate is slow compared to that of the newly industrialised economies (NIEs) in South East Asia. The report also stated that activity outside the mining and petroleum sector has remained stagnated, and an increased crime rate is having a pervasively negative impact on development in PNG (UNDP, 2001).

One of the key ingredients for IS growth is a sound economic framework. (Vinig, Blocq, Braafhart & Laufer, 1998). South East Asian economies have, in the main, adopted policies favouring market-based competition, privatisation, liberalisation and the development of a strong private sector. The governments in these countries focused on providing incentives for building infrastructure and actively competing for foreign investors (see summary in Table 2.1). For instance, India embarked on a neo-liberal approach to development and adopted a mixed economy with state directed planning, resulting in high gains in India's IT industry.

DCs like the USA, Canada, Australia and the UK encouraged the privatisation of state owned institutions, liberalising their market. Similarly, South East

Asian countries have adopted the same principles to develop their market economy by encouraging low labour cost, expanding markets and building a strong manufacturing industry. These strategies are beneficial to economic growth and a competitive industry.

Have these factors that promote IS been addressed in the respective countries?	Country Classification		
	Developed Countries	Newly Industrialised Economies	Least Developed Countries
Liberalized unregulated market	Yes	Yes	No
Political and economic stability	Yes	No	No
Telecommunication Infrastructure	Yes	No*	No
IS research and development	Yes	Yes	No
Primary and secondary IS education	Yes	No*	No
Software and hardware industry	Yes	Yes	No
IT export	Yes	Yes	No
Manufacturing Industry	Yes	Yes	No
* Rapidly developing			
DC	Developed economies (Australia, USA, England)		
NIE	Newly industrialised countries (Singapore, Malaysia)		
LDC	Least developed countries (PNG, Fiji, Solomon Island)		

Table 2.1: Significant Factors for Promoting IT Industry

PNG is struggling to come to terms with the provision of an economic strategy for the IT industry. Nevertheless, initiatives have been taken to boost the IT industry. One of the initiatives was to liberalise the telecommunication sector (Waieng, 2000). The telecommunications network in PNG is owned by the government and operated by its statutory body, Telikom, the country's sole telecommunication carrier.

In the late 1990s, the then Mekere Government advanced the concept of market liberalisation by proposing and advocating the privatisation of most state-owned institutions. Privatisation was seen by the government, donor agencies and foreign governments as an option to restore financial credibility to state-owned enterprises (UNDP, 2001). In 2000, Waieng, then a national minister responsible for telecommunication in the Mekere Government stated that new laws were being drafted to remove the monopoly currently enjoyed by state-run institutions like Telikom. In 2002, Telikom, the only carrier in PNG was sold to a Fijian based company in partnership with a PNG based foreign owned private company. This aroused substantial public reaction, resulting in the “contract of sale” being revoked by a following government.² There are similar cases in newly industrialised countries like Singapore, Malaysia, and even DCs such as France.

A summary of issues relating to the IT industry in the DC, NIE and LDCs is presented in Table 2.1 and summarised in section 2.1.2. The characteristics of a conducive environment for the IT industry as highlighted in the foregoing discussions are:

- An unregulated market-based economy with social and political stability is necessary for the growth of IT in any country. This is evident for example in Singapore and Malaysia. The market in LDCs is small thus most often multinational organisations hesitate to invest.

² The debate on the sale of Telikom, the national carrier has been an ongoing issues for political, unions, nongovernmental organisations, statutory bodies and legal teams. <http://www.thenational.com.pg/1109/nation4.htm>, <http://www.telikompng.com.pg/>. Recently Telikom was sold to Econet, a Zimbabwe based company. This decision was again made void by the cabinet in the 2004 Somare Government.

- DCs seem to satisfy all the factors that promote IT industry growth. The growth is not only in technology and economy but also in intellectuals, a necessary resource for the information society.
- IT and telecommunication infrastructure is by far the least developed in most LDCs, which appears to be a major setback in IT industry growth.
- NIEs like Singapore, Malaysia and Korea liberalised their institutions in order to foster a competitive market economy. This would then globalise the economy and bring in foreign investment. However many people in the rural areas do not even own a phone indicating an expanding gap between the haves and have-nots in both NIEs and LDCs.
- In LDCs such as PNG, Fiji and Botswana, there is a government monopoly in telecommunication and other institutions. It also indicates that there is political and economic instability contributing to the slow growth in the IT industry.
- Finally, hardware and software industries are nonexistent in many LDCs. Thus externally designed and developed technologies pertaining to IT including IS are imported from external vendors. Hence Information System personnel assume the role of software maintenance team.

Strategies, whether socio-economic or technological, modelled and applied in one country may not be necessarily applicable to another. Each setting is unique and therefore, appropriate strategies need to be developed for each setting. Managers must heed the intervening factors such as the cultural and law and order factors, which are common impediments to IS strategy amongst the LDCs. Nevertheless, the foregoing issues when properly addressed can promote and propel not only IT, but also the well being of the country.

2.1.1.2 Cultural Factors

The transfer and utilisation of technology can be influenced by the culture in which it is adopted (Hassan & Dista, 1999; Harris & Davison, 1999; Dirksen, 2001). In this regard, Hassan and Dista (1999) concluded that problems may arise not because of technology, but in most cases, because of differences between the designer of IS and the cultural environment in which it is adopted. Hence, an understanding and analysis of the cultural factors are important for IS studies.

Culture is something that is perceived and felt, hence cannot be precisely defined (Olutimayin, 2002). Bodley (1994) used the term culture to refer collectively to a society and its way of life. Hofstede's (1983) approach defined national culture as a 'collective programming of the mind which distinguishes the members of one group from those of another' (p.23). In this context, culture deals with a collective way of thinking by a group of people.

By far the majority of IS research concerned with national culture on various

aspects of development, implementation and management of IT have relied on the model advanced by Hofstede (1983). In a recent survey of the four popular IS journals, Myers and Tan (2002) found over 160 papers referenced Hofstede's work, highlighting its popularity. However, Hofstede's model has been criticized for lacking conceptual validity, making sweeping generalisations about the dominant culture (Hess, 2001), and failing to acknowledge the cultural diversity in each country and society (Myers & Tan, 2002). It was argued that within each nation there are tribes, clans and linguistic and customary differences. Examples include PNG with more than 800 languages and diverse cultural beliefs and values. Similarly, Nigeria is a diverse society with over 300 ethnic groups and as many languages. A further example for Pacific Island Nations is Fiji, where two major ethnic groups constitute the population -- the indigenous Fijians and the Indo-Fijians with different cultural orientations (Lodhia, 2002).

Despite the reservations, Hofstede's approach is useful as exemplified by its wide acceptance. This study relies on Hofstede's (1983) model to describe the cultural orientation in PNG. Hence, the four main classifications are:

- Individualism/Collectivism: Individualist societies have loosely knit social structures where individualistic approaches are encouraged. Collectivist societies prefer tightly knit social frameworks where in-group ideals take precedence.
- Large/Small Power Distance: This measures the extent to which the

members of a society accept that power is distributed unequally. Large Power Distance has a hierarchical order in which everyone has a place with no justification. Small Power Distance societies strive for power equalisation.

- **Strong/Weak Uncertainty Avoidance:** This measures the degree to which members of societies feel uncomfortable with uncertainty and ambiguity. Strong Uncertainty Avoidance societies are less tolerant to deviant ideas and maintain rigid codes. Weak Uncertainty Avoidance societies are more tolerant to deviance and are open to new ideas.
- **Masculinity/Femininity:** Masculine society prefers achievements, heroism assertiveness, and materialism and is less caring with an individualistic approach. Femininity emphasises relationship, modesty and quality of life.

Each society arrives at its answers as a consequence of these fundamental dimensions, which represent the common element of structure in the cultural system of the country. PNG scores closer to a collectivist culture with an egalitarian social structure as summarised in Table 2.2 (Kavanamur, 2002).

2.1.1.3 Political Factors

Political and social stability is a crucial factor affecting IS diffusion in LDCs (Montealegre, 1989; Javanpaa & Leidner, 1998). The common characteristic

of the political environment in most LDCs is that of volatility, and instability and upheavals, as exemplified by the recent political turmoil in the PINs. The dynamic nature of the political environment in LDCs and in particular the PINs is best illustrated by the recent turmoil in some countries in the region. For example, the recurring political coups in Fiji, ethnic clashes in the Solomon Islands, and in PNG, the attempted changes of a democratically elected government after 18 months in office.

According to the UNDP (2001) report on PNG, no government since independence has survived its full five-year term and most governments were changed by vote of no confidence in the Prime Minister. These matters project an atmosphere of political uncertainty, characterised by interference with planning and often leading to bureaucratic bottlenecks. Political instability contributes to policy instability, loss of investor confidence, social upheavals, and increasing law and order problems (UNDP, 2001); thus, undesirably projecting a negative impact on both the government and private sector organisations in the country. For example, the telecommunication services in PNG were often sabotaged and disrupted as criminal elements dismantled repeater stations and severed communication lines.

Furthermore, most state-owned enterprises are technically insolvent, and this is largely attributed to political intervention and nepotism, a culturally oriented informal system commonly described in PNG as 'wantokism'. Wantokism means 'nepotism' in Pidgin-English³. Employment of 'wantoks' in positions is

³ Pidgin-English, one of the three national languages, is a common dialect spoken throughout the country.

a common practice in the public sector. 'Wantoks' means 'relative' in Pidgin-English. The 'wantokism' is a cultural notion in a collectivist society where the kin or clan takes precedence over oneself and other non-relatives. While once a norm in a collectivist society to commune in an extended family, the practice has been allowed to erode the formal system. In this regard, the informal system is stronger than the formal system, usually the case in many LDCs (Higgo, 2003).

PNG is composed of numerous ethnic and tribal groups with diverse cultural backgrounds. The tribal system is in continuous conflict with the formal system. Decision making along the formal procedures are hardly adhered to as managers are obligated to prioritise attending to their 'wantoks' needs, a direct conflict with the formal systems. Similarly, heads of government and statutory bodies are frequently replaced, in most cases as a means to meet political ends. For instance, the high turnover rate of managers in the public sector often results in the lack of continuity in public policy formulation and execution (Kavanamur, 2002).

2.1.3.1 National IS Policy Framework

Public policies are described as a set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them. This is done within a specified situation where these decisions should in principle be in the power of these actors to achieve (Burger, 1993). Information policy is a broad concept that encompasses a set of public sector laws, regulations and policies that have an impact on

information flow (Grieves, 1998; Cornella, 1998). By this definition, national information policies are crucial and amplify the significance of information in today's information driven society. Information policy provides a broad framework within which the wide range of information-related activities undertaken by public and private industry can be reconciled. Hence, cooperation and coordination is necessary for the national focus between organisations, central and local governments, the associations of information users, professionals and the information industry both in the private and public sector (Gray, 1988).

In his discussions, Sinebare (2000) contends that LDCs be classified based on the existence accorded to their information policy. According to him, the criteria are: *non-existent information policy*, *implicit information policy* and *explicit information policy*. Al-Abdul-Gader (1999) suggests that few could be classified as *non-existent*. Most LDCs have at least attempted to, and in some instances successfully, identified and developed their national IT policy and strategic framework. For those who have these policies, IT has been a catalyst for national growth. For instance, Singapore adopted its national strategy in 1980, Taiwan in 1980, and India in 1984. Countries such as Korea and Singapore have an explicit information policy where the government plays an active role. However, in countries where governments are active participants in IT, they seem to have an implicit information policy. These countries include Malaysia, Sri Lanka, India and Pakistan. They work under the auspices of government organisations such as the IT Council of Sri Lanka or Department of Electronics in India (Sinebare, 2000).

Papua New Guinea is categorised as having an implicit information policy with the government taking a participative role (Sinebare, 2000). At the national level, the government established an Information Technology Board within the Department of Personnel Management. An Information Technology Board Working Group was established to, among other things, create awareness and understanding of IT among government organisations, develop a national policy, improve inter-department coordination and sharing of information, and capacity building in the public sector (UNDP, 2001). The UNDP's work in this area in providing experts in building awareness at the high government levels and expertise in the formulation of a national policy is commendable. However, the progress in this direction is slow. A recent study by the United Nations Education and Science Corporation Organisation [UNESCO] (2002) revealed that the majority of the 15 PINs do not have any IT policies in place.

National policy and planning are key ingredients for IS in the country. IS implementation in most developing countries has been sporadic and on an ad hoc basis epitomizing the lack of policy framework and direction. The current state of the IS industry in many LDCs, and in particular PNG, may be attributed to the policy and planning strategies and the approach taken by the national government. The literature is studded with useful material emphasising the significance of policy and planning. PNG can learn from the experiences of other countries such as India, Malaysia and Singapore. A serious effort is urgently required at the national level for PNG. Additionally, the development of IS policy and strategic plans at the organisation level can address issues such as human resources and funding.

Northfield (1999) stated that the country's responses to the challenges of policy are conditional and influenced by the contextual environments and the level of infrastructure in the country. Hence, extrapolation and adoption of models from one country to another is not viable and traditional policy application will not be adequate or appropriate in the emerging environment.

These policies are not independent, but are linked to a broader national policy framework and vary from country to country (Northfield, 1999). For example, the USA's policy was linked with the social objectives of education and health. Singapore linked its policy to long-term government planning and a direct link between economic, industry and IS development. Another example is Malaysia, who linked its IT policy to the economic development plans.

With the constant threats of political instability and subsequent lack of political will and direction, there has not been any real comprehensive IS policy guideline in place to take on this responsibility in PNG. Successive governments at the national level were not providing the direction necessary to drive the IT industry in the country. In a similar vein, social and sound economic conditions were necessary to sustain IS growth.

2.1.1.4 Demographic Factors

2.1.1.4.1 General factors

The analysis and results of demographic indicators in the LDCs are imperative and negatively skewed. Examples of these include: high rate of mortality and illiteracy, increase in population, and vulnerability to natural disasters. Poverty

and the recent revelations of increased HIV contractions are alarming because these issues will have some impact on human resources in these countries.

2.1.1.4.2 Characteristics of the country of study - PNG

PNG is an island nation north of Australia from which it became independent in 1975. It is a parliamentary democracy with a single legislature, the National Parliament, through elected members. Elections are held every 5 years for the 109 seats: 20 regional and 89 open electorates. It is an LDC with a small but slowly developing IT industry and relies on technology imported from other countries. PNG has cultural norms that are different to other countries. Like most other LDCs, PNG's unstable political environment is one of the major hindrances to economic growth.

Of its 5.2 million people, 85% live in rural areas. Overall there is a population density of 8 persons per square kilometer with an annual population growth rate estimated at 2.4 percent. PNG has more languages (over 800) than any other country in the world, with the possible exception of India. The official language is English with Pidgin and Hiri Motu being used widely as *lingua franca* to facilitate communication among people of diverse linguistic backgrounds.

2.1.2 Summary of LDC environment

The model by Austin (1990) as illustrated in Figure 2.1 shows that all four factors are interrelated and to some extent influence each other. For example, political stability is associated with a strong economy as illustrated in Table

2.2. Table 2.2 presents a summary of the foregoing discussions on the environment in which IS is implemented.

Environmental Factors	PNG (LDC)	Developed Countries
A. Economic factors		
Labour (IS Professionals)	scarce	abundant
Agricultural/Industrial Capital	agricultural	industrial
GNP	<US\$744	>US\$15,000
Inflation	high	low
Infrastructure		
National Information Infrastructure	weak	strong
Technology		
Flow	recipient	donor
Availability	scarce	abundant
B. Political Factors		
Instability	high	low
Institutions	weak	strong
C. Work culture		
Creative potential	limited	unlimited
Time perspective	past and present	future-oriented
Time units of action	short term	long term
Success orientation	moralism	pragmatism
Environment	context dependent	context independent
People orientation	paternalistic	participative

Table 2.2: Summary Comparing Environmental Factors between PNG and DCs ⁴

The LDC environment is characterised by political instability and weak institutional structure, weak agriculturally based economies, and demographic and work cultures that are influenced by a collectivist cultural orientation. Hence, the adoption of IS and management models and practices developed

⁴ Derived from interpretation by Kavanamur (2002) of factors identified by Hofstede, (1997).

elsewhere may not necessarily be appropriate, even though it may have been successful elsewhere. The discussions on IS environments presented in Table 2.1 is in congruence with the summary in Table 2.2.

Table 2.3 is a summary of selected literature on IS studies and key findings.

Reference	Method	Level of Analysis	Key Findings
Arweg and Erwin (1999)	Survey	DSS	CSF – Top Management Support, User Training, Perceived Utility
Enns and Huff (1999)	Case Study	Infrastructure	Political, Economic, Culture, Inter organisation factors impact IT implementation success
Higgo (2003)	Case Study	Implementation	Contextual Issues
Jain (1997a)	Case Study	Implementation	Human Resources Organisation Structure, Culture
Jayasuriya (1999)	Case Study	Health Information System	IS Structure, Human Resources & Management in LDC
Madon (1992)	Case Study	IS	IS training, Management Leadership
Montealegre (1999)	Case Study	IS	Socio-political, Economic, Cultural, Human Resources

Table 2.3: Summary of Relevant IS Studies in LDCs

2.1.3 Relevance of the Literature on IS in LDCs

PNG, the country of choice for this study, as an LDC is faced with a diverse set of issues that impede development, particularly in IS implementation. The implementation of IS and its management is influenced by the social and organisational settings in which it is embedded. Negative social and economic

settings are major impediments to development. Yet the uptake of IS and other technologies has proliferated over the last decade, and in most instances involved the implementation of models developed elsewhere. The adoption of Austin's (1990) environmental model provides a framework for the analysis of the LDC environment. Discussions on the major factors in the framework illuminate the underlying socio-economic environment. Similarly, the model advanced by Hofstede (1983) is useful in analysing the cultural orientation of the stakeholders and the environment in which IS was embedded. By contrasting the DC and LDC environments, this literature illuminates the extent of the differences between these settings. In light of this literature, highlighting the characteristics of LDCs is necessary in order to position this study.

2.2 Information Systems Success

2.2.1 Literature on Information Systems Success

2.2.1.1 IS Success Studies

IS success studies have attracted much attention in the last two decades as IS is widely being utilised at various levels (Li, 1997; Delone & McLean, 1992). The popularity of IS success studies can be attributed to two main factors: firstly, the growing appreciation of the vital role of IS in organisations and understanding of the issues involved in the assessment of the effectiveness of IS; secondly, organisation dependency upon IS.

The recent spurt of writings and research pertaining to IS effectiveness has not yet resulted in the formulation of a universally accepted approach or

methodology for the assessment of IS effectiveness. Despite the plethora of IS studies there is little agreement among these studies (Garrity & Sanders, 1998; Myers et al., 1998). IS research has advocated a perplexing variety of conceptual schemes, analytical points of departure and models for approaching the study of IS effectiveness.

The literature abounds with discussions on effectiveness related to behavioural measures drawing on theoretical frameworks from other disciplines such as social psychology. Similarly, numerous researchers in the IS domain have drawn on work from organisational theories such as that of organisational effectiveness (Grover et al., 1996; Seddon, Staples, Patnayakuni & Bowtell, 1999). These studies have illuminated a multitude of issues and differing perspectives among researchers and practitioners as to what constitutes success, how it is best measured, and the appropriate methods to study this phenomena (Garrity & Sanders, 1998; Grover et al., 1996; Seddon et al., 1999; Myers et al., 1998). While a plethora of approaches have been developed for the study and measure of IS success, what exactly is meant by IS success is still unclear in the IS discipline.

The *Oxford English Dictionary*⁵ defines effectiveness as “*producing a desired or intended result*”, and success as “*the accomplishment of an aim or purpose*”. IS effectiveness then, can be defined as the extent to which a system, given certain resources and means, achieves the goals for which it was designed. In other words, IS success should be evaluated according to the degree to which the original objectives of a system are accomplished

⁵ http://www.askoxford.com/concise_oed/success?view=uk

within the available resources. However, different stakeholders in an organisation may validly come to different definitions and conclusions about the success of the same information system (Briggs et al., 2003; Seddon, 1997). Hence, Seddon (1997) concluded that *“IS success is thus conceptualized as a value judgment made by an individual, from the point of some stakeholder”* (p.248).

Even though success continues to be recognized as central to both theoretical development and the practical applications of information systems, the elements that influence its success in the different settings are not fully understood. Hence, IS success studies are important to illuminate and understand these elements, particularly for LDCs.

2.2.1.2 Framework for IS Studies

Various approaches have been taken over the years to study and classify IS research. One of the works most referred to in defining the IS dimensions is that of Ives et al. (1980). Their conceptual framework provides a synthesis of the insights of early work while accommodating criticisms of this body of knowledge. They posit five environments and four processes to find conformity and legitimacy in IS studies as presented in Table 2.4. The five environments are: external, organisational, user, system development, and system operation. The processes are: developmental process, operational process, user process and IS applications.

Development, operation and use are enclosed in the organisational environment.

Environments	Description
Ives et al. (1980)	
External	The resources and constraints that affect IT systems from sources outside the organisation. Social, political, cultural and economic issues.
Organisational	The organisational resources and constraints that influence IT systems. Organisational culture, goals, tasks, structure, and management philosophy and style.
User	The immediate environment surrounding users of IT systems. It is marked by user characteristics, user peers and user tasks.
System development	IS development, methodology case tool, skills and management.
Operation	Hardware and software operational skills.

Table 2.4: Dimensions of IS Studies derived from Ives et al. (1980).

Other scholars have based their work on the same model by Ives et al. (1980). For example, Lyytinen (1987) classified the approaches as: IS architecture, information need, socio-technical, evaluation, and success factors.

In a similar vein, the study of IS success has been characterised by disagreement and lack of conformity. The model advanced by Grover et al. (1996) is useful for this study. Grover and his colleagues categorised the studies devoted to the measurement of IS effectiveness into four distinctive research streams:

- *Criteria demonstration*: theoretical development and justification of criteria,

- *Measurement*: evaluation and statistical development of effectiveness measures,
- *Criteria relationship*: linking effectiveness criteria, and
- *Antecedent of IS effectiveness*: theoretical and statistical determination of antecedents to IS success.

The study on antecedents of IS effectiveness mainly focuses on the determinants of IS effectiveness, rather than the criteria themselves. It is argued that if practitioners are aware of the factors *“and address them during implementation, the system is more likely to succeed”* (Larsen & Myers, 1999, p.397). However, these approaches have been criticised for varying reasons. For example, the approaches view implementation as a static phenomenon and ignore factors that can have varying levels of importance at various levels of implementation. Other criticisms include the inconsistency in defining success factors, and the approaches being based on an underlying mechanistic view of IS. Furthermore, IS success is evaluated and compared from perspectives of different groups and individuals. The distinction among them must be clearly made and consistently adhered to. Different frames of references cannot be seen interchangeably. IS success from the point of view of the organisation is not identical or corresponding to views from other entities, such as members or communities. This point is saliently discussed in Seddon et al. (1998).

The study of IS success is difficult and inconclusive because of the multi-dimensional construct and the multiple perceptions from different evaluators (Bajwa, Rai & Brennan, 1998). Furthermore, IS utilisation and success is subjective to temporality and interpretation of various stakeholders. As an example, Larsen and Myers (1999) investigated a financial institution's Business Process Reengineering project in New Zealand and observed that IS implementation is a dynamic process and success is subjective to temporal and stakeholder perception. It was concluded that success is a moving target dependant on time. Furthermore, these factors may be differentiated between DCs and LDCs as a consequence of their social, organisational and cultural settings.

Nevertheless, studies on the antecedents of IS success have flourished over the years and contributed to the IS domain. Grover et al.'s framework, in particular, the research stream on the antecedents of IS success, is useful for this study.

2.2.1.3 Analysis and Classification of IS Success Factors

Researchers have adapted varying approaches to the analysis and classification of the IS success factors. For example, Delone and McLean (1992) suggested three levels of analysis: process, organisational and individual. Other approaches to categorisation have included that of Ein-Dor, Segev and Orgad (1993), who in their review of international and cross-cultural studies classified contributing factors as: cultural, environmental, structural and procedural. Odedra-Straub (1993) identified various factors

contributing to failure (and success) by reviewing a number of case studies and classifying the levels as national and organisational. Similarly, Markus and Robey (1988) used the levels of individual, organisational and society for their analysis.

Other categories include that of Woherem (1992) in Al-Abdul-Gader (1999), who in studying IT barriers in several LDCs adopted three categories: operational, contextual and strategic. Ang et al. (2001), in a recent study investigated the impact of IT on Total Quality Management in public organisations in Malaysia by measuring the extent of IT use at a macro level. The objective of that study was to determine if public sector organisations with differing levels of IT usage have different factors that facilitate or inhibit IT use. They categorised success factors into organisational, technological and external dimensions. The results indicated that organisational and technological factors have a strong influence on IT utilisation. In a similar environment, Jain (1997a) conducted a case study on IS implementation in five South East Asian countries and identified organisational factors that contribute to IS success in the context of LDCs. In a similar vein Al-Abdul-Gader (1999) operationalized the IS model advanced by Ives et al. (1980) previously discussed in section 2.2.1.2 in this Chapter.

Hence, it seems that IS research has been non-cumulative and is yet to find consensus about an overarching framework regarding the context in which effectiveness criteria are applied. Nevertheless, by using these models, a multitude of factors have been identified and analysed. For example, in his study on IT diffusion in five Gulf nations, Al-Abdul-Gader (1999) identified 40

barriers that were perceived to inhibit IT diffusion success in African Gulf Countries, congruent with findings from other LDC studies. Similarly, Jain's (1997a) study revealed several organisational factors that contribute to IS success. Li (1997) revealed five new factors additional to the 39 identified by Bailey and Pearson (1983). Miller and Doyle (1987) collated 38 factors derived from prior studies, including 24 from Bailey and Pearson (1983).

The study by Bailey and Pearson appears to receive the most attention (Ives, Olson and Barourdi, 1983) and has been widely adopted. However, in the view of at least one critic (Li, 1997), Bailey and Pearson's original study only focused on the user environment aspect. The questionnaire in that study was designed to elicit respondent perceptions at the user level, thus overlooking the organisational, environmental and social settings. Over the years other researchers identified additional factors initially overlooked by Bailey and Pearson. Li (1997) for example extended their work by identifying an additional five factors. Li's work is based on the context of North American settings.

The significant omissions from the studies in North America (see for example Bailey & Pearson, 1983; Li, 1997; Delone & McLean, 1992; Montazemi, 1988) are the external environment elements. For instance, socio-economic, political, and IT infrastructure were not considered in these studies. It is commonly known that IS is influenced by the contextual settings in which it is embedded. It is also common knowledge that these conditions differ between DC and LDCs. Factors such as the cultural elements that are often predominant in LDCs (Heeks, 2002; Al-Abdul-Gader, 1999) were omitted in

these studies. Hence it is prudent that these elements are investigated and analysed since they influence the way organisations function.

A summary of the literature and the categories that were analysed is set out in Table 2.5.

Reference	Categories of Analysis
Al-Abdul-Gader (1999)	Environments: User, Organisational, External Processes
Ang et al. (2001)	Organisational, technological and external
Delone and McLean (1992)	Process, Organisational and Individual
Ein-Dor, Segev, and Orgad (1993)	Cultural, Environmental, Structural and Procedural
Jain (1997a)	Organisational
Markus and Robey (1988)	Individual, Organisational and Society
Odedra-Straub (1993)	National and Organisational
Woheren (1992)	Operational, Contextual and Strategic

Table 2.5: Summary of Levels of Study and Classification of Factors

2.2.1.4 The Measure of IS Success

IS success can be measured at a number of levels as discussed earlier in this Chapter. For example, several studies suggest three major levels: systems and process, individual, and organisational levels (Garrity & Sanders, 1998). Similarly, numerous criteria have been employed with varying degrees of success. These criteria include: cost-benefit analysis, usage behaviour, process, and investment returns. However, traditional investment analysis techniques and criteria such as cost-benefit analysis, return on investment, or payback period may not be suitable for IS success measures because of the

unique nature of IS investment. Instead, subjective judgement and surrogate measures supplement such evaluation (Saarinen, 1996).

The paper by Delone and McLean (1992) is regarded as one of the most significant on the debate of IS success measure. Their work was an effort to put in perspective and find some commonality and theoretical basis from the multitude of IS success studies at that time. They reviewed over 100 articles, and the outcome of that study was the classification of the existing measures into six dimensions (see Figure 2.2): Systems Quality (success of IS itself); Information Quality (measure of IS output); Information Use (user output use); User Satisfaction (responses to use of IS output); Individual Impact (effect of information on user); and Organisation Impact (effect of information on organisation). Thus, it can be inferred that success comprises these six interrelated dimensions.

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Figure 2.2: Information Systems Success Model (Delone & McLean, 1992)

Numerous studies have modified or extended the Delone and McLean model. For example, Myers et al. (1998) extended the Delone and McLean model to include IS impact on groups, and the subsequent impact on organisations by

the groups. Others, including Seddon (1998), criticised the same model for looking at a single criteria in measuring IS success. Debate in this area is ongoing. Nevertheless, the model is widely accepted, thus useful to understand IS implementation in this study.

Success of IS is not a straightforward concept. A better measure of IS success would be some weighted average of many variables such as use, user satisfaction, performance and profitability. The use of multiple categories is necessary because a single dimensional measure does not cover the varying aspects of the organisation. Multiple measures of IS success are required because there are no absolute perceptual measures of IS success across varying technological and organisational contexts. Satisfaction with a wider variety of heterogeneous behaviour should be acknowledged. The multiple application criteria is justified by the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), which postulates observation of heterogeneous behaviours of a target. The resulting measure may be called a multiple act criteria.

2.2.1.4.1 IS Utilisation

The question of IS effectiveness has been of central concern to the IS fraternity for a long period. Lucas (1978) in tracing the stream of research argued that system use was the most satisfactory indicator. Measuring performance through other criteria such as cost-benefit analysis was difficult as discussed earlier. Also, Delone and McLean (1992) suggested that effective IS use was a satisfactory surrogate for measuring IS effectiveness.

However, given that there are two types of use, voluntary and non-voluntary, system use as an indicator may lead to some implications. For example, Delone and McLean's model is effective when use is voluntary. Goodhue and Thompson (1995) reaffirm this notion and suggested that their Technology Task Fit model can be utilised in both voluntary and non-voluntary use situations. In that model, use of the system eventuates only when there is fit between task and technology. The difficulty with this belief is that the models do not consider the intervening factors that influence the completion of the task. These intervening factors include, the nature of the task and user needs. The tasks may be completed partially using technology to compensate for the lack of system features to suit the task. Furthermore, even if the tasks and technology fit, contextual factors must also be considered.

The two popular points of view held in measuring IS utilisation are: objective and subjective measurements. IS can be measured by actually monitoring the actual use by the number of login times, length of login, number of systems utilised or records updated (Amoroso & Cheney, 1991; Robey & Rodriguez-Dias, 1989). Conversely, subjective measures allow users to estimate their own or their peers' usage of a particular system. Four indicators commonly applied to measure IS usage are: (1) actual daily use of the system, (2) frequency of use, (3) the number of packages, and (4) the number of tasks the system is used for. Using multiple acts to measure behaviour is supported by Fishbein and Ajzen (1975) and validated by several studies including Anakwe et al. (1999), and Igbaria, Guimaraes and Davis (1995).

The study by Baroudi, Olson and Ives (1986)⁶ concluded that usage stimulates satisfaction. Work by Bailey and Pearson (1983) which identified 39 IS user satisfaction factors has been useful and popular among IS researchers. Doll and Torkzadeh (1988) in a subsequent study used the Bailey and Pearson instrument to derive a 12-item instrument to measure IS success for a specific application in a microcomputer environment. In their respective studies, Bailey and Pearson investigated the mainframe computing environment, while Doll and Torkzadeh (1988) studied specific applications in a PC workstation environment. It seems that their instrument may not be suitable for a heterogeneous environment. Harrison and Rainer (1996) however argue that Doll and Torkzadeh's methodology can be used to measure IS success using end user satisfaction as a surrogate in a PC oriented environment and empirically supported the assumption. End user computing satisfaction is conceptualised as the affective attitude towards IS applications by individuals who interact directly with IS. End user skills and IS support policies are independent variables that can affect end user satisfaction.

2.2.1.4.2 User IS Satisfaction

With the increasing number of computers used in organisations by individuals, it is necessary to evaluate the effectiveness of such usage. Of the many success measures, user satisfaction is the most widely researched and used measure of IS effectiveness and success (Delone & McLean, 1992; Harrison & Rainer, 1996; Doll & Torkzadeh, 1991; Melone, 1990; Li, 1997). TRA provides a theoretical basis for concluding that an individual's perception of

⁶ A path analysis to maintain validity was employed in Baroudi et al. (1986).

the computer system and related activities are predictive of success of the computer system (Melone, 1990; Doll & Torkzadeh, 1988; Delone & McLean, 1992).

Fishbein and Ajzen (1975) postulate that certain beliefs about an object lead to an attitude about the object. This attitude leads to the behavioural intention. Finally, a loop back of the behavioural experience can modify the belief about the object. For example, the user believes that IT increases productivity (belief), therefore the user is satisfied (attitude) with IT and utilises (behaviour) the computer system. The user's belief is modified ⁷ after the experience of using the computer system.

User satisfaction and IS use are popular surrogates for measuring IS success (Delone & McLean, 1992). Baroudi et al. (1986) and Igbaria and Nachman (1990) in their respective studies found strong relationships between user satisfaction and computer use. The more users use the system, their level of IS satisfaction increased, thus increasing further use and subsequently having an impact on the organisational IS success. This is theoretically justified by TRA's belief-attitude-behaviour-belief loop back. TRA states that belief influences attitude (user satisfaction), attitude influences behaviour (use) and behaviour (experience) influences belief. It can be postulated that the higher degree of IS usage has a positive correlation to user satisfaction, and conversely, higher degree of user satisfaction has a positive correlation to IS utilisation.

⁷ The modification can be either positive or negative and may modify user belief accordingly.

In the Delone and McLean (1992) model, system quality and information quality influence use and user satisfaction. User satisfaction influences use as well as the reverse being true. This can be justified by the theory of attitude and behaviour, TRA and Triandis (1980). Numerous studies have investigated IS use as surrogate for IS success (Delone & McLean, 1992; Thompson et al., 1991; Al-Khaldi & Wallace, 1999). The testing of these surrogates and the factors that influence them is necessary to fully understand their interrelations and the level of IS success in organisations.

2.2.2 Relevance of Literature of Information Systems Success

This study investigates IS implementation and its success in PNG organisations. Literature highlighted the multi-dimensional concepts of IS success, and the lack of conformity in defining the criteria, and how these criteria can be measured. The framework advanced by Ives et al. (1980) is useful for this study for establishing the dimensions of IS studies. This model is also utilised as a guide to categorise the identified elements. Literature on the construct space by Grover et al. (1986) was also relevant. The four streams of study in IS effectiveness are useful to position the underlying stream of this study.

The Delone and McLean (1992) IS success model is useful in understanding the dimensions of IS success and how it can be measured. The attitudinal aspect of the model, use and satisfaction and the justification by the theories in psychology was useful in understanding the user attitudes in the PNG environment. These issues are better understood by illuminating and

comparing studies and results from different settings. It is also useful to set a direction by contrasting with prior work.

Two popular surrogates for IS success measures were reviewed. These surrogates are useful to understand respondent use and success of IS in organisations.

2.3 The scope of IS in PNG

2.3.1 Literature on the Scope of IS in PNG

2.3.1.1 IS industry in PNG

Computers were introduced into PNG in the late 1960's (Sinebare, 1998). Since then, computers have proliferated and are utilised in both the public and private sector. Today, evidence of the impact of computers is everywhere. For example, in the health, finance, shipping and customs, and retailing industries.

Sinebare (1998) proposed that the growth rate of the IT industry in PNG was at 12%. The uptake of IS in the country has been phenomenal particularly in the last decade with the introduction of Internet technology. The recent UNDP country assessment report indicated that the government was fully supportive in taking advantage of the latest developments in the field of information and communication technology (UNDP, 2001). However, the fundamental requirements for the growth of the IS industry in that country appear to have been inadequately addressed.

The approach by Vingi et al. (2002) provides a useful framework for analysing the IS industry in PNG. They proposed that three key ingredients are required for a successful IT industry: *knowledge base, financial base and government support*. They analysed the Israel IT industry contrasting it with that of the Dutch, Taiwanese and the Silicon Valley industries. Firstly, academic and industry research and development, an avenue that creates IT knowledge base was nonexistent in PNG. The government's position is uncertain given the insufficient support for research and development in the country⁸. Secondly, sound economic framework and internationally-oriented venture capital is required to encourage foreign investment, and the set up of 'start-up' IT companies. Almost all the IS investments in public organisations in the country are donor agency sponsored. Additionally, the IT services industry is dominated by a handful of foreign companies. Finally, government support in setting up policy and legislation, encouraging foreign investments, and building national IT infrastructure was again inadequately addressed.

2.3.1.2 IS Evolution in PNG

Three commonly discussed major technological eras covering three stages of IT innovation and business exploitation of the evolving technology is presented to better understand the status of IS. These eras are illustrated in Figure 2.3. It provides a useful framework to analyse the evolution of IS in PNG organisations.

⁸ The 1997 national government budget drawn by the then Skate Government ceased allocations to all research organisations including the National Agriculture Research Institute (NARI), Medical Research Institute (MRI), Cocoa & Copra Research Institute (CCRI), and Forestry Research Institute (FRI). All employees were to be retrenched. The rationale – cost cutting exercise. This decision was later rescinded and the organisations were funded by the Mekere Government.

IS issues and organisational implications faced in one era may not necessarily be applicable in the other. For instance, skills and knowledge mastered may not be useful in another era, hence, organisational staff need to be retrained (Ross & Feeny, 1999).

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**Figure 2.3: Stages of IT Growth and the Exploitation by Business
(Source Ross & Feeny, 1999.)**

The *mainframe* era covers roughly the 1960s into the early 1980s. During that time IT was largely synonymous with mainframe computers. IS success was determined by efficiency measures such as systems availability and reliability. The *distributed* era started at the end of the 1970s, during which corporate IT became characterised by integrated networks of workstation PCs, minicomputers, and mainframes connected through local and wide-area networks. The evaluation measure was focused from efficiency to effectiveness. IS has now expanded to higher levels of the organisation. More knowledge workers make direct use of IS for a large variety of tasks or

applications (for example office automation, statistics, and database) (Delone & McLean, 1992).

Finally, the *web-based* era started in the mid-1990s. It encompassed the rapidly growing emphasis on the use of Internet and World Wide Web protocols to drive both internal and externally oriented applications of IT.

The model provides a framework to understand technology growth in PNG organisations, its direction and associated issues.

2.3.1.3 Internet Technology in PNG

The Internet technology was introduced in PNG in 1997. At the time of this study, five Internet Service Providers (ISP) provide online Internet and email connections nationwide. They are Daltron Electronics Ltd, DG Computers (PNG) Ltd, Datec Ltd, Global Technologies Ltd and Online South Pacific a division of Data Nets Pty Ltd. Full Internet access in general is limited to a small number of computer users, particularly in the main centres.

The development and use of the Internet and related services is mainly found in private and multinational organisations (Waieng, 2000). There is limited Internet use in public enterprises and next to nothing at homes. Apart from a handful of tertiary institutions, Internet services are virtually nonexistent in most primary, secondary institutions and partially existent in tertiary institutions (Waieng, 2000).

Results from a recent study indicate that the Internet at this point is a plaything with no strategic value in PNG (Kelegai & Middleton, 2001). In other words, Internet related business processes such as e-commerce or e-banking are limited. However, there are signs of gradual change as organisations have displayed a keen interest in Internet technologies. For instance, recently several commercial banks in the country have embarked on introducing e-banking.

2.3.1.4 IS Studies in the Public Sector

A large component of IS studies are conducted overseas based on experiences of the private sector (Jain, 1997a, 1997b). Bretchnieder (1990) in Jain (1997a) asserted that public institutions with greater dependencies differ from the private sector in organisational environments. The constraints in the public sector have given rise to the difference in managerial initiatives and the need to identify different evaluative strategies compared to those used in the private sector. IS management in the public sector is 'heavily influenced by political, social, economic and cultural factors' (Jain, 1997a:p.6). Therefore, studies conducted in DCs in the private sector may have limited relevance to IS implementation in LDCs. One reason is the disparity in the level of IT development arising from the variations in historical, social, cultural and economic factors between DCs and LDCs.

Parhizgari and Gilbert (2004) asserted that private and public sector organisations serve different types of customers. Private sector organisations are more financially driven, while public sector organisations are politically

driven. Internal structures are designed to cater for the customer. In this regard, private organisations purpose and structure differ to the public sector organisation.

2.3.2 Relevance of the Literature on the Scope of IS in PNG

Little has been done in terms of empirical research and literature relating to IS in PNG, apart from work by Sinebare (1999). Work and documentation by the UNDP is useful in highlighting the developments in the IT industry in PNG as well as in the other PINs. Two useful frameworks were highlighted in the literature. Firstly, Ross and Feeny (1999) advanced a useful model for conceptualising the main eras of IS evolution, and how organisations exploited these technologies. Secondly, the framework by Vingi et al. (2002) provides a guideline for understanding the environment and ingredients necessary for the growth of the IS industry in PNG.

The literature also is useful in illuminating the potential of Internet technology in the country and the infrastructure, human resources, and the socio-economic requirements to propel it. It is however not clear how far the technology is used for business in organisations.

2.4 Long-Term Consequence

2.4.1 Literature on Long-Term Consequence

Long-term consequences refer to outcomes that will have a positive consequence in the future. For example, users may perceive that by using the system they have a better chance of being promoted. Thompson et al. (1991)

define perceived consequence as *“outcome that may payoff for future”* (p.129).

Additional to this approach, Davis, Bagozzi and Warshaw (1989) propose the technology acceptance model (TAM). Their model includes a construct they termed *“Perceived Usefulness”*. Perceived Usefulness is defined as the degree to which a person believes that use of a system would improve his(her) performance; that is the user’s perception of how useful the object is to complete the current task. A positive correlation was found between Perceived Usefulness and behavioural intention in their study.

The technology acceptance model is based on the constructs and relationships of the TRA. *“it posits that usage of IT is determined by the beliefs a user holds about its Perceived Usefulness and its Perceived Ease of Use”* (Karahanna & Straub, 1999, p.238). Perceived Ease of Use refers to the degree to which a person believes that using a particular system would be effortless. Perceived Usefulness and Perceived Ease of Use correlate with usage and are empirically supported by many studies (Mathieson & Keil, 1998; Thompson et al., 1991; Igbaria et al., 1995).

Two other similar constructs, relative advantage and compatibility are also useful. Relative advantage is the incremental advantage over use of the system, and compatibility refers to the extent to which innovation is compatible with the users experience (Karahanna & Straub, 1999). Triandis (1971, 1980) asserted that user behaviour in some instances depended on long-term consequence. In the context of IS, users will only use the system if

they believe that there is a positive consequence or gain. These relationships were empirically supported by Thompson et al. (1991), and Khaldi and Wallace (1999).

Similarly, the expectancy theory proposed by Vroom (1964) posits that individuals' behaviour is based on the desirability of the rewards. In other words, individuals will utilise IS if they expect some sort of reward, even though it may not be useful to them. The relationship with these constructs, Perceived Usefulness and Perceived Ease of Use and their antecedents is best understood by the TRA. TRA describes how belief about an attitude towards an object such as IS leads to behaviour (Karahanna & Straub, 1999). According to the TRA cognitive belief about an object such as Perceived Usefulness, Perceived Ease of Use, long-term consequence, and relative advantage immediately affects attitude towards using that object.

2.4.2 Relevance of Literature on Long-Term Consequence

Prior work in this concept is useful to illuminate and understand user attitude in utilising IS. The theories advanced by Davies et al. (1989) (TAM) and Thompson et al. (1991) (Perceived Ease of Use) can provide a guideline to understand what motivates stakeholders.

2.5 Computer Anxiety

2.5.1 Literature on Computer Anxiety

Computer anxiety can be defined as the fear of an object. Howard and Smith (1986) identified three principles related to computer anxiety. Firstly, psychological: personal traits manifesting themselves as technological

alienation. Secondly, educational: lack of education and knowledge in understanding the capabilities of computers. Finally, operational: how to operate computers. Harrison and Rainer (1996) suggest that individuals with high computer anxiety possessed lower outcomes compared to those with low computer anxiety. This may also occur because of fear of, or dissatisfaction with computer systems. Computer training may reduce anxiety. This postulates that the user's social or cultural orientation may have an influence on computer anxiety.

2.5.2 Relevance of Literature on Computer Anxiety

Models in this concept provide a useful basis to explaining user and manager attitude towards IS, taking into consideration their cultural orientation. This is particularly useful to understand management IS use behaviour in PNG considering their limited knowledge and awareness of IS and the related technologies.

2.6 Chapter Summary

The lack of research in PNG indicates that there is benefit in carrying out an exploratory analysis of the effectiveness of IS implementation there. In so doing, the identification of factors that influence implementation success may lead to a list of success factor elements that may be used for LDCs in general. Literature and the factors revealed elsewhere were identified to highlight work already done in this domain. In this Chapter, a selection of literature was reviewed and its relevance to the study was described.

There is strong debate that IS implementation is influenced by the social and environmental context in which it is embedded. In light of this debate, the environmental model by Austin (1990) provides a useful framework to explore and illuminate the socio-economic environment in LDCs. Similarly, the cultural orientation of stakeholders is a dimension explored by the model advanced by Hofstede (1983) in this study.

The literature also highlights the debate on the multi-dimensional aspect of IS, the multiple perspectives from a diverse group of contenders and the lack of conformity in this area. Again, in light of this debate, useful frameworks for IS studies, streams of IS success study, guidelines for classification of success factors and their relevance for this study were elaborated. Attitudinal models relating to user behaviour in the context of IS and the grounding theories in social psychology are pointed out to better understand stakeholder behaviour.

Literature and useful contributions to the survey instrument were also highlighted. The findings and models highlighted in the literature provided a springboard to position this study and answer the questions emanating from the literature.

Chapter 3

Research Methods

3.0 Introduction

Chapter 2 presented the related literature pertaining to the domain of study with relevance to the research problem. This Chapter describes the methods used that enabled the current study to be achieved. An overview of the research strategy was presented in Chapter 1.3. This study employs a multi method strategy: multiple case studies followed by a formal survey. The methods used in the two approaches are described. The features of case study research and the strengths and weakness are highlighted.

The initial research strategy adopted for this study was a dominant less dominant design that encompassed multiple cases and an embedded survey. Circumstances leading to the adoption of a multi method strategy are described in section 3.1.

The Chapter is divided into two parts. Part I describes the Stage 1 study, that is, the initial strategy adopted for this study. Part II describes the strategy employed in the Stage 2 study.

3.1 Review of the Research Questions

RQ	Research Questions	Category Addressed	Survey Item	Chapter Section
1.	What are the perceived elements that contribute to IS success in PNG organisations?		4.3.2	Stage 1
1.1	What are the perceived user environment elements that contribute to IS success in PNG organisations?	User Environment Elements		4.3.2.1
1.2	What are the perceived organisational environment elements that contribute to IS success in PNG organisations?	Organisation Environment Elements		4.3.2.2
1.3	What external environment elements influence IS success in PNG organisations?	External Environment Elements		4.3.2.3
2.	To what extent are the elements addressed in PNG organisations to ensure IS success?		4.3.4 5.10.2.1	4.3.4 Section A Part 1
2.1	How important are these elements to ensure IS success in PNG organisations?		4.3.5 5.10.2.3	4.3.5 Section A Part 2
2.2	Is there a difference in individual perceptions of how effectively IS success elements are dealt with in the organisations?		5.10.2.2	Section A Part 1
2.3	Is there a difference in respondent's perceptions of the importance of IS success elements in organisations?		5.10.2.4	Section A Part 2
2.4	Is there a relationship between respondent perceptions of how effectively IS success elements are addressed in organisations and the importance of these elements?		5.10.2.5	Section A Part 1 & 2
2.5	How do respondents ascertain training and assistance in the aspects of IS in the organisation?		5.10.2.6	Section B
2.6	How successful was IS and what success criteria were used in the organisation?			Section B

Table 3.1: Summary of Research Questions

There are two major research questions that drive this study. This Chapter is divided in to two parts to describe the methods applied to address the questions. Part I of the Chapter presents the research strategy for addressing research question 1. Part II describes the methods used to elicit data to address research question 2.

Part I: Stage 1 Qualitative Inquiry

A contributing factor to the genesis of the current study is a prior study conducted in 2000 on IT education in PNG. Preliminary results of that study were reported in Kelegai and Middleton (2001, 2002). That study established the paucity of empirical data and research in IS studies in PNG and amongst other PINs. It also highlighted several factors that impeded IS success, in particular, human resource constraints faced by organisations. Further exploration of IS implementation was necessary to illuminate the impeding issues. Hence, the current study was undertaken in 2001 with an overall aim to capture meaningful information, and focus on a contemporary situation to understand the interplay between IS, and the social, organisational, political, and cultural settings in PNG.

3.2 Adopted Research Strategy in Stage 1 Study

The study set out to achieve two objectives. First, to identify the elements that contributed to the success of IS in organisations in PNG from the perspective of key actors: middle managers, senior executive management (SEM) and non-managers. Second, to understand the settings in which IS was embedded, and determine the extent to which the elements were dealt with in the organisations.

The study was exploratory in nature, and required interaction with informants to better understand their perceptions of IS, and the context in which it is embedded. In such situations, a qualitative approach was necessary to elicit the relevant data. Hence, the initial research strategy adopted for this study was a dominant less dominant design (Creswell, 1994), which encompasses multiple cases and an embedded survey. The case study, in this design is the dominant method, while the embedded survey is less dominant. The adoption of a quantitative approach in the initial study was in line with Gable (1994), that is, the quantitative approach is supported by case study as a dominant feature.

Case study as described by Yin (2003), is an “*empirical inquiry that investigates a contemporary phenomenon within a real-life context, especially when the boundaries between phenomenon and context are not clearly evident*” (p.13). Thus, the adoption of the case study research method was an attractive one because it was consistent with the exploratory aims of the study in establishing a deeper and richer understanding of the phenomenon. It was also suited to answer the type of research questions proposed in the study, to assess extent of the control of the event, and to focus on the contemporary as opposed to the historical (Yin, 2003; Silverman, 1993).

The case study method is also a widely accepted research strategy in IS. In separate studies, Scott and Ives (1992), and Farhoomand (1992) found that case study was the most common research strategy. The popularity is encouraged by the evolving role of the IS discipline, where organisational

issues and interrelations between entities are emphasised, which lend themselves to qualitative research (Markus & Robey, 1988).

Qualitative researchers argue that human behaviour should not be seen in isolated parts, but in a more holistic approach that places individual actions in their cultural context. In this regard, Papua New Guineans maintain a holistic view in society, therefore an interpretation of an event is made with reference to other events – past and present. With this epistemological stance, case study method was an attractive one as it also reflected the researcher's independent assumptions on understanding the nature of knowledge, and the appropriate ways to understand that knowledge.

A further significant influence was the experience and knowledge of the process in which knowledge is relayed within the individual cultural context. Papua New Guineans tend to be cautious with individuals outside their cultural grouping, and avoid uncertainty, but interact freely with persons they are well acquainted with. As a Papua New Guinean, and being socialised in that cultural context, was an advantage for the researcher in understanding the interactions, explanations, and interpretations of events by respondents.

Case study research as illustrated in the foregoing discussions, seeks to understand social action at a level of greater richness and depth. However, the case study approach is often criticized for the lack of rigor, statistical generalisability, and non-representativeness (Sjoberg, Williams & Vaughan, 1991). Lee, Kim and Lee (1995) identified four weaknesses in areas of controllability, deductibility, repeatability, and generalisability. The case study

weaknesses were addressed in order to maintain rigor prior to engaging in the current study.

3.3 Case Study Validity and Reliability

The quality of case study design can be judged by four tests (Lee et al., 1995; Yin, 2003). Table 3.2 shows the tests followed by their descriptions and how they were addressed in this study.

Validity and Reliability Tests	Description
Construct validity	involves selecting the correct operational measures for the concepts being studied,
Internal validity	Involves establishing causal relationships (for explanatory or causal studies),
External validity	involves establishing the domain to which a study's findings can be generalised, and
Reliability	involves demonstrating that the operations of a study can be repeated with the same results.

Table 3.2: Tests for Case Study Validity and Reliability

Construct validity refers to the selection of the correct questions to measure and understand the concepts being studied. The use of prior work, for instance by Ang et al. (2001) and Li (1997) contributed to addressing construct validity in this study. In designing the case study protocol (see section 3.4), questions were set around the themes to be investigated drawing from guidelines set in other studies.

Pattern matching is an important tactic for establishing internal validity (Yin, 2003). The difficulty in achieving internal validity in an exploratory case study was acknowledged, however, causal relationships were explored by

examining the elements that influence IS success in PNG organisations. The rationale to use this tactic was to determine the extent to which the elements identified in other LDCs and in DCs were applicable to the PNG environment. Prior work by other researchers such as Jain (1997a), Al-Abdul-Gader (1999) and Bailey and Pearson (1983) provided insight to the current study. Case replication was also considered in seeking internal validity. The selection of several public sector organisations was on the basis of expecting similar results, that is a literal replication as contended by Yin (2003).

External validity in this study was addressed by replicating the same study over roughly the same time period. That is, eight instrumental studies were conducted to form the basis of a collective case study design as advanced by Skate (1994). The use of multiple cases in the current study conforms to satisfying the external validity features. Multiple cases can also contribute to generalisability as discussed later.

The strategy applied to address reliability in this study was the development of a formal presentable case study database. Other investigators can review the evidence directly, thus, increasing the reliability of the entire case study as proposed by Yin (2003). Reliability is interpreted as the ability to replicate the original study using the same research instrument and achieving the identical results (Sjoberg et al., 1991). Accordingly, the goal of reliability is to minimise the errors and biases in a study. The database in this study consisted of field notes and diary, documents, schedules and interview transcripts (see section 3.9 Data Management and Analysis). In addition, case study protocol can contribute to case study reliability.

3.4 Case Study Protocol

The case study protocol according to Yin (2003) is a major tactic in increasing reliability of the case study research. It is essential to multiple-case design and provides consistency for procedures and conformity among organisations. The case study protocol for this study was developed consistently with the guidelines proposed by Yin (2003). Instruments included in the research protocol were constructed around the themes revealed in the literature but relevant to the PNG context within the study framework.

Face and content validity of the protocol was maintained through a rigorous review and verification process involving colleagues and experts in the Centre for Information Technology and Innovation, Queensland University of Technology. It was reviewed after the pilot study. A revised version of the protocol designed for this study can be found in Appendix 4.

Prior to conducting the study, approval was first sought from the QUT Ethical Committee in 2000 (QUT Ref No:2112H - see Appendix 2). Subsequently, organisations were informed about ethical issues in the preliminary letter prior to the studies (Appendix 1). To comply with the QUT ethics approval, participants in this study will remain anonymous and the transcripts, audiotapes and documents kept in a safe location.

Having decided on the research topic, the objectives, research questions, research design, and having addressed issues of reliability, organisations were contacted via postal mail in mid 2001 to participate in the study. More

than 50 organisations were contacted, and out of the 50 only 20 organisations responded affirmatively. Summaries of the research topic, case study detail and other details were mailed to the 20 organisations. After receiving further confirmation from organisations, suitable case sites were selected using procedures described in section 3.5.

3.5 Case Selection

Cases were then selected based on the list of organisations that responded affirmatively. Eight organisations were selected in the current study guided by the non-probability sampling technique as suggested by Neuman (2000). The objective of the qualitative researcher in this case was to focus on how the cases, despite the quantity, would illuminate social life or construct new theory instead of focusing on representation or detailed techniques (Neuman, 2000). Hence, an organisation was mainly selected on the basis that it provided the best representation, and contributed to answering the research questions.

The replication guidelines proposed by Yin (2003) were also considered in selecting the eight case sites. As an example, PNG Unitech and the Internal Revenue Commission were potential sources of literal replication. The PNG Waterboard and Boroko Motors Ltd as commercial entities could potentially show outcomes contrary to the first two cases.

The objective of the research was to gather data from a wide range of organisations, and shed light on the difficulties they faced in different parts of the country. For instance, hardware service and maintenance is difficult to

attain in many smaller centres. Hence, the Stage 1 study was initially scheduled for organisations based in Port Moresby, Lae, Madang, Rabaul and Goroka. However, the study was limited to organisations based in Port Moresby and Lae for reasons presented in section 3.7. The initial control in selecting the case site was the implementation of IS in the organisation. Other influencing limitations are discussed later in section 3.14.

Soon after selecting the case, a preliminary letter containing the project criteria, and summary of the case study instrument was mailed to the organisations. A copy of the letter can be found in Appendix 3. To reduce logistic problems, organisations were requested to nominate an employee to coordinate the study. The staff member's contribution was critical to the final outcome of this study.

The field study finally commenced in May 2004, beginning with the PNG Unitech case study.

3.6 The PNG Unitech Study (Pilot Study)

The PNG Unitech case study was the first of the eight case studies. The case study commenced on May 22nd 2002, and ended on June 2nd 2002. The selection of PNG Unitech as a pilot study was for two main reasons. First, the author's prior acquaintance with the institution provided useful background knowledge about the case site. Second, there was easy accessibility to the organisation. The PNG Unitech study was useful in consolidating the research framework, and deriving guidelines for the subsequent case studies. It was

also useful in assessing the multiple components of the research protocol. The protocol was reviewed after the PNG Unitech study.

In the first few days, logistic matters such as interview rooms, phone, and transportation were addressed. The encountered difficulties are mentioned in section 3.14 and noted in the summary of the field notes presented in Appendix 5.

Adhering to the case study protocol, three methods of data collection were employed namely interview, document analysis and through personal contacts in the PNG Unitech study. Semi structured interviews were conducted with purposely selected individuals from the three categories: non-managers, middle managers, and the senior executive management. Prior to the interview, instruments were distributed to the interviewees. They were informed about confidentiality and consent regarding audio-taping of the interview sessions. No participant objected. All interviews, each lasting 40 to 60 minutes, were conducted in one central location.

Fourteen out of the twenty scheduled interviews for the PNG Unitech case study were conducted. The rest were unavailable. Notably, the CEO of the organisation was not available at the time of the study. Numerous requests were made to the SEM members, but were declined. However, top management's views were attained from one member of the senior executive management team.

3.7 Stage 1 –The Multiple Case Studies

The study at PNG Unitech ended in early June 2002. After the pilot study, the author flew to Port Moresby for the remaining case studies. Again, the initial two weeks involved logistic issues, organising accommodation and transport, meeting schedules, and locating resource facilities.

The timing of the field study was a concern because it was scheduled about the same period as the national elections in PNG. Key informants were unavailable and the general situation was volatile, an issue further discussed in section 3.14.

3.8 Data collection techniques employed in Stage 1 study

The case studies in Port Moresby were investigated concurrently. The main sources of evidence for the case study approach used in the Stage 1 study are shown in Table 3.3 and presented in 3.7.1, 3.7.2 and 3.7.3.

Source of evidence	Type	Discussed in section
Interview	Structured and open-ended with participants	3.7.1
	Structured and open-ended with user groups	
	Informal discussions with other parties	
Documentation	Administrative documents	3.7.2
	Policy documents	
	Act of Parliament	
Archival Records	Organisational records	3.7.3

Table 3.3: Main Sources of Evidence in Stage 1 study

Multiple techniques were utilised in this study to uncover and understand the phenomenon in the natural environment. Triangulation of methods is supported by Yin (2003) and also contributes to case study reliability.

3.7.1 Interviews

The interview was the primary source of evidence used in this study. Open-ended and focused interview strategies were employed. Prior to the interview sessions, copies of the research brief and instruments were mailed to the study coordinator in each organisation. The instrument consisted of two sets of questions, one for non-managers and the other for managers. Table 3.5 presents a summary of the interviews.

Participants											
Case	Senior Management		Middle Management		Non Managers		Group		Total		
	Re	De	Re	De	Re	De	Re	De	Re	De	%
PNG Unitech	1		1	1	7	3		1	9	4	24%
IRC	3	1	3	2	14	3	2		22	6	50%
PNGWB	1		3	1		2			4	3	13%
Boroko Motors	1		2		2	2			5	2	13%
Total Interview	6	1	9	4	23	10	2	1	40	15	100%
	11%	2%	20%	7%	42%	18%			73%	27%	
Total % of Destroyed Interviews									15, 27%		
Total % of Reconstructed Interviews									40, 73%		

*RE: The interviews were reconstructed.

*DE: These interviews were completely destroyed during the hold-up in Port Moresby.

Table 3.4: Participant Interview Summary of Organisations

Of the total of 55 interviews from the four case studies, 13% (7) were senior management team, 27% (15) middle managers and the rest were non-managers. Fifteen interviews were completely destroyed and 40 reconstructed (refer to section 3.7 on fieldwork implications). This does not include data from the other cases not analysed in this report.

Three group interview sessions comprising 1 supervisor and 4/5 users in 2 organisations were also conducted. Only two sessions were reconstructed. The interviews were transcribed verbatim and coded for analysis using NVivo. The NVivo analysis package is described in section 3.9.

3.7.2 Document Review

Several documentation sources were consulted and reviewed in relation to the scope of the current study. These sources include newspapers, reports, and organisation structures, Act of Parliament, and public service management guidelines. These resources were reviewed to gain insight into the range of issues relating to the study domain. For instance, the availability of skilled and competent IS professionals in the organisation is a contributing IS success element. A review of the documents on PNG public service management and employment guidelines provided a comprehensive insight into the set of procedures, variances in remuneration packages, and benefits for skilled IS professionals employed in the public sector. It revealed that the IS profession was classified under the administrative/social science category. The rewards in this category are generally poor for organisations subjected to the PNG public service management guidelines.

3.7.3 Historical Archives

This source includes organisational structure, annual reports and publications. A further source of information useful to the report is the field notes. The field notes in this thesis are presented as the author's diary. The diary includes two categories. Firstly, it contains the researcher's emotions, perspectives, issues, and difficulties or progress for the duration of the study. Secondly, it describes the organisations, interviews, individuals and other issues, ideas and thoughts about the study process. These thoughts emerged as the study progressed, and from the varying issues deliberated at various stages of the field study. The edited version of the reconstructed document can be found in Appendix 5.

3.9 Research Strategy Realignment

Several weeks prior to the scheduled completion of the case studies, the fieldwork was discontinued as a result of extenuating circumstances⁹. The incident had an adverse impact on the study. Scheduled interviews were not completed. Hence, qualitative data collected in the case studies were incomplete, and a large portion of the data was unusable. After a review of the events and the subsequent implications, a new strategy was developed to pursue the study. The strategy involved firstly, to reconstruct empirical material retrieved from the hold-up, particularly interview data. To reconstruct the interviews, the retrieved interview tapes were listed and cross-referenced with the list of individuals interviewed. The audio quality of a large portion of

⁹ The author and his assistant were 'held-up' at gunpoint in Port Moresby by criminals and threatened to be shot. Apart from personal possessions, a large portion of empirical material normally kept secure by the researcher was unavoidably stolen and presumably destroyed. These included: interview transcripts, documents, laptop computer containing research data, and other research material

the tapes was distorted (see summary in Table 3.5). These tapes were rerun numerous times and if still uncertain, interpretations were made to the closest explanation. On several occasions, organisations were contacted for further clarification.

The final analysis constitutes only four case studies. The case selection criteria were described in section 3.5. However, the major selection criteria was the data and to what extent it represented the characteristics of the organisation. Table 3.5 presents a summary of the cases presented in this thesis.

Case	Category	Location	Comments
PNG Unitech	Public/Government	Lae	Pilot Study Case
Internal Revenue Commission	Public/Government	Port Moresby	Government
PNG Waterboard	Private	Port Moresby	CSA*
Boroko Motors Ltd	Private	Port Moresby	Private

* CSA - Commercial Statutory Authority. Semi government organisation functioning on a commercial basis as enacted by Act of Parliament

Table 3.5: Summary of Cases Reported from Stage 1 Study

The PNG Unitech is a government funded statutory organisation (Higher Education) and is based in Lae. The Internal Revenue Commission (IRC) is also a government funded organisation. The PNG Waterboard (PNGWB) is a commercial statutory authority (CSA), a semi government organisation but commercially orientated as stipulated under the PNG Waterboard Act (1996). Boroko Motors is a private organisation. The latter three cases were based in Port Moresby.

Secondly, a Stage 2 study was employed to solicit further data from the major respondents, and strengthen qualitative data (Yin, 2003). The study method employed in Stage 2 is reported in Part II of this Chapter.

3.10 Data Management and Analysis for Stage 1 study

Interviews were recorded on mini tracks and transcribed verbatim at the end of each day during the field study. Emergent ideas or omitted themes were further probed in the subsequent interview sessions. The transcription process was reiterated a number of times to derive the best possible interpretation of the interview. Each transcript was coded to reference the recorded tape, the organisation and initials of the participant. A transcript sample can be found in Appendix 6.

A database was developed in Microsoft Access to manage case study data as recommended by Yin, (2003). Firstly, interview transcripts were imported in to the Microsoft database as Word files. Each record was coded and referenced to the corresponding object file and the physical tape. Secondly, relevant documents associated with each case site were coded and organised into a database. Text files of the interview transcripts were imported to a qualitative data analysis package for analysis.

DSR NVivo was the preferred analysis package for Stage 1 because the coding techniques and features were appropriate for the data analysis in this study. NVivo is a Windows based analytical package prominently employed for qualitative data analysis. It is also versatile and easy to use.

This study adopted the analysis approach suggested by Strauss and Corbin (1990). Data were differentiated, contrasted and basic concepts conceptualised. The concepts were then combined into categories including their properties and dimensions. The analysis involved reviewing each transcript line by line, and in some instances, in paragraphs to capture the relevant themes. This involved applying content analysis concepts to initially code specific words. Themes were identified and nodes were created to represent these themes. After repeated reviews, the new elements were revealed and in some cases the elements were broken down into smaller units. Others were combined to form new elements. Themes relevant to the new elements were classified accordingly. Analysis was deemed complete when all the data could be readily classified, the categories were saturated, and the sufficient numbers of regularities emerged (Guba & Lincoln, 1994; Miles & Huberman, 1994; Strauss & Corbin, 1990).

The content analysis technique was also utilised to coin words or phrases pertaining to a theme under a generic dimension. For instance, the systems quality dimension is defined in Delone and McLean (1992) and by Li (1997). Valuable information and insight was also drawn from work done by other scholars to categorise the identified elements relating to a specific theme, into several dimensions. They are: System Quality; Information Quality; Human Resources Management; Management: Strategic; Technical; Socio-Economic and Political.

Results from the Stage 1 study formed the basis for the Stage 2 study. The case studies of Stage 1 identified critical factors influencing IS uptake and

successful usage in PNG organisations. A formal survey was designed to further check the extent of these influences on IS in PNG. More discrete quantitative studies were thus allowed by these preliminary qualitative investigations.

Part II: Stage 2 Quantitative Inquiry

The research design in the initial study described in Part I encompassed a multiple cases design and embedded survey. The results attained in the initial study became the springboard for employing a formal survey.

The objective of the Stage 2 study was to examine stakeholder perception of how organisations dealt with the elements that contribute to IS success. In doing so, it addressed research question two of the current study, that is; **“To what extent were the elements being addressed to ensure IS success in PNG organisations”?**

3.11 Survey Instrument

The development of the survey instrument began in 2003 after the analysis of the case study data. The results of the case study formed the basis of the questionnaire. The process of questionnaire construction was adopted from Sarantakos (1993), which iterates through a number of interrelated steps. The steps are, Step 1: Preparation, Step 2: Constructing the first draft, Step 3: Self-Critique, Step 4: External Scrutiny, Step 5: Re-examination and Revision, Step 6: Pre-test or Pilot study and Step 7: Revision.

Steps 1, 2 and 3 focus on question type, administering methods and constructing new or adopting previously established questions and self-analysis of the basic rules such as format, symmetry, and simplicity. These are addressed in section 3.11.1. In step 4, critical review was sought from the supervisors and another faculty staff experienced in questionnaire surveys. This led to the next step of re-examining and revising the questionnaires. A pilot study was undertaken in the faculty, addressed in section 3.15.

3.11.1 Survey Instrument

The four-page survey consists of two major parts. The survey can be found in Appendix 13. The thrust of Part 1 was to understand perceptions of how effectively PNG organisations addressed the elements that contributed to IS success. It consists of 53 questions representing a cross-section of issues identified in Stage 1 of this study and from work by other scholars in prior studies. Both categories of respondents were required to answer Part 1.

Part 2 also consists of 53 questions representing the same IS aspects as in Part 1. However, Part 2 captured management's perception of the importance of each element as contributors of IS success. Only managers answered Part 2 of the survey.

In the perception instrument, Q1 to Q40 contain elements at the individual and organisational level. Q41 to Q53 represent issues relating to the environment external to the organisation. The 53 items are scored on a 7-point Likert scale (7=Extremely Important; 1=Extremely Unimportant).

Section A consists of questions relating to type of IS, the frequency of use and success rating and success measures. It also attempts to identify the mode of IS training and level of IS assistance available in the organisation. Personal demographic variables in this study related to nationality, gender, years in the job, years in organisation are defined in Section C. Each set was assigned a number and printed on the covering letter.

3.11.2 Inclusion of work from prior studies

Useful instruments in prior studies were utilised for this study. Ang et al. (2001) for instance, used a semantic instrument to measure the use of IT in Total Quality Management projects in public organisations in Malaysia. A component of their instrument¹⁰ relating to technological and organisational factors was modified and adapted to suit the purpose of this study.

In addition, Jain (1997a) identified a number of dimensions in her multinational study of organisations in Malaysia, Singapore, Thailand, Indonesia and Taiwan. Jain's study illuminated major IS success factors in organisations in South East Asia. In that study IS success constructs were determined by employing factor analysis to load each factor to the constructs. Content and construct validity concerns were addressed in that study, therefore the identified dimensions were included in this study.

Furthermore, work by Li (1997), a meta analysis of IS success measurements was also consulted. Li (1997) adopted the Bailey and Pearson (1983) instrument. Five additional IS success factors were identified by Li (1997).

¹⁰ Permission was granted by Ang et al. (2001) to utilise their instrument for the purposes of this case study research.

The Bailey and Pearson instrument focuses on user requirements as their original study concentrated on users at a mainframe set up. Selected elements from Bailey and Pearson's instrument were adopted for this study. The Miller and Doyle (1987) study adopted a modified version of the Bailey and Pearson (1983) instrument, but modified to suit their requirements. Their study identified and ranked IS success factors and determined their effectiveness in organisations in South Africa.

This study adopted the seven point Likert scale ranging from 1 (Extremely Unimportant) to 7 (Extremely Important) as operationalised by Li (1997). The matrix of adopted contributors can be found in Appendix 11.

3.12 Addressing Reliability and Validity in Stage 2 study

In October/November 2002, a series of meetings were conducted with the supervisors and experts in the school to discuss the survey instrument and how best to address reliability and validity issues. These meetings catered for face and content validity. Validity is defined as how well the instrument measures the desired truth. Following that, the questionnaires were distributed to randomly chosen postgraduate students as a pilot discussed in the following sections.

The instrument was field tested to check for reliability and validity. The survey was administered to five identified individuals from the Centre for Information and Technology Innovation, QUT. The individuals were postgraduate research students in the Information Systems Management Research Group. Instruments were emailed to participants with instructions.

The pilot survey contained three sections. Section A contained 53 items purporting to measure the respondent perceptions of how effectively IS success elements were addressed. Items 1-43 contained elements at the user and organisational environment levels. Items 44 – 53 contained external environmental level elements. The items were scored on 7-point Likert scale, ranging from 1 (Extremely Effective) to 7 (Extremely Ineffective). Section B contained items on usage, training and IS assistance available in the organisation.

Section C contained demographic items, such as nationality, gender, time on job and in organisation implementation of IS success measures in the organisation. Space was provided for additional or clarifying comments.

Face and content validity of the questionnaire was addressed by examining the responses and comments by the pilot study participants. Similarly, reiterative revisions and meetings with experts in the school provided another means to assess the validity of the instrument.

After a final review, the questionnaire was administered to participating organisations via key informants/contacts in each organisation in September 2003. A tactic employed in this study to eliminate the poor response rate, as experienced in a prior study, was the provision of an incentive. The inducement was the awarding of prizes¹¹ to randomly selected participants¹¹.

¹¹ Participants were requested to complete the survey questionnaire, keep the covering letter and return survey form. Each survey form was allocated a reference number, printed on the covering letter (kept by respondent) and survey form (returned to author). After receiving all possible replies a draw was conducted on 10th August 2003, by the Acting Dean of Faculty

3.13 Main Survey

3.13.1 Data Collection Procedures

The primary means of data collection in Stage 2 of this study was the self-administered mail survey to respondents in selected PNG organisations. In September 2003, more than 650 questionnaires each with a covering letter containing instructions were mailed to the contacts in 20 organisations in PNG. The questionnaires were then distributed to the participants by the contact in their respective organisations. Completed questionnaires were returned to the contact and forwarded to the author. Respondents were instructed to retain the covering letter containing the allocated numbers. The author was in constant contact via email and telephone with the organisations. The response rate was slow, taking more than the anticipated six months to complete the survey. Thus, the analysis process was further delayed; a problem highlighted in section 3.14.

A total of 267 responses from the 650 questionnaires were received, that is a response rate of 40%. Further analysis suggests that over 60% of both categories of respondents responded. Results are presented in Chapter 5.

The data were stored in a MicroSoft Access database and later imported to a PC based statistical package - Statistical Package for Social Scientists. Each record containing data items for each respondent was linked to the completed questionnaire document. The documents were stored in a safe place.

and witnessed by a senior staff of the School. Four PNGK50.00 vouchers were presented to four winning respondents.

3.13.2 Data Analysis Procedures

The analysis process began as soon as questionnaires were returned. Data were analysed using the Statistical Package for Social Sciences Version 12.9. The package was useful for descriptive statistics and inferential statistical methods such as, correlations, and significance t-tests. The analysis procedures are described and laid out in a similar manner as the research questions.

Three major tests were carried out on the data with the aim to answer the research questions. These tests are described in sections 3.13.2.1, 3.13.2.2 and 3.13.2.3.

3.13.2.1 Descriptive Statistics

Descriptive data include mean and standard deviation for all items. Secondly, the mean values were sorted in descending order to determine the most effective and the least effective elements.

3.13.2.2 Independent sample t-test

Each sub question was tested using a series of steps. First, the data were split into the two groups, i.e. Public Vs Private, Non-Managers Vs Managers, and Indigenous Vs Non-Indigenous. Next an independent sample t-test was run. The equality of variance was determined next. The homogeneity of the variance in the population being compared was tested by using Levene's Test for Equality of Variance (using the F-value and the p-value). Equal variance was assumed if $p > 0.05$, and not achieved if $p < 0.05$. Using the 0.05

significance criterion, statistically significant difference was identified among the elements.

3.13.2.3 Pearson's Product Movement Correlation Analysis

Pearson's Product Movement Correlation analysis was run to test relationship between the importance of IS success elements and how effectively these elements are addressed by organisations as perceived by managers.

3.13.2.4 Research Question 2

How effectively are the elements that contribute to IS success addressed in the organisations?

The two-step procedure to answer this question is described in section 3.13.2.1. First, a descriptive aggregate data for survey item in Part 1 was attained, followed by a rank order listing of respondent's perceptions.

Environmental factors are external to the organisation and beyond organisational control. Therefore environmental elements were excluded in this procedure.

3.13.2.5 Sub Question 2.1

Is there a difference in the respondents' perceptions of the effectiveness of IS elements in the organisations?

The goal for sub question 2.1 was to assess if perceptions differ between different groups pertaining to how effectively organisations were addressing the identified elements. Four sub questions were addressed. Sub question

one tested if there was a significant difference between Non-Managers and Managers. Sub question two tested if there was a significant difference between respondents in public and respondents in private organisations relating to the perceptions of the effectiveness of IS elements. Finally, sub question three tested if there was a significant difference between Indigenous and Non-indigenous respondent perception of the effectiveness of IS elements in the organisations. The independent sample t-test is described in section 3.13.2.2. Results of these tests are presented in Chapter 5.3.

Descriptive aggregate mean was also calculated to assess the mean difference between the groups.

3.13.2.6 Sub Question 2.2

How important are the elements for the success of IS in the organisations?

Descriptive aggregate data for the survey item in Part 2, as described in section 3.13.2.1 include mean and standard deviation for all the items relating to Part 2. The mean values were sorted in descending order to determine manager perceptions of the most important and the least important elements in the organisations. Results of these tests are presented in Chapter 5.4.

Again, environmental factors were external to the organisation and beyond organisational control. Therefore environmental elements were also excluded in this procedure.

3.13.2.7 Sub Question 2.3

Is there a difference in the managers perceptions of the importance of IS elements in the organisations?

+An independent sample t-test was run to illuminate the differences in perceptions of importance between managers in private and public organisations following a similar procedure as in section 3.16.2.5. Results of these tests are presented in Chapter 5.5.

3.13.2.8 Sub Question 2.4

Is there a relationship between the importance of the IS elements and how effectively they are addressed in the organisations?

Descriptive statistics and the mean order ranking (ascending – most to least) of the perceptions of the importance and how effectively these elements are dealt with were undertaken. The mean scores of the 10 most and 10 least important elements were compared with 10 most and 10 least effectively addressed IS success elements.

The Pearson's Product Movement Correlation analysis was run to test the relationship between the importance of IS success elements and how effectively these elements are addressed by organisations as perceived by managers. Results of these tests are presented in Chapter 5.5.

3.13.2.9 Sub Question 2.5

How have respondents attained their computer skills and training?

Mainly descriptive statistics were sought to answer this question. Results of these tests are presented in Chapter 5.7.

3.13.2.10 Sub Question 2.6

How successful was IS and what success criteria were used in the organisation?

The data analysis procedure to answer this question was similar to section 3.13.2.9.

Table 3.6 presents a summary of the data analysis and statistical tests. These tests contribute to answering the research questions. The asterisk indicates that tests were carried out in that category.

Research Questions	Test			Section Presented	Survey
	Descriptive Statistics (Mean, Standard Deviation)	Independent Sample t-test (Difference)	Pearson Product Movement Correlation		
2	*			5.3	Part 1
2.1	*	*		5.3	
2.2	*			5.4	Part 2
2.3	*	*		5.5	Part 2
2.4	*		*	5.5	Part 2
2.5	*			5.7	Part 2
2.6	*			5.7	Part 2

Table 3.6: Matrix of Statistical Tests

3.14 Problems and Limitations

The problems and limitations presented here are particularly specific to this study. By highlighting these limitations, other researchers can be aware of the possible dangers.

- A major difficulty in this research was the life-threatening incident as discussed in section 3.7. Interviews in most organisations were incomplete and over 50% of the items damaged. The fallout of this was devastating. The author and his family endured physiological trauma and this contributed to delay in the study completion.
- Case selection was limited to the organisations that initially expressed their interest to participate in the study. There were organisations in the country that were advanced in IS implementation, but did not participate.
- Law and order concerns were a major hindrance. It was extremely unsafe as a result of the law and order problems in the country. The chaos during the national elections held in the same period of the fieldwork also contributed to the upsurge in law and order problems thus impeding the study. Law and order is one of the external factors that impacted on the success of organisational systems as discussed later.

- The use of multiple cases is beneficial, particularly to attain a better general perspective of the phenomena. However, concurring with Yin's (2003) observations, the approach required more resources. In reality, time and money was limited, particularly in an environment like PNG. For instance, the logistics of organising interviews with several organisations were complex, and most organisations were not available.
- A further difficulty was the respondents' understanding of the concepts relating to the domain of study. It was often difficult for respondents to diverge from the preconceived perception of IS.
- Accessibility issues hindered mobility for the author since the majority of the buildings were not wheelchair accessible.

3.15 Chapter Summary

The conventions of two methods, case study method and survey were reviewed in this Chapter. The usefulness of the multiple case study approach and the survey questionnaire were reviewed. Also the circumstances leading to the adoption of the multi method strategy and application of the techniques and guidelines when applying the conventions were discussed. Reliability and validity issues were addressed to ensure proper guidelines were maintained in the multi method study. The next two chapters, Chapters 4 and 5, present the results of the multi method study. The description of the results of the case studies is presented in Chapter 4, while survey results are presented in Chapter 5.

Chapter 4

Results - Stage 1 Study

4.0 Introduction

The data collection approach employed in Stage 1 was described in Chapter 3. This Chapter¹² presents the results of the Stage 1 study - case studies of four organisations in PNG. The results are presented in the same manner as the initial research questions were posed in Chapter 1. The Chapter is structured as follows. An overview of the research questions and case sites are presented in sections 4.1 and 4.2 respectively. Section 4.3 presents a cross analysis of the case studies followed by the conclusion in section 4.4.

The Stage 1 study adopted the linear-analytic structure as proposed by Yin (2003). As a common approach, this structure is applicable to descriptive, explanatory and exploratory studies. In regards to disclosure, instead of individual reports, this study presents the composition of a cross case analysis as suggested by Yin. That is, individual case reports are not disclosed, but only aggregate evidence is published. Identities of the case sites are revealed, however, participants remain anonymous. Similarly, the study adopted the analysis process suggested by Strauss and Corbin (1990) described in Chapter 3.9.

¹² A paper drawn from this section titled "Factors Influencing Information Systems Success in Papua New Guinea Organisations: A Case Analysis", was presented at the Information Technology in Regional Areas conference, 17 December 2003, Caloundra where it won a best paper award and was published in the Australasian Journal of Information Systems, 2004, Vol. 11 No. 2 pp57-69.

4.1 Review of the Research Questions

The objective of the Stage 1 study was to determine the elements that contribute to IS success and assess the extent to which these elements are addressed in PNG organisations. The Stage 1 study addressed two main questions as presented in Chapter 1 and summarised in Table 4.1. The three categories addressed in this study - user, organisation and external environments - were adopted from the framework advanced by Ives et al. (1980), described in Chapter 2.2.1.2.

RQ	Research Questions	Category Addressed	Discussed in section
1.	What are the perceived elements that contribute to IS success in PNG organisations?		4.3.2
1.1	What are the perceived user environment elements that contribute to IS success in PNG organisations?	User Environment	4.3.2.1
1.2	What are the perceived organisational environment elements that contribute to IS success in PNG organisations?	Organisation Environment	4.3.2.2
1.3	What external environment elements influence IS success in PNG organisations?	External Environment	4.3.2.3
2.	To what extent are the elements addressed in PNG organisations to ensure IS success?		4.3.4
2.1	How important are these elements to ensure IS success in PNG organisations?		4.3.5

Table 4.1: Summary of Research Questions in Stage 1 of Current Study

Research question two is the underlying question addressed in stage two of this study, presented in Table 5.1.

4.2 Overview of the Case Sites

Eight case studies were initially conducted, however, the results of only four organisations are presented in this thesis, the circumstances of which are explained in Chapter 3.6. The four case studies reported in the Stage 1 study are: The PNG University of Technology (PNG Unitech), Internal Revenue Commission (IRC), PNG Waterboard (PNGWB) and Boroko Motors Ltd. An overview of the organisation context is presented in Table 4.2.

Organisation Context				
Case	Category	Size	IS Staff	IS Experience
PNG University of Technology	Public Higher Education	2000	3	1970
Internal Revenue Commission	Public Revenue Generation	700	14	1990*
PNG Waterboard	Private Service	300	2	1980
Boroko Motors	Private Sales/Marketing	200	4**	1980

* The taxation component of IRC was computerised prior to the amalgamation
** Only network support and training staff

Table 4.2: Context of Organisations

The PNG Unitech and IRC are public sector organisations. Financially they depend on national government funding. Although facing similar contextual issues, the institutions maintain contrasting perceptions of IS. The PNGWB, is a commercial statutory agency, and operates on a commercial basis. Thus, it is able to sustain its operations. In this study, the PNGWB is classified as a private sector organisation. Finally, Boroko Motors Ltd provided an opportunity

to contrast IS implementation between organisations in the public and private sector.

The case studies commenced in May 2002, and abruptly ended in August the same year. The PNG Unitech pilot study began on 22nd May and ended early June 2002, the first of the four case studies. The IRC, PNGWB and Boroko Motors studies commenced mid June 2002 and ended in August 2002. The latter three case studies were conducted concurrently. Detailed descriptive analysis of the case studies can be found in Appendix 7, 8, 9 and 10. The following sections present summaries of the four case studies.

4.2.1 The PNG University of Technology (Pilot study)

The PNG Unitech case study achieved two objectives: first, to elicit stakeholder perceptions of the elements associated with effective implementation of IS in the institution; and second, to refine and consolidate the research framework, the case study protocol, and data collection procedures useful for the remaining studies. The results from this study contributed to the overall analysis of IS in PNG.

The institution has over the years embraced IS as a tool and utilised it to enhance its administrative, academic and research programs. Hence, a wide range of computer systems were implemented and supported at PNG Unitech. For example, office automation systems were utilised extensively throughout the institution, thus projecting the high level of IS penetration.

The principal system evaluated in the PNG Unitech study was the Student Information System (SIS). The system was first developed in the late 1970s. It has since evolved through a number of major changes. An example of one of the changes was the migration from the mainframe based system to the current Oracle Relational Database Management System. The system, however, was perceived to be problematic and ineffectively addressing user requirements at the time of this study. Users expressed dissatisfaction with the system.

The utilisation of IS and related technologies was widely encouraged by the organisation. However, the general consensus among the participants was that top management involvement, direction and commitment was inconsistent.

The IS division progressed through numerous structural changes. These changes reflect the vision and direction of IS at the strategic level. A view held by one of the managers in that organisation was that, "*things were falling to pieces at the strategic level*" (*sic*). In this regard, IS was not viewed as a strategic tool or a core business activity. This could be one reason why resource allocation for IS was not prioritised.

The lack of resources, particularly the stringent IS funding level, and the shortage of skilled IS staff were barriers to effectively implement and manage IS. The institution relies on national government funding. However, government allocations depended on numerous variables including the socio-economic conditions, political focus and developmental emphasis by the

current government. To supplement the funding deficiency, donor-assisted programs were widely encouraged. In fact, PNG Unitech was the beneficiary of numerous donor sponsored IS projects, including the SIS. Innovative changes and progress were constrained by the insufficient level of IS funding.

Stakeholder perceptions differed regarding the level of the SIS success. The outcome of the case study showed that the SIS was functional, however, participants were of the view that the system was unable to efficiently achieve user requirements.

The experiences gained from the pilot case study provided insight, and highlighted issues that needed to be addressed. It provided guidelines for the remaining case studies, particularly the study protocol. The study also revealed useful information that conceptualised the organisation's IS portfolio, and elicited key elements that contributed to the success of IS in PNG Unitech. Results of the study contributed to the overall analysis presented later in this Chapter. The summary of IRC, the first case study undertaken in Port Moresby, is presented next.

4.2.2 Internal Revenue Commission

The IRC was established in 1992. The IRC is responsible for the country's tax, customs and recently the Value Added Tax systems. The organisation encourages the utilisation of IS in all its divisions. IS plays a key role in the organisation's business activities.

The principal systems evaluated in IRC were: the Revenue Assessment System (RAS) and the Automated Systems for Customs Data¹³ (ASYCUDA). RAS supported the IRC's tax system, likewise, ASYCUDA automated the functions of the customs divisions. The systems were implemented on separate platforms and functioned independently, and were supported by the IS section. The Customs division maintained its own ASYCUDA support team.

Similar to PNG Unitech, IRC relies on national government funding. Again, the level of allocation depended on the country's socio-economic condition, long-term strategies and the government's political will. The organisation sought funding from donor agencies to supplement the national government funding deficiencies. The RAS was donor-funded and ASYCUDA is a free off-the-shelf package, donated by international agencies, in this case the United Nations Technology Assistance Development Division [UNCTAD].

The senior executive management team was of the view that IS was a strategic and integral part of IRC's operations. The top management comprises the Commissioner, Deputy Commissioners and senior divisional directors. However, a number of issues were raised that potentially restricted IS development in the IRC. These include: the lack of competent IS staff and provision of IS training, management support, funding, availability of skilled IS professionals and data security.

¹³ ASYCUDA, acronym for - Automated SYstem for CUstoms DAta was developed by the United Nations Technology Assistance Development Division [UNCTAD]. In 1981 UNCTAD received a request from the secretariat of the Economic Community of Western African States (ECOWAS) to assist in the compilation of foreign trade statistics in their member States. After an initial evaluation it became quickly apparent that this would only be possible at the Customs clearance offices and that the Customs clearance procedures required to be modernized to achieve quality results.

The IRC study was a snapshot of the current IS situation, and therefore, somewhat limited. However, useful data were collated which provided the nucleus of the case study results. The study results are discussed later in Chapter 5.

4.2.3 The PNG Waterboard

The PNGWB case study was undertaken concurrently with IRC and Boroko Motors. Boroko Motors is presented later in section 4.2.4. The agency possessed a high level of experience because of the organisation's history in IS implementation. The principal system investigated in this case study was the Customer Billing System, a major component of the Management Information System implemented just prior to this study. The general perception in that organisation was that IS was meeting organisational requirements, particularly customer billing and administration.

Top management in that organisation perceived IS as a core business activity, and a critical factor for its success. This view was supported by the CEO, that is that, IS was *"critical and top priority"*. Another respondent reaffirmed the CEO's point and further expressed the view that the organisation relied *"on information generated by the system"*. However, concerns were raised regarding issues at the strategic level. These issues include IS policy guidelines and IS planning. For example, one manager was of the view that there was *"no IS policy"*. Similarly, another respondent expressed the view that the organisation did not have a *"fully developed IS policy"*.

The organisation's operations including IS were supported by utilising the revenue generated through water and sewage service charges. Thus, PNGWB was able to support its operations.

4.2.4 Boroko Motors Ltd

The Boroko Motors case study was undertaken concurrently with the IRC and PNGWB. Boroko Motors is a division of a private sector organisation, Carpenter Group of Companies. The organisation implemented an enterprise system and supported two major computer information systems, a stock control system and the vehicle system. The systems were installed and maintained by external consultants.

IS investments were assessed in terms of achieving efficiency in the organisation process with the primary objective to maximise the organisation's efficiency and profitability.

Senior management in that organisation were of the view that IS was a strategic and integral part of the organisation's business activity. The impact of external factors on organisation functions was their major concern. For instance, the company was a nationwide distributor of motor vehicles, hence an effective telecommunication infrastructure was critical for their operations.

Similar to the previous organisations, there was no accepted IS policy or any guidelines for the organisation. Moreover, respondents were not aware of any IS planning, particularly on a long-term basis as decisions were made

externally. Further development was based upon the recommendation from consultants. Case results contribute to the overall analysis.

4.3 Cross Analysis of the Case Studies

4.3.1 Stages of technological growth in organisations

The four organisations involved in the Stage 1 study progressed through the first two major technological eras as proposed by Ross and Keeny (1999). The IS evolution framework is presented in Chapter 2.3.1.2. However, these organisations were yet to fully evolve into the third era as shown in Table 4.3. This may be partially attributed to a number of factors including the organisational preparedness, and their ability to sustain web driven change.

Case	Unit of Analysis <i>Organisation IS- Principal Application</i>	Technological Era		
		Main Frame	Distributed system	Web based
PNG Unitech	Student Administration	Yes	Yes	No
IRC	RAS	Yes	Yes	No
	ASYCDA			Yes (Not implemented)
PNGWB	Billing System	Yes	Yes	No
Boroko Motors	Reynolds & Reynolds Enterprise System	Yes	Yes	Yes (Not implemented)

Table 4.3: Matrix of the Technological Era of Organisations

4.3.2 Contributors of IS Success

The analysis of qualitative evidence revealed more than fifty elements that were perceived to be prime contributors for IS success in PNG organisations.

Elements that contribute to IS success as identified in this study	Similar contributing elements in the literature	New elements emerged in this study
1	Training provided for users in IS capabilities	*
2	User awareness & understanding of IS in the organisation	*
3	Relationship between users & IS staff	*
4	IS staff in the organisation	
5	Technical skills and competence of IS staff	*
6	Career advancement & remuneration for IS staff	*
7	User confidence in the computer system	*
8	IS staff ability to promptly process user requirement	*
9	IS application integration in the organisation	*
10	IS infrastructure in the organisation	
11	IS flexibility & responsiveness to changing user needs	*
12	Availability (low percentage of downtime) of IS	*
13	IS integrity	*
14	Reliability of output information from IS	*
15	Accuracy of information from IS	*
16	Availability and timeliness of output information from IS	*
17	Currency (up-to-dateness) of information from IS	*
18	IS application development by IS staff	
19	User assistance in solving IS difficulties/problems	*
20	User access to IS facilities in the organisation	*
21	Identifying user requirements by IS staff	
22	Availability of IS documentation	*
23	Management of IS in the organisation	
24	Data security and administration	*
25	IS vendor (supplier) application support	*
26	Management awareness & understanding of IS capabilities	*
27	Support given by top management for IS applications	*
28	Funding for IS application for the organisation	*
29	Strategic planning for IS application for the organisation	*
30	Prioritising IS as a strategic tool in the organisation	
31	Alignment of IS strategy with business objectives	*
32	IS knowledge transfer from IS specialists to organisation	*
33	Organisational position of IS division	*
34	Working relationship (proximity) between CIO & CEO	*
35	Leadership and direction by IS Director/CIO	
36	IS ownership by management	
37	IS innovativeness (creativity) in the organisation	
38	Co-operation with public/private agency in IS implementation	
39	Ability to adapt changing technology, software & methodology	
40	IS policies & guidelines in the organisation	
41	National IS policies encouraging IS implementation	*
42	Availability of skilled IS professionals in the country	*
43	Political condition in the country	*
44	Economic condition of the country	*
45	Law & Order conditions in the country	
46	National planning & direction for IS in the country	
47	Employment procedures and conditions for IS specialists	*
48	Affiliation with industry professional bodies	*
49	National Information policies	
50	IS industry support in the country	*
51	Access to telecommunication infrastructure in the country	
52	Long term (future oriented) IS planning	
53	Long term (future oriented) IS budgeting	
54	Cultural impact – wantok system	*

Table 4.4: General Summary of Elements Identified in Study

The list is context-specific and not exhaustive, however, it demonstrates characteristics similar to that of results observed in prior studies. The findings are shown in Table 4.4.

A comparative cross table analysis was employed to determine and confirm the presence of previously identified elements in the PNG context. The analysis process is described in Chapter 3.8. New elements not found in the literature from prior studies were identified. Consistent with the research framework and in congruence with prior work, elements revealed in this study were categorised into three levels: user, organisation and external environments. The framework for categorisation was adopted from Ives et al. (1980)(refer to Chapter 2.2.1.2). Several other categories including software development defined in the Ives et al. (1980) model were given less emphasis because of the lack of activity in this area. This limitation is described in Chapter 7.3. In addition, elements with similar themes were grouped into dimensions as described in Chapter 3.8. Results are presented according to the manner in which the research questions were posed earlier in the Chapter.

In the following tables, the aggregated counts of the number of passages (number of times an element is mentioned) are presented. The significance of the number of counts is arbitrary. Hence, it is acknowledged that general assumptions cannot be made on the basis of these counts. However, it does show the popularity of the element among stakeholders.

4.3.2.1 User Environment Elements

The rationale of sub question 1.1 was to elicit and understand the elements that contribute to IS success at the user environment. The identified elements are presented in Table 4.5.

Analysis of case data revealed 21 elements that were perceived as contributors to IS success at the user environment level. Of the 21 elements, 95% cross-referenced with similar themes identified in the normative literature.

User Environment Elements that contribute to IS Success in PNG Organisations	No. of Passages (Frequency)				Tot	New Elements emerged in this study
	PNG Unitech	IRC	PNG WB	Boroko Motors		
Human Resource Management (HR)					122	
Training provided for users in IS capabilities	18	31	17	5	71	
User awareness & understanding of IS in the organisation	8	20	10		38	
Relationship between users & IS staff		3			3	
Technical skills and competence of IS staff	1	6	5	1	13	
Information Quality(IQ)					19	
Reliability of output information from IS		4			4	
Accuracy of information from IS		2	3		5	
Availability and timeliness of output information from IS	1	3	3	1	8	
Currency (up-to-date) of information from IS			2		2	
System Quality(SQ)					34	
IS ability to promptly process user requirement	2	2			4	
IS flexibility & responsiveness to changing user needs		3	1		4	
Availability (low percentage of downtime) of IS			8		8	
IS integrity		8	1	1	10	***
Data security and administration		11			11	
Technical(Tech)					29	
IS application integration in the organisation		2	2	3	7	
IS infrastructure in the organisation	1	3			4	
IS application development by IS staff			2		2	
User assistance in solving IS difficulty/problems	2				2	
User access to IS facilities in the organisation		2			2	
Identifying user requirements by IS staff		4			4	
Availability of IS documentation		8			8	
*** Elements emerged in this study						

Table 4.5: Elements that Influence IS Success - User Environment

IS integrity, represented by 3 asterisks in Table 4.5, was a new element identified in this study. Senior staff expressed concern regarding audit trails in maintaining system integrity, reliability, accuracy, data security and administration.

An aggregated count of the number of passages revealed that together with IS training (71 counts), user awareness and understanding (38), technical skill and IS staff competency (13), data security and administration were predominantly mentioned.

The human resources management dimension was predominantly mentioned with an aggregated total of 122 passages. This was followed by Systems Quality with 34 counts, and Technical construct with 29 counts. As a single element, the provision of IS training was predominantly mentioned by participants in all the organisations. With the exception of Boroko Motors, user awareness and understanding of IS was next.

These results reflect the insufficient level of capability development in organisations. Participants were of the view that there were inadequate IS professionals with the competency to lead and train them. Technical and system quality issues were also highlighted as skill levels and technical difficulties affected system and output quality.

4.3.2.2 Organisational Environment Elements

The rationale of sub question 1.2 was to understand and explain the elements that individuals perceive contribute to IS success at the organisational environment. The elements are presented in Table 4.6.

Organisational Environment Elements that contribute to IS Success in PNG Organisations	No. of Passages (Freq)				Tot	New Elements emerged in this study
	PNG Unitech	IRC	PNG WB	Boroko Motors		
Human Resource Management (HR)					70	
IS staff in the organisation			4		4	
Career advancement & remuneration for IS staff	4	15	1		20	
Management awareness & understanding of IS capabilities	5	7	1	3	16	
IS knowledge transfer from IS specialists to organisation		29			29	***
Working relationship (proximity) between CEO & CIO						
Leadership and direction by IS Director/CIO			1		1	
Management (MN)					123	
Management of IS in the organisation	1	1			2	
Organisational position of IS division	15			1	16	
IS ownership by management	2				2	
Co-operation with public/private agency in IS implementation	4	1			5	
Support given by top management for IS applications	18	17	3	3	41	
Funding for IS application for the organisation	19	33	5		57	
Strategic (STR)					110	
Strategic planning for IS application for the organisation	2	9	1		12	
Prioritising IS as a strategic tool in the organisation	18	8	5	3	34	
Alignment of IS strategy with business objectives	2	6		3	11	
IS policies & guidelines in the organisation	9	8	3	3	23	
Long term (future oriented) IS planning	7	8			15	
Long term (future oriented) IS budgeting	7	8			15	
Technical (Tech)					24	
IS vendor (supplier) application support		12			12	
IS innovativeness (creativity) in the organisation	1	5			6	
Ability to adapt changing technology, software & methodology			3		3	
Ability to adapt changing technology, software & methodology			3		3	

Table 4.6: Elements that Influence IS Success - Organisational Environment

Analysis of the case data revealed another 21 elements at the organisational environment. Of the 21 elements, 81% corresponded to themes identified in prior studies. Again, elements were grouped into themes emerged from the

analysis. Two new elements emerged at the organisational environment. These elements are: skills and knowledge transfer, cooperation between public agencies and between private and public sector organisations. Scarcity in local IS professionals prompted organisations to employ foreigners for short and long-term contracts. However, participants were of the view that foreign consultants rarely trained local staff, thus skills were not transferred to the organisation. Hence, organisations continue to rely on foreigner expertise.

Although there was increased uptake of IS in the public sector, there appeared to be little cooperation among these agencies. Resources and experiences were not being shared between the organisations. This is of concern, because government organisations are required to work in unison to implement government policies. Similarly, participants were of the view that long-term planning and budget were lacking in the public sector, particularly for IS investment. The uncertainty of favourable national government funding was a contributing factor to the inadequate level of IS funding. Cultural orientation of managers may also influence long-term IS planning and budgeting.

Aggregated count of the number of passages revealed that IS funding (57 counts), management support (34), prioritising IS (34), skills and knowledge transfer and awareness (29) were predominantly mentioned. IS funding, management support and organisation structure were also prominent in PNG Unitech. Similarly, IS funding, knowledge transfer and management support were the prominent elements mentioned in IRC. Prioritising of IS, funding and IS staff level were principal elements for PNGWB.

Aggregated counts of the elements in Table 4.6 show that the Management dimension was prominent with a total of 123 counts while Strategic followed with 110 counts. Results show that participants were concerned with management and strategic issues such as management support and funding, IS policy and planning.

4.3.2.3 External Environmental Elements

IS is influenced by the organisational and by the wider political socio-economic, cultural, and technological climate with which organisations exists. Understanding the elements that inhibit IS success at this level was significant. Table 4.7 presents the identified elements.

External Environment Elements that influence IS Success in PNG organisations	No. of Passages (Freq)				Tot	New Elements emerged in this study
	PNG Unitech	IRC	PNG WB	Boroko Motors		
Human Resource Management (HR)					80	
Employment procedures and conditions for IS specialists	1	15			16	***
Availability of skilled IS professionals in the country	18	39	4	3	64	
Socio-Economic & Political construct					37	
Political condition in the country	4	8	2	3	17	
Economic condition of the country	4	8	2	3	17	
Law & Order conditions in the country		1		2	3	
Strategic (STR)					20	
National IS policies encouraging IS implementation	3			2	5	
National planning & direction for IS in the country	4	10	1		15	
Technical (Tech)					31	
Affiliation with industry professional bodies	5				5	
IS industry support in the country			4		4	
Access to telecommunication infrastructure in the country		12		10	22	
Cultural (CUL)					18	
Cultural impact – wantok system	7	5	3	3	18	***

Table 4.7: Elements that Influence IS Success - External Environment

While causality is often difficult to determine, external factors implicitly or explicitly can influence IS success in organisations.

Twelve elements were identified at the environmental level. Of these, ninety percent corresponded with the themes identified in prior studies. Public service employment procedure and conditions and “wantok system” emerged as new external elements in this study (represented by 3 asterisks in Table 4.6). Case data analysis revealed that stringent public service recruiting procedures and employment conditions affect recruitment and retaining of IS professionals, both local and foreign.

Government agencies depended on government support, and thus, rely on a healthy economic, political and social environment. The current volatile socio-economic environment projected a negative influence on IS in the organisations, both private and public.

Aggregated count of the number of passages revealed that availability of skilled IS professionals (64 counts) was the predominant topic of discussion. Access to telecommunication infrastructure (22 counts) was next followed by economic and political conditions (17 counts).

Except for Boroko Motors, the unavailability of skilled IS professionals was predominantly highlighted in IRC, Unitech and PNGWB. Employment procedures and telecommunication issues were also prominent for IRC, but aggregated counts of elements in Table 4.7 show that the Human Resource construct was prominent with a total of 80 counts, while the Socio-Economic

and Political construct followed with 70 counts. Results show that there was a general consensus among participants regarding the unavailability of IS professionals and the impact of the volatile economic and political environment. Similarly cultural impact on IS implementation is represented by the “wantok system”. As described in Chapter 2.1.1.3, “wantok system” is a cultural notion that promotes clans and tribalism, where relatives, clans or region take priority over any other.

4.3.2.4 New elements revealed in this study

New elements not previously identified emerged in this study as summarised in Table 4.8. The four elements were introduced in sections 4.3.2.1, 4.3.2.2 and 4.3.2.3.

Elements established in this study	Description
1. IS Integrity	A system that has exhausted security, quality, self audit, and self integrity tests. Correct processing and information on a computer system. Self assuring threat against informal system (wantok system).
2. Skills transfer from consultant to organisation	Knowledge and skills on any aspect of IS that consultants are engaged in.
3. Employment procedures and conditions for IS specialists	The government bureaucratic system of staff recruitment and employment.
4. Cultural impact - the wantok system	Informal system that is in conflict with the formal system. Accepted form of nepotism, a subtle discrimination of resource allocation.

Table 4.8: Elements Emerged in Study

4.3.2.4.1 IS Integrity

Managers in the organisations were concerned with the reliability of the system and the outcomes it produced. They were of the view that a system that exhausted security, emphasised quality, self-audit, and self-integrity tests was important. They emphasised the need for reliable data, correct processing and output information quality from their computer system. In addition, the system is protected against threats from informal systems such as the “wantok” system.

4.3.2.4.2 Skills transfer from consultants to organisations

Human resource pertaining to IS in PNG is characterised by the scarcity of skilled IS professionals and the continued engagement of consultants. All the cases investigated in this study engaged consultants at varying levels to develop and implement and maintain their organisational IS. However, there is ongoing debate regarding the transfer of knowledge and experience to the organisations. Organisations have become dependent on consultants and give less emphasis to building up their knowledge base and skill levels.

4.3.2.4.3 Employment procedures and conditions

Organisations, particularly in the public sector, were impeded by the stringent bureaucratic procedures in employing IS staff. Managers were frustrated by the slow processing of recruitment, and often missed the opportunity to employ suitable IS personnel, scarcely available in the market. A further implication is that remuneration packages accorded to employees, set by the public service, were inadequate.

4.3.2.4.4 Cultural influence – the “wantok system”

As described in Chapter 2.1.1.3 the “wantok system” is a social norm common in most collectivist societies. In the context of IS, scarce resources were distributed discriminately, in most instances favouring their “wantoks”. Similarly, the “wantok system”, an informal system, tends to be in contrast to and stronger than the formal system. Secrecy and security, including formal procedures, are prone to be breached as employees are obligated to provide and cater for wantoks’ needs, including the provision of information.

4.3.3 Comparison with other studies

Case studies of the four organisations undertaken in Stage 1 of this study revealed more than fifty elements. The majority of these findings were consistent with that found in prior studies elsewhere. For example, Al-Abdul-Gader (1999) identified 40 barriers that inhibit the success of IT diffusion in five Gulf nations. Jain (1997a) revealed similar factors grouped into five dimensions. Li (1997) revealed five new factors additional to the other 40 already identified by Bailey and Pearson (1983).

Results in Stage 1 of this study revealed some similarities with elements identified in the North American studies and those from LDCs. Although the level of importance in the aggregated counts are arbitrary, these figures show that stakeholders were aware of these barriers.

Slightly over 56% of the IS success factors defined by Li (1997) are consistent with the findings in this study. Similarly, 45% of the factors found in Miller and

Doyle (1987) study were present in this study. Furthermore, slightly over 35% of the elements defined in Al-Abdul-Gader's (1999) study are present in this study.

No.	Elements that contribute to IS success as identified in this study	Prior Studies					Current Study
		Li (1997)	Miller Doyle (1984)	Jain (1997a)	Ang et al. (2001)	Al-Abdul Gader (1999)	
1	Training provided for users in IS capabilities	*	*	*	*	*	
2	User awareness & understanding of IS in the organisation	*	*				
3	Relationship between users & IS staff	*	*				
4	IS staff in the organisation						
5	Technical skills and competence of IS staff	*	*				
6	Career advancement & remuneration for IS staff				*	*	
7	User confidence in the computer system	*	*			*	
8	IS ability to promptly process user requirement	*	*				
9	IS application integration in the organisation	*		*			
10	IS infrastructure in the organisation						
11	IS flexibility & responsiveness to changing user needs	*	*				
12	Availability (low percentage of downtime) of IS		*				
13	IS integrity						*
14	Reliability of output information from IS	*					
15	Accuracy of information from IS	*	*				
16	Availability and timeliness of output information from IS	*	*				
17	Currency (up-to-date) of information from IS	*	*				
18	IS application development by IS staff						
19	User assistance in solving IS difficulty/problems	*			*		
20	User access to IS facilities in the organisation	*	*				
21	Identifying user requirements by IS staff					*	
22	Availability of IS documentation	*	*				
23	Management of IS in the organisation						
24	Data security and administration	*	*				
25	IS vendor (supplier) application support	*		*		*	
26	Management awareness & understanding of IS capabilities				*	*	
27	Support given by top management for IS applications	*	*			*	
28	Funding for IS application for the organisation	*	*		*	*	
29	Strategic planning for IS application for the organisation		*	*		*	
30	Prioritising IS as a strategic tool in the organisation						
31	Alignment of IS strategy with business objectives				*		
32	IS knowledge transfer from IS specialists to organisation						*
33	Organisational position of IS division	*					
34	Working relationship (proximity) between CIO & CEO			*		*	
35	Leadership and direction by IS Director/CIO						
36	IS ownership by management						
37	IS innovativeness (creativity) in the organisation						
38	Co-operation with public/private agency in IS implementation					*	
39	Ability to adapt changing technology, software & methodology						
40	IS policies & guidelines in the organisation					*	
41	National IS policies encouraging IS implementation				*		
42	Availability of skilled IS professionals in the country			*		*	
43	Political condition in the country			*			
44	Economic condition of the country				*		
45	Law & Order conditions in the country						
46	National planning & direction for IS in the country						
47	Employment procedures and conditions for IS specialists						*
48	Affiliation with industry professional bodies			*			
49	National Information policies						
50	IS industry support in the country				*		
51	Access to telecommunication infrastructure in the country					*	
52	Long term (future oriented) IS planning					*	
53	Long term (future oriented) IS budgeting					*	
54	Cultural impact – wantok system						*

Table 4.9: Summary of Elements Compared to those in other Studies

Table 4.9 shows a matrix of the elements revealed in the current study and those in prior studies.

It can be concluded from these results that despite the contextual differences organisations in DCs and LDCs were faced with similar IS success barriers.

4.3.4 Importance of the elements that contribute to IS success

The general consensus among participants in the four cases was that all the identified elements were perceived to be important to a certain extent. By applying content analysis techniques, a frequency count was attained for each element. A limitation of the Stage 1 study was that it was difficult to attain the degree of importance for the identified elements. This concern is addressed in the Stage 2 study.

At the user environment level, IS training was the most dominant and highly rated. Aggregated count of the number of passages revealed that together with IS training and lack of funding, user awareness and understanding, data security and IS availability were predominantly mentioned. Similar assessment of elements at the organisational level revealed that lack of IS funding, management awareness and support were the dominantly mentioned issues. Other issues include policy, planning and administrative process.

At the external environmental level, availability of skilled IS professionals was prominent and perceived as an important IS success constituent. Hence,

Human Resource, Strategic issues and System Quality dimensions were highly rated.

4.3.5 Effectively addressing user environment elements

This section seeks to understand how effectively organisations in PNG address the identified user environment level elements. Table 4.10 shows the elements and the extent to which the elements were dealt with. Elaborations of selected elements are presented next.

User Level Elements that contribute to IS Success in PNG Organisations	Has this element been effectively addressed in the organisation?			
	PNG Unitech (25%) of N	IRC (56%) of N	PNG WB (11%) of N	Boroko Motors (8%) of N
Human Resource Management (HR)				
Training provided for users in IS capabilities	No	No	No	Mix
User awareness & understanding of IS in the organisation	No	No	No	Mix
Relationship between users & IS staff	No	Mix	Mix	Yes
Technical skills and competence of IS staff	No	No	Mix	Mix
System Quality(SQ)				
IS ability to promptly process user requirement	No	Yes	Mix	Yes
Availability and timeliness of output information from IS	No	Yes	Mix	Yes
User confidence in the computer system	No	Yes	Mix	Yes
IS flexibility & responsiveness to changing user needs	No	No	Yes	Yes
IS integrity	No	Yes	Yes	Yes
Reliability of output information from IS	No	Yes	Yes	Yes
Accuracy of information from IS	No	Yes	Yes	Yes
Technical(Tech)				
User access to IS facilities in the organisation	Yes	Mix	Yes	Yes
Availability of IS documentation	No	No	No	No
Data security and administration	No	Yes	Yes	Yes
IS vendor (supplier) application support	No	Mix	Mix	Yes

Table 4.10: Addressing IS Success Elements - User Environment (N=36)

Top management in the public sector were generally aware of the impending issues and the importance of addressing them. However, they were hindered by resource constraints, a view saliently summarised by a member of SEM at

Unitech - *“Management is willing but we do not have the resources to support it”*. As observed, private sector organisations were generally capable of addressing these elements.

4.3.5.1 IS Training

The provision of IS training is a critical success factor (Jain, 1997a; Montealegre, 1998). Case study results in this study reveal that IS training was also perceived as an important element for IS success. However, participants were of the view that there was insufficient provision of IS training in the organisations. For example, in the IRC one participant expressed the view that *“proper training for the use of computers was unavailable”*. A respondent in that organisation was of the view that IS training at all levels was lacking. He also thought that it was a critical element for utilising IS and its success, thus, required immediate attention.

Similarly, participants in PNG Unitech were concerned about the level of IS training provided in that organisation. One respondent expressed the view that the institution needed to *“seriously approach the issue of training”* as it was significant to IS success at PNG Unitech. The same respondent was of the view that *“anything pertaining to IS should involve training”*.

In PNGWB, top management were of the view that IS training was an important element for IS success. However, generally managers felt that *“IS training was lacking”*. For example, one respondent stated that the organisation possessed the technology, however *“the problem was IS literacy and skills”*. In addition it was stated that there was a lack of a training plan for IS staff and the users.

In contrast, Boroko Motors maintained a strong emphasis and was committed to providing ongoing IS training for all staff. The primary objective of the IS section in that organisation was to provide user training, network administration and support. Participants were satisfied with the organisation's ongoing training program. In their case, the organisation engaged external consultants to implement and administer the IS. IS experience in the organisation was relatively new, therefore, IS knowledge and literacy programs were required at all levels on an ongoing basis.

A brief summary of participant observations regarding the provision of IS training is shown Table 4.11.

Case	Training provided for users in IS capabilities
PNG Unitech	<i>"training through IT services is limited, and with no support"</i> <i>"we seriously need to approach the issue of training"</i>
IRC	<i>"the training facility is not available"</i> <i>"training is a must and ongoing, should be budgeted every year"</i> <i>"training is lacking and is a major issue here"</i>
PNGWB	<i>"our training is not good, IT training is a must"</i> <i>"users need training"</i>
Boroko Motors	<i>"training is one area that needs to be emphasised"</i> <i>"training is concerned we have not had too many issues"</i>

Table 4.11: Summary of Quotes - IS Training

Generally, the need for IS training was identified at a number of levels: IS staff training, user training in the operations for a particular system, and a general IS literacy program on the evolving technologies. IS training was required at all levels in organisations on an ongoing basis for managers, non managers and IS staff.

Participants were of the view that inadequate IS literacy and training programs contributed to the lack of IS awareness and understanding. They also felt that IS training at the management level needed emphasising, since management support, funding and other strategic issues depended on how management perceived IS. That is, management knowledge and awareness of IS positively influenced how management perceived IS and supported it.

Results from this study show that the provision of IS training was perceived to be an important element by all participants. However, apart from the mixed feelings from Boroko Motors, there was lack of commitment by organisations in addressing the element as reflected in Table 4.11.

4.3.5.2 Information Quality

Results show that organisations emphasised information integrity and information availability with a focus on delivery. Furthermore, system integrity was essential to maintain information reliability for business operations and decision-making. Managers require accurate information delivered on a timely basis. Except for PNG Unitech, these factors were addressed by the three organisations.

The quality and integrity of information delivered depends on system integrity, and the quality of data input. The need for data input integrity was emphasised by a manager in PNGWB who stated that “*the important thing is the input*”. Similarly, participants in the IRC were of the view that data input and output quality were important. Tax information was confidential, therefore security and accuracy were appropriately emphasised.

4.3.6 Effectively addressing organisational environment elements

The goal of sub question 3.2 was to understand if organisational elements were being effectively addressed. The key elements discussed are: management IS knowledge and support, IS funding, prioritising IS as a strategic tool, IS policy, availability of IS professionals, CEO/CIO proximity, and IS staff in the organisation.

Generally, the results show that PNG Unitech was ineffectively dealing with all the elements revealed in this study. Results across the four cases regarding management of IS, IS policies and guidelines, cooperation among organisations and strategic planning were similar. These four elements were inadequately addressed by the four organisations. Comparisons between the public sector organisations show that the IRC was making far greater effort in dealing with the identified elements. On the other hand, results show that the private sector organisations again in general have dealt with the elements.

4.3.6.1 Management Support

Management support is one of the key elements for IS success. However, participants expressed the view that top management were not committed to supporting IS at PNG Unitech. One participant was of the view that management were not supporting IS financially. Participants perceived that top management support was particularly lacking as shown in Table 4.12. A senior executive member was of the opinion that funding constraints did not allow the organisation to support IS. He expressed the view that “*the constraint was the availability of funds*”. The organisation’s inability to fund IS

projects was a critical factor inhibiting organisational commitment and support.

Top management in PNGWB perceived that IS was a useful and strategic tool and an integral part of the organisation. Participants felt that top management were conversant in IT and were fully supporting IS in the organisation. As reflected in Table 4.12, IS was perceived as important and equally supported by top management.

Emergent Organisational Elements that contribute to IS Success in PNG Organisations	Has this element been effectively addressed in the organisation?							
	PNG Unitech		IRC		PNG WB		Boroko Motors	
	Mgr (16%) of N	SEM (5%) of N	Mgr (26%) of N	SEM (16%) of N	Mgr (16%) of N	SEM (5%) of N	Mgr (11%) of N	SEM (5%) of N
Human Resource Management (HR)								
IS staff in the organisation	No	No	Mix	Mix	Mix	Mix	Yes	Mix
Management awareness & understanding of IS capabilities	No	No	Mix	Mix	Yes	Yes	No	Mix
Working relationship (proximity) between CEO & CIO	No	No	Yes	Yes	No	No	No	No
Leadership and direction by IS Director/CIO	No	No	Mix	Yes	No	No	No	NO
Management (MN)								
Support given by top management for IS applications	No	Mix	Mix	Yes	Yes	Yes	Mix	Mix
Funding for IS application for the organisation	No	No	Mix	Yes	Yes	Yes	Mix	Mix
Organisational position of IS division	No	No	Yes	Yes	Mix	Yes	Mix	Yes
Management of IS in the organisation	No	No	Mix	Mix	No	No	No	Mix
IS policies & guidelines in the organisation	No	No	No	No	No	No	No	No
Co-operation with public/private agency in IS implementation	No	No	No	No	No	No	No	No
Strategic (STR)								
Strategic planning for IS application for the organisation	No	No	No	No	No	Mix	No	No
Prioritising IS as a strategic tool in the organisation	No	Mix	Mix	Yes	Yes	Yes	Yes	Yes
IS ownership by management	No	No	Mix	Mix	Yes	Yes	Yes	Yes

Table 4.12: Comparing Organisational Elements between Cases (N=16)

In Boroko Motors top management perceived IS to be a useful and a strategic tool. However managers were of the view that top management were apprehensive in supporting IS in the organisation. One of the managers in that organisation stated that management support was lacking.

Participants had mixed feelings about top management support in the IRC. One manager felt that top management was supportive, but only after observing the things IS could be capable of achieving. Others expressed their view that top management were not doing enough to support IS in the organisation.

The lack of IS knowledge and awareness may be a contributing factor to the lack of enthusiasm by top management. As stated, though "*top management is very progressive towards information technology*", there was a lack of understanding of the many features of IS. Another manager thought "*the problem was management's lack of knowledge of the computer system*". Apart from word processing and email their computers were hardly used for operational purposes.

The level of knowledge and literacy, and understanding of IS contributes to the management's perception of IS responsibilities, usefulness and strategic value to the organisation. It may influence management's willingness to support IS. The state of IS in the organisation as expressed by respondents reflects "the personal perceptions of leaders in the department, on how they view IS, its value to them and how they support it, through funding and staff

level and education". For instance, in the PNGWB, participants felt that top management were conversant with IS. Hence, participants felt that top management were involved in IS and providing the necessary support, including funding. However, in PNG Unitech participants perceived that top management level support and financial backing were absent.

A summary of participant observations regarding top management support is shown in Table 4.13.

Case	Support given by top management for IS applications
PNG Unitech	<i>"only a policy, when it comes to financing, management are not supporting"</i> <i>"I'd like to see commitment by the University as an organisation"</i>
IRC	<i>"top management is very progressive towards IS"</i> <i>"previously there was no management support .. Now they realise the importance of it after we have provided useful reports"</i>
PNGWB	<i>"our Managing Director is very conversant and supports IS"</i> <i>"top management is all for IS"</i>
Boroko Motors	<i>"from the top we lack that sort of thing"</i> <i>"I do not see them really pushing"</i>

Table 4.13: Summary of Quotes - Top Management Support

Hence, knowledge, awareness and understanding of IS capabilities were important ingredients for top management to make informed decisions.

4.3.6.2 IS Funding

Numerous writers suggest that the lack of funding is one of the top barriers that inhibits IS success in organisations, particularly in LDCs (Galliers, 1991; Li, 1997; Ang et al., 2001). Perhaps this is more so for government-funded organisations in LDCs, where the socio-economic conditions are volatile and

unstable. As a result of the country's poor economic conditions, and national governments' political direction, government-funded organisations are often faced with a shortage for budget allocations. Organisations in PNG are required to function within these constraints. In this context, IS was inadequately funded in most instances. The PNG Unitech and IRC, both government-funded institutions, showed that funding in general was an ongoing barrier to their operations.

In PNG Unitech, it was expressed that top management were not supportive with "*the funding level needed by IS division*". Another respondent was of the view that, the lack of funding was "*an obstacle to the efforts to successfully implement IS and provide other services*".

In contrast, funding in private sector organisations depended on the anticipated outcome, and the system's contribution to maximising productivity and profitability. For instance, in Boroko Motors, funding was available if management were in agreement that the IS project would yield better results for the organisation. With the increase in IS experience and newer technology, management were willing to invest in IS provided it contributed to increasing benefits.

To supplement the discrepancies in government funding, the IRC and PNG Unitech receive assistance from a number of donor agencies. For example, the JICA and AusAid assistance programs for infrastructure and human resources development, particularly relating to IS. AusAid was committed to support long and short-term training programs for IS staff. Similarly, PNGWB

was a recipient of donor-assisted funding for its major projects including IS investment prior to its annexing as a commercial entity. The RAS and ASYCUDA systems in IRC are the result of donor-assisted developments. A brief summary of participant observations regarding the IS funding are shown in Table 4.14.

Case	Funding for IS application for the organisation
PNG Unitech	<i>"The government is unable to fund us"</i> <i>"I am sure the problem are beyond the ITS unit of which funding may be one"</i>
IRC	<i>"Funding are very critical for us"</i> <i>"We are putting our hands up again for aid project money"</i>
PNGWB	<i>"We have our own budget with no government support"</i> <i>"We are self funding"</i>
Boroko Motors	<i>No comments</i>

Table 4.14: Summary of Quotes - IS Funding

However, long-term sustainability and continuity of the donor-funded projects were a major concern. Although foreign aid contributes enormously to IS and at a wider context improve the socio-economic condition of the country, it was important that these investments were sustained by the government. In doing so alleviate complete dependency on external funding. The difficulties with sustaining JICA equipment at PNG Unitech is an example of the inability, and dangers, of the lack of futuristic IS planning and budgeting. A view expressed by a respondent was that it would cost the organisation *"thousands to maintain the equipment because of the big gift at one time"* [sic]. Although projects funded by international donor agencies may be helpful for good governance, these projects need to be developed within a framework and systematic policy commitment in the organisation and by the government.

4.3.6.3 Prioritising IS as a strategic tool

In terms of the business process of the organisation, management were reluctant to perceive IS as a core business activity, but as a support unit. For instance, in the PNG Unitech organisation structure, the IS division is coupled with the institution's stores and transport, student services, and security services. A manager in that organisation was of the view that the IS division was *“seen as a true appendix service to the organisation”*. Another respondent was of the view that no one *“realistically has a priority outside the IS area.... and has been a 3rd, 4th or 5th problem down the line” [sic]*. Similarly, another respondent expressed the view that the organisation needed to *“change the way it viewed IS and maybe give it a little more prominence”*. He further stated that it was not seen *“as this new kind of strategic level tool and a significant component of a whole new strategy to achieve organisation goals”*. This may reflect the lack of emphasis and priority placed on IS in the organisation.

Conversely, management in PNGWB and Boroko Motors perceived IS as a core business activity and a critical success factor. For instance, top management in PNGWB stated that IS was *“critical and a top priority”*. Therefore, there is a high degree of IS support from the top management there. Similarly, IS was considered a priority at Boroko Motors. A senior manager was of the view that *“it was unimaginable being able to achieve anything without IS”*. Another manager was of the view that *“IS is actually an integral”* part of the organisation's business process.

Case	Prioritising IS as a strategic tool in the organisation
PNG Unitech	<i>“more and maybe it may require prioritising”</i> <i>“do not think anybody realistically has a priority of IS”</i>
IRC	<i>“again IT is very, very critical in this particular”</i> <i>“they do not put priority of IT”</i>
PNGWB	<i>“this is critical and it’s a priority”</i>
Boroko Motors	<i>“IT is actually an integral part of organisation”</i>

Table 4.15: Summary of Quotes - Prioritising IS

In sum, it is encouraging that even though organisations may not view IS as a major thrust, they realised the strategic importance of IS as a resource for accomplishing other objectives.

4.3.6.4 IS policies and planning

Strategic issues such as IS policy and planning are significant guidelines for the organisation’s IS development. However, there was no IS policy and long-term planning evident for all the organisations.

PNG Unitech is a leading technological institution in the Pacific with vast experience in the use of IS for academic, research and administrative requirements. However, the general consensus among the informants was that there was inconsistent and inadequate emphasis on IS policy and direction. A manager was of the view that *“definitely, we need an IS policy and we need it as soon as possible”*. Another respondent stated that *“there ought to be a policy, that policy needed to support and underpin the mission of the University, and that, at the moment we do not, and it falls to pieces from there”*. Although a number of attempts were made to develop an IS policy, the working document has been in a draft form for some years.

Case	IS policies and guidelines in the organisation
PNG Unitech	<i>"definitely, we need an IS policy"</i> <i>"there is no IS policy at the moment"</i>
IRC	<i>"there is no definite policy in place"</i> <i>"we do not ... that type of comprehensive IS policy"</i>
PNGWB	<i>"we really haven't got a policy as yet"</i> <i>"we have no IS policy ... we are working on it"</i>
Boroko Motors	<i>"we have disaster Recovery strategy and Contingency Planning"</i> <i>"I do not think we have an IS policy"</i>

Table 4.16: Summary of Quotes - IS Policy and Guidelines

The IRC also did not have an IS policy in place. One senior manager in that organisation expressed the view that *"no definite policy was in place"*. Similarly, there was no IS policy in place at Boroko Motors. One participant in that that organisation was of the view that IS was *"mainly driven by the need to automate because ...we do not have an IS policy"*.

There was a similar scenario in PNGWB in which there was *"no IS policy"* in place. Participants in PNGWB were also of the view that long-term IS planning was ineffectively addressed in that organisation. For example, when the management system was upgraded to a new platform, there were concerns and disagreement regarding the manner in which the new system was *"developed and implemented"*. As a result of the deficiencies in preparation the organisation faced delays and disruptions in their activities.

4.3.6.5 CEO/CIO proximity

Close proximity between CEO and Chief Information Officer (CIO) enables the CIO to understand the CEO's visions and plans, and align the IS and

organisational strategies. Reciprocally, the CEO can be better informed and understand IS, and its capabilities in the organisation. Close proximity of the CIO is an important factor that can influence the success of IS. For these reasons, authors such as Willcocks, Feeny and Islei (1997) and Galliers (1991) stress the essentiality to maintain close proximity between the CEO and CIO in the organisation.

The proximity of the CEO of the organisation and the IS division director was distant by one level in organisational channels of communication in all the organisations except for the IRC. Generally, top management perceived IS as a support service rather than a core business activity. This was reflected in the organisation structure, where the IS division is positioned several levels below the CEO. However, at IRC there was close proximity because of the IS division's position in the organisation structure.

4.3.6.6 IS staff in the organisation

The importance of the availability and development of human resources in LDCs has been stressed (Heeks, 2002; Montealegre, 1999; Al-Abdul-Gader, 1999). In the current study, unavailability of IS professionals was considered at the national and organisational levels. Participants were concerned about the level of skilled staff and the organisation's ability to recruit and retain IS staff. For instance, a major contributing factor to the failure of PNG Unitech's student information system was the lack of resources, in particular the availability of skilled IS personnel, as supported by this view from a participant, *"the level of technical and professional expertise was lacking, ... the problem here was staffing"*.

Other issues include: remuneration packages matching or better than that of private organisations, training and career advancement, organisation's clear policy and direction for IS, staff planning, inefficient bureaucratic recruitment process, and management understanding of staff requirements.

Unless these issues are addressed, the chances of recruiting and retaining IS staff are slim. For instance, the IS staff turnover in PNG Unitech was high. Similar concerns were raised at IRC.

In contrast, private sector organisations often have the resources to recruit and retain IS staff as was the case with Boroko Motors. The view expressed by a participant was that skilled IS professionals were not attracted to the public sector because "*of the level of remuneration packages*". As presented in Table 4.16 participants in all cases felt that the availability of IS staff in organisations was important. However, all the participants at PNG Unitech felt that the issue was inadequately addressed, while IRC and PNGWB showed mixed feelings. However, Boroko Motors felt that the IS staffing issue was sufficiently addressed.

4.3.7 Implications of external environment elements

An explanation of each elements such as the availability of IS professionals, national government IS planning and direction, and political and economic conditions is presented next.

Environmental conditions in which organisations operate have an impact on their functions. Therefore, for organisations to function effectively, an

understanding, scanning and analysis of the environmental forces surrounding the firm is essential (Kavanamur, 2002).

External Environment Factors	Is the factor important for IS success in organisations			
	PNG Unitech	IRC	PNGWB	Boroko Motors
National IS policies encouraging IS implementation	No clear policy guidance	No clear policy guidance	No clear policy guidance	No clear policy guidance
Availability of skilled IS professionals in the country	Lack of skilled IS professional	Lack of skilled IS professional	Lack of skilled IS professional	Lack of skilled IS professional
National planning & direction for IS in the country	Lack of vision and planning	Lack of vision and planning	Lack of vision and planning	Lack of vision and planning
Access to telecommunication infrastructure in the country	Inadequate Infrastructure	Inadequate Infrastructure	Inadequate Infrastructure	Inadequate Infrastructure
National Cultural Issues	Implications	Implications	Implications	Implications
Political & economic condition in the country	Non conducive Volatile	Non conducive Volatile	Non conducive Volatile	Non conducive Volatile
Law & order conditions in the country	Breakdown of Law and order	Breakdown of Law and order	Breakdown of Law and order	Breakdown of Law and order
IS industry support in the country	Lacking	Lacking	Mixed	Mixed

Table 4.17: Implications of External Environment Factors on IS Success

Results show that external barriers impede organisations and subsequently impact on IS. Participants in the four organisations were of the view that the national government must make an effort to address the external elements. This was particularly so for the public sector organisations, who rely on the government funding allocations.

4.3.7.1 Availability of IS professionals

Numerous writers suggest that there is an acute shortage of IS professionals, particularly for LDCs (for example Heeks, 2002; Jain, 1997a; Montealegre, 1999). Participants in all the organisations agreed that skilled IS professionals were scarce in PNG. One senior manager in the IRC was of the view that it

was “*difficult to locate people with skills of specialised software packages*”. Similarly, in PNG Unitech it was stated that the country did not “*necessarily have the expertise*”, therefore, it was difficult to employ IS professionals from within the country. The availability of skilled IS staff is critical to the successful application of IS in organisations in the country. The issues of IS staff was also discussed earlier in section 4.3.6.6.

As a result of the lack of skilled IS professionals in the country, organisations “*engaged people from outside to assist in the IS development*”. It was argued that generally, IS staff lack the knowledge, experience and confidence to engage in the development of large systems. Thus, one manager was of the view that IS consultants will continue to play a “*significant role in IS development and implementation in the organisation*”.

Organisations may perhaps have developed a culture of dependency on external consultancy for the development and implementation of their information systems. Ensuing implications are outlined. Firstly, the short spans of consultants engagement often resulted in, either, aborted, failed or in-completed IS projects. Secondly, the mode of communication with consultants was through the phone or email, however “*communication through email was difficult*”. There was no face-to-face contact. From a cultural perspective, collectivist societies generally prefer face-to-face communication and tend to dislike other forms. Thirdly, it was argued that consultants failed to train IS staff. Consultants were engaged for short periods to “fix” the immediate IS problem, and placed little emphasis on training and

knowledge transfer. Finally, consultant fees were a major cost area for the organisations. As expressed by a manager, it was “*very expensive to bring people up (to PNG) to fix*” the problems. Engaging consultants brings only short-term benefits hence needs to be immediately addressed.

Case	Availability of IS professionals
PNG Unitech	<i>“Getting people with IT qualifications from outside is like looking for diamonds”</i> <i>“Staffing is a major problem in this University and the country”</i>
IRC	<i>“Human resources need improving. Lack of IT professionals but it's a fact of life there are not sufficient Papua New Guineans who have the level of computer skills”</i>
PNGWB	<i>“We don't necessarily have the expertise and know how, so we have engaged people from outside to assist us”</i>
Boroko Motors	<i>“It is hard to find people with specialised skills”</i>

Table 4.18: Summary of Quotes - Availability of IS Professionals

4.3.7.2 National government IS planning and direction

The general view held by many is that the national government was not providing the direction necessary to drive the IT industry in the country. Particularly for a national IS policy, no comprehensive policy framework was in place to take on this responsibility although several attempts have been made in the recent years. One respondent in IRC expressed the view that they “*hardly get any interest from the government on IT*”. Another respondent maintained a similar view, that is, that there was no “*direction or encouragement by the government*”.

There are also concerns about planning, and direction of IS at the national level, particularly human resource planning relating to IS in the country.

Case	National IS planning & direction for IS in the country
PNG Unitech	<p><i>“Clear top level guidelines would be helpful”</i></p> <p><i>“Politically there is no IS manpower planning in PNG”</i></p>
IRC	<p><i>“I don’t think the government has taken any kind of serious interest in promoting IT industry”</i></p> <p><i>“The government should take a realistic view on IT development in the country. At the moment it is ad hoc and undecided”</i></p>
PNGWB	<i>“We hardly get any interest with the government on IT”</i>
Boroko Motors	<p><i>“There is no talk by the government or encouragement on IT”</i></p> <p><i>“I don’t know, it would be good if we had policy direction”</i></p>

Table 4.19: Summary of Quotes - National IS Planning and Direction

One respondent expressed that *“politically there is no manpower planning in PNG”*. While another respondent suggested that, *“if we can have some direction as to how many people should do IT with government influence, I think that will help in some ways”*.

4.3.7.3 Political and economic conditions

Organisations function within the economic and socio-political constraints of the country. Particularly for government-run institutions, funding depended on a number of implications including the economic condition of the country. Government funded organisations such as PNG Unitech and IRC rely on government budgetary allocations. As a public sector institution, *“we get our funding from government”*. Depression at this level and *“shrinking budgets from government”* clearly has a domino effect in organisations. The relationship with the country’s economic condition and IS funding in the organisation is reflected by one respondent with this comment: *“If there is a cut to the university’s budget, then obviously we expect a cut in funding in terms of money”*.

The political arena in PNG is known to be volatile and unstable in the region. Governments can change every 18 months as allowed by the Constitution projecting an atmosphere of constant political uncertainty. Due to the instability, there are social upheavals, no basic government services reach the rural areas and increasing law and order problems. Any policy or plan by one government is immediately displaced when the other takes over. Particularly for the development of a national IS policy, *“there has not been really any comprehensive policy guideline in place to take on this responsibility”*.

As a result of the political and economic instability, law and order problems have escalated. Law and order is a major barrier that has a negative impact on many organisations in the country. For example, telecommunication service lines were often disrupted when criminals dismantled solar panels from communication sites.

Case	Political and Economic Setting
PNG Unitech	<i>“We are not given the level of funding support that we are getting it's understood because of the national economic problems”</i>
IRC	<i>“Politics is one of the major downfalls”</i> <i>“But for other people why come here when you can get here in the Bahamas”</i> <i>“They constantly change of expertise and the reasons for the change are economic, law and order”</i>
PNGWB	<i>“The political scene has a huge impact, huge impact on the future”</i>
Boroko Motors	<i>“Well, at the moment it's a disaster. it's the law and order, well three things, law and order, infrastructure and education”</i>

Table 4.20: Summary of Quotes - Political and Economic Setting

4.3.7.4 Telecommunication infrastructure

Inadequate telecommunication infrastructure is a major factor that influences IS success in LDCs. Organisations depended on the communication infrastructure to effectively conduct their business. However, telecommunication service in the country was a major concern since the government lacked the financial means to improve telecommunication infrastructure. A senior manager expressed the view that *“the biggest problem with PNG is communication...the communication network is a nightmare”*. In addition, telecommunication costs were high, as one respondent expressed, *“telecommunication has unrealistic prices... it is too expensive”*. The vandalism of transmitter stations and land compensation claims by landowners contributed to the disruption of telecommunication services. Land in PNG is customarily owned, thus, land compensation is one of the major hindrances to economic growth in the country.

4.3.7.5 National cultural issues

National cultural issues and factors may have an underlying effect on IS adoption, use and success, particularly for the LDCs. There were mixed feelings about the effect of culture on IS success in the organisations investigated in this study. IS was *“a fairly new thing”* in many other organisations in PNG, therefore, employees were initially reluctant to use the system. A respondent at Boroko Motors commented that, generally, *“most (employees) were happy and keen to use computer systems, however, some users were shy with computers”*. IS training and literacy programs may alleviate this fear and reluctance. Such behaviour may emanate from the cultural orientation of the participants. For instance uncertainty avoidance, one

of the four characteristics advanced by Hofstede (1997), may have its roots in the PNG cultural mind-set as a collectivist society.

Generally, employees tend to adapt the new technology, however one cultural concern was that, Papua New Guineans were usually less tolerant about the unknown and would refrain to avoid humiliation. One manager stated that Papua New Guineans, *“hate to be shamed and humiliated, therefore, we had to be very careful”* during training sessions. Generally, the results show that employees were willing to learn, however, they tend to be passive and less tolerant to deviant ideas, and maintain a rigid code of belief and ethics. PNG features are close to a collectivist society, therefore, the cultural issues raised here may be exemplifying the belief that cultural factors influence IS success in organisations in PNG.

The *“wantokism”* is a cultural notion in PNG where the kin or clan takes precedent over oneself and others. In relation to IS, resource and knowledge sharing may be determined along the lines of regional or tribal affiliations - *wantoks*. For example, one respondent suggested that if he had a problem relating to IS, he would immediately seek assistance from his *“wantok”*, a cousin in this case, for assistance and favour. There were other skilled personnel, but it is a *“cultural thing that links me straight away because I know that I will get the type of IS support that I want from my wantok”* expressed a respondent. While the *“wantok”* system may have its cultural advantages, it promotes favouritism, and is one of the major social issues in PNG. In this context resources are distributed discriminately.

The effect of wantokism is evident in other areas such as human resource management. Most state-owned enterprises in PNG are technically insolvent and this is largely attributed to political intervention and wantokism (Kavanamur, 2002).

4.4 Chapter Summary

The Chapter presented the results of the Stage 1 of this study: case studies of four organisations in PNG. A descriptive summary of each organisation included: organisation background, organisation structure and channel of communication, IS staff, and IS implementation in the organisation.

The pilot case study highlighted inadequacies of the success factors identified from the normative literature from the perspective of a government-funded institution in an LDC.

Consistent with the research framework, factors and issues identified in the case studies were categorised into user, organisational and external environments.

The results show that organisational and external factors have a strong influence on IS success in organisations in PNG. Therefore, the government must play a leading role in setting the direction for IT development in the country if it is to confidently participate in the global environment. Strategic issues such as information policy guidelines, national infrastructure, and economic and political stability, must be addressed.

Cultural factors also impact on the uptake of IS as these technologies impact on social and technical change, therefore cultural implications must also be addressed.

The next Chapter describes the methods used in Stage 2 of the current study.

Chapter 5

Results - Stage 2 Study

5.0 Introduction

Chapter 4 presented the results of the Stage 1 study. The purpose of this Chapter is to present the results of the Stage 2 study. The research methods and data analysis procedures applied in the Stage 2 study were described in Chapter 3 Part II. The objective of the Stage 2 study was to elicit respondent perceptions of how effectively these elements are dealt with in organisations in the country. Sub questions including the relationships between the different entities were also investigated. Other aspects explored include: demographic, IS use behaviour and how respondents acquired IS training. The results are presented in the same manner as the research questions were posed drawing on the data analysis procedures described in Chapter 3.

5.1 Review of Research Questions (Stage 2 study)

The research questions formulated to guide the Stage 2 study are summarised in Table 5.1. The two main questions were defined in Chapter 1. Additional questions regarding the difference between groups and relationships between respondents are also presented.

RQ	Research Questions	Survey Item	Discussed in section
2.	How effectively are IS success elements addressed in the organisations?	Section A Part 1	5.3
2.1	Is there a difference in individual perception of how effectively IS success elements are dealt with in the organisations?	Section A Part 1	5.3
2.2	How important are the elements for the organisation's IS effectiveness?	Section A Part 2	5.4
2.3	Is there a difference in respondents' perception of the importance of IS success elements in organisations?	Section A Part 2	5.4
2.4	Is there a relationship between respondent perceptions of how effectively IS success elements are addressed in organisations, and the importance of these elements?	Section A Part 1 & 2	5.5
2.5	How do respondents ascertain training and assistance in the aspects of IS in the organisation?	Section B	5.7/5.8
2.6	How successful is IS and what evaluative criteria are used to measure IS success in PNG organisations?	Section B	5.10

Table 5.1: Summary of Research Questions addressed in Stage 2 Study

5.2 Characteristics of the Survey Responses

5.2.1 The Survey

Two sets of the final three-part questionnaire were mailed to organisations in PNG; one set for managers and the other for non-managers. A sample of the final questionnaire can be found in Appendix 13. Of more than 650 questionnaire sets, 267 (N) respondents from eight out of the twenty organisations completed and returned the survey-- a response rate of forty percent. Five returned questionnaires were incomplete therefore unusable. Distribution summary of the survey response is presented in Table 5. 2.

Of the total (N=262) usable responses, the IRC contributed the most responses with 162 (61.8%), and the rest from other participating

organisations. Private organisations (DHL Ltd, Boroko Motors Ltd, and PNGWB) completed and returned 45 (16.8%) sets. Higher education and research organisations constitute 40 (14%) of the total 217 government organisation responses.

Organisation		Respondent Category			Total
		Non Managers	Middle Managers	SEM	
Internal Revenue commission	Public*	89	62	11	162
		34.0%	23.7%	4.2%	61.8%
PNG Waterboard	Private**	5	16	2	23
		1.9%	6.1%	.8%	8.8%
Boroko Motors Ltd	Private	10	2	1	13
		3.8%	.8%	.4%	5.0%
Auditor General	Public	10	5	0	15
		3.8%	1.9%	.0%	5.7%
DHL (PNG) LTD	Private	7	2	0	9
		2.7%	.8%	.0%	3.4%
PNG University of Technology	HER***	15	5	0	20
		5.7%	1.9%	.0%	7.6%
University of Goroka	HER	5	5	1	11
		1.9%	1.9%	.4%	4.2%
Copra & Cocoa Research Institute	HER	5	4	0	9
		1.9%	1.5%	.0%	3.4%
Total		146	101	15	262
		55.7%	38.5%	5.7%	100.0%

* Public = Public sector government funded organisations

**Private = Commercial entities & privatised semi government organisations

***HER = Government funded higher education & research organisations

Table 5.2: Summary of Survey Respondents

The term 'enduser' encompasses the whole spectrum of users who utilise IS in the organisation. Thus, enduser includes middle managers, non managers,

and senior executive management (SEM) team. SEM consists of the CEO and executive team. Middle managers comprise of section or divisional heads. Of the 262 usable responses 146 (55.7%) were from non managers, 93 (37%) from middle managers and the rest from members of SEM. SEM response in this study was poor as reflected by the lack of input in four organisations.

IS success elements were classified into three categories: user, organisational, and external environments. The elements were further grouped into seven dimensions as described in Chapter 3.8.

5.2.2 Reliability

A Cronbach alpha test was used to evaluate the reliability of the measure as suggested by Nunnally (1978). Cronbach alpha can be considered an adequate index of the inter-item consistency reliability. The reliabilities of each of the 53 items were adequate since the Cronbach alpha values for each were significantly greater than the prescribed 0.70 threshold. The Cronbach alpha test for reliability is given in Table 5.3.

Part 1: Effectively Addressing in Organisations	Part 2: Importance of IS Success Elements
(N=262)	(N=22)
0.9787	0.9793

Table 5.3: Inter-Item Consistency Reliability Test

The aggregate Cronbach alpha values for the tests were above the 0.70 threshold. Hence, the values show that the instrument is sufficiently reliable.

5.2.3 Survey Respondents

A relatively well-balanced sample response was received in terms of gender. Female respondents constitute 98 (30%) of the total (N) responses and the rest were male. Similarly 23 (8.8%) completed sets were received for non-indigenous respondents. Of the total (N) 95 respondent's time in organisation (TIO) was less than 2 years, 134 between 2 to 4 years, while the rest over 5 years.

Variable	Category	Number	Percentage
Gender	Male	164	62.6
	Female	98	37.0
	Not Stated	1	0.4
	Total	262	100
Nationality	PNG	239	91.2
	Others	23	8.8
	Not Stated	0	0.0
	Total	262	100.0
Respondent Category	Non Managers	146	55.7
	Middle Manager	101	38.5
	SEM	15	5.7
	Not Stated	0	0.0
	Total	262	100.0
Time in Current Job	< 6 Months	23	8.8
	6 Months – 1 year	67	25.6
	1 Year – 2 Years	63	24.0
	2 Years – 4 Years	91	34.7
	5 Years – 6 Years	4	1.5
	6 Years <	13	5.0
	Not Stated	1	0.4
	Total	262	100.0
	Time in Organisation	< 6 months	11
6 months – 1 Year		33	12.6
1 Year – 2 Years		51	19.5
2 Years – 4 Years		134	51.3
5 Years – 6 Years		10	3.8
6 Years <		22	8.4
Not Stated		1	0.4
Total		262	100.0

Table 5.4: Characteristic of Respondents (N=262)

Slightly more than 153 (60%) respondent's time in current position with the organisation was less than 2 years, 91 between 2 to 4 years, and the rest over

5 years. Of the total (N), 244 (93%) respondent's time in current position was less than four years. Thus, an overwhelming majority were either promoted or recruited to their current positions in the last four years.

The results show that relatively high percentage, 88% (229 of the total 262(N)) of respondents were employed within the last four years at the time of this study.

5.3 Addressing the IS Elements in Organisations – General

View

5.3.1 Descriptive Aggregate

Determining how effectively the contributing elements of IS success are dealt with by organisations was the subject of research question 2. The 53 items in the questionnaire were scored on a 7-point Likert scale (7=Extremely Effective; 1=Extremely Ineffective). To measure the degree of effectiveness, descriptive aggregate data of survey items in Section A Part 1 were calculated. Ranking of mean scores in descending order (effective to ineffective) shows those elements perceived to be the least and most effectively addressed in the organisation. Figure 5.1 presents a pictorial representation of the mean rank order of the general perception of the total (N) population.

5.3.1.1 General perception

Of particular interest is the top and bottom twenty-five percent of the mean score rank order as they represent the 10 most and 10 least effectively

addressed elements. Mid level elements are also analysed and discussed. As shown in Figure 5.1, respondents, in general, perceive that long-term IS budgeting, provision for IS training in IS capabilities, long-term IS planning, user awareness and understanding of IS, the availability of documentation, and the transfer of knowledge from experts were the six elements seen to be dealt with least effectively in PNG organisations.

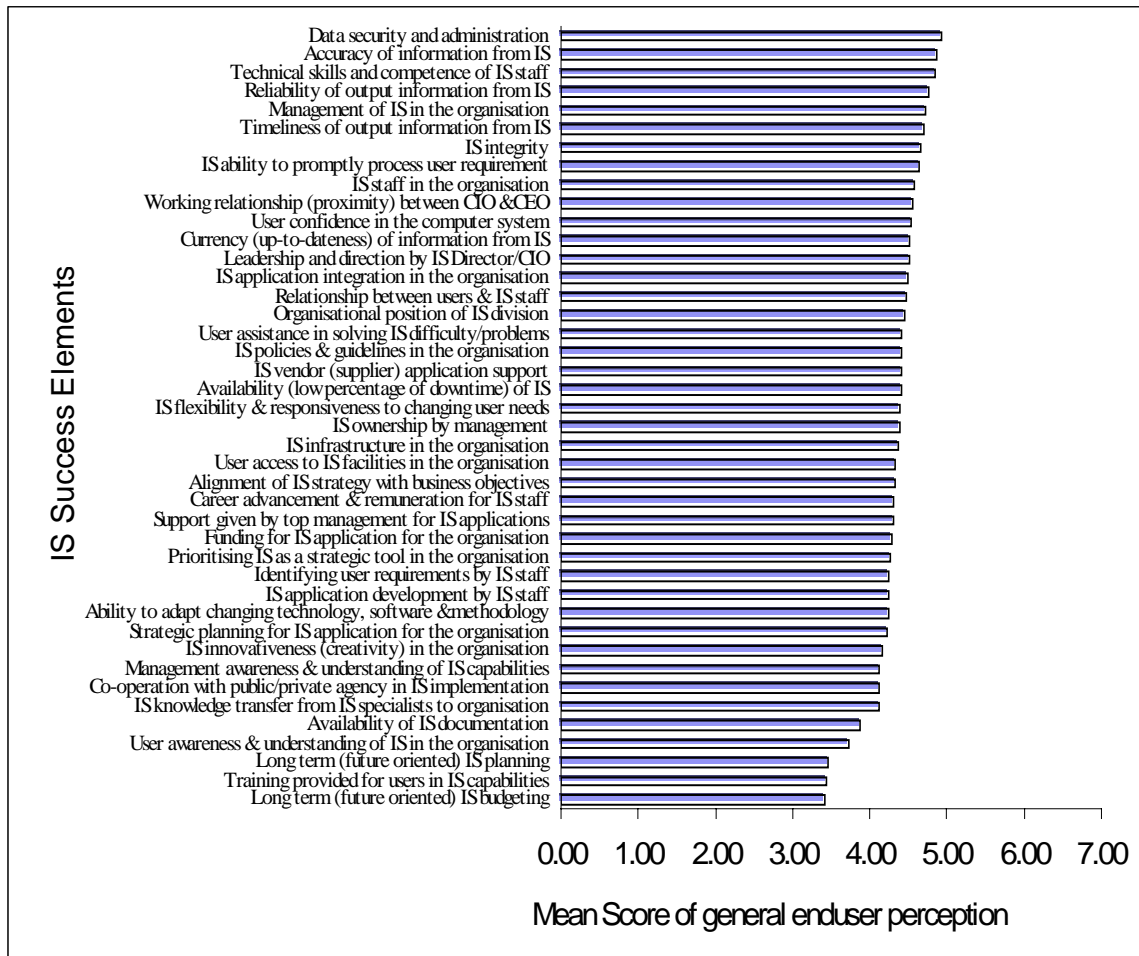


Figure 5.1: Addressing IS Success Elements – Mean Rank Order

In addition, respondents were of the view that cooperation among organisations, management awareness and understanding of IS, innovativeness, strategic planning for IS, inability to adapt changing technology, software and methodology were also ineffectively dealt with. A

similar view was held for two other elements - user requirement analysis and application development. Strategic level elements including prioritising IS, alignment of strategies, and IS funding were also viewed as least effectively dealt with by organisations.

In sum, the results illuminate the lack of human resource development and the need to attend to strategic level elements. This contributes to the organisation's inability to be innovative and manage the rapidly evolving IS, and thus, reliance on foreign funding and expertise. Conversely, data and output quality and system integrity were perceived to be effectively dealt with by organisations. While there was a general consensus about the unavailability of skilled IS professionals in the country, respondents were of the view that the availability of IS staff, and the technical skills and competence of these staff, were effectively addressed.

5.3.1.2 Manager perception

A mean score ranking of manager (managers include middle managers and SEM) responses shows little difference in their perception of how effectively IS success elements were addressed relative to the general views held by others.

Organisations were unable to adapt the changing technologies. This may be because of the lack of emphasis on IS innovativeness, and or the lack of funding. Another reason was the lack of skilled IS professionals to make informed decisions.

The majority of the participating organisations engaged consultants and or service organisations to design, develop, implement and manage the organisational IS. IS staff were primarily involved in maintenance and service provision. Thus, they have limited opportunity to engage in the full cycle of IS application development and implementation and maintenance. In this regard, most organisations were passive adopters of IS.

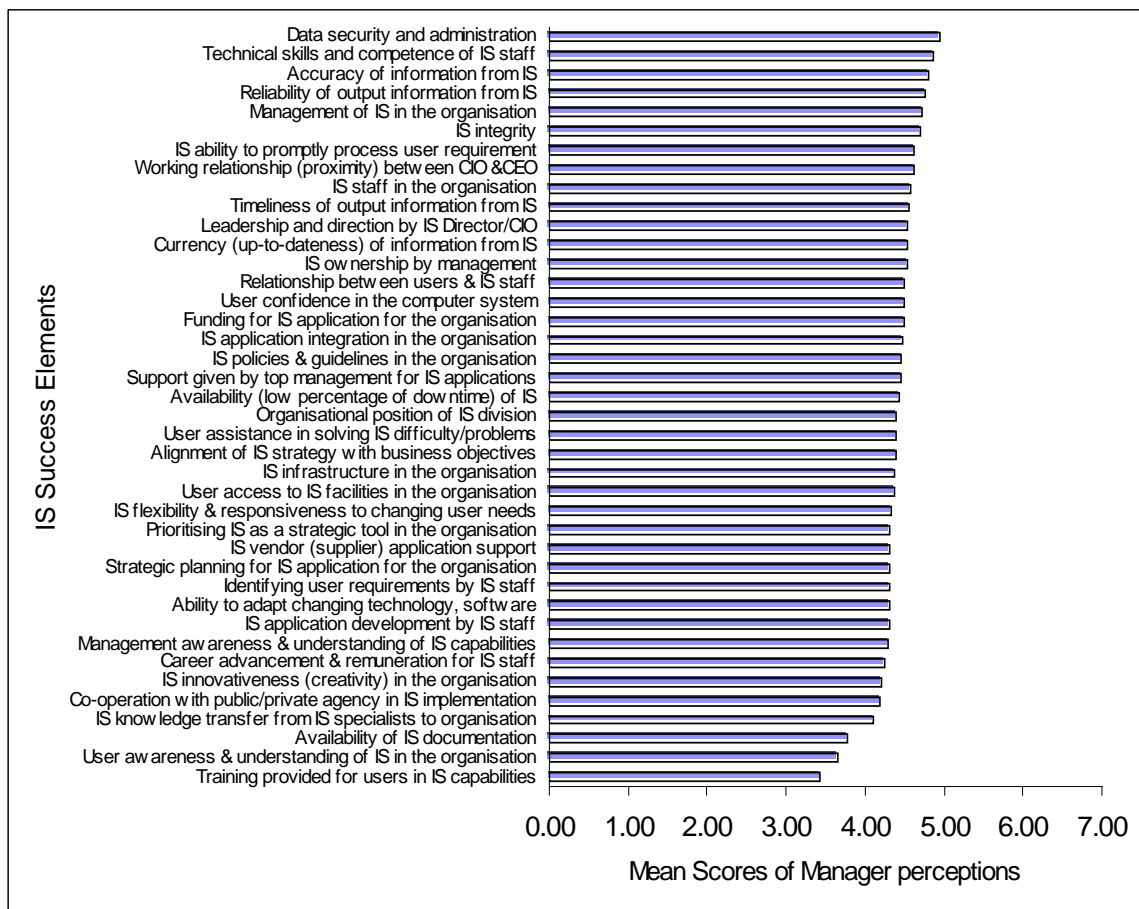


Figure 5.2: Mean Rank Order of Manager Perception

The above results are tested for statistical significance in the next section.

5.3.2. Confirmatory Analysis of Difference (t-tests)

Sub question 2.1 sought to determine if there was a difference between groups in their perception of how effectively IS success elements are dealt with in the organisations. Table 5.5 shows the summary of the confirmatory tests undertaken to answer sub question 2.1.

Test	How effectively the IS success Element is Addressed – Confirmatory t-test between ..	Section	Table/ Figure
1	Respondents in Private and Public organisations (general)	5.3.2.2	5.6
2	Managers and Non Managers (general)	5.3.2.3	
3	SEM and Middle Managers (general)	5.3.2.4	5.7
4	Managers in Public and Managers in Private organisations	5.3.2.5	5.9
5	SEM and Non Managers (general)	5.3.2.6	5.8
6	Non Managers in Public and Non Managers in Private	5.3.2.7	5.10
7	Indigenous and Non Indigenous	5.3.2.8	
	How important the IS success Element is – Confirmatory t-test between ..		
9	Managers in Public and Private sector organisations	5.5.3	5.13
10	Correlation (Importance Vs Effective)	5.6	5.16

Table 5.5: Summary of Confirmatory t-tests

Initially, descriptive aggregate survey data were calculated for each group. For instance, public and private sector organisations, non managers and managers, national and expatriate staff. Mean scores were ranked in ascending order (ineffective to effective).

Similarly, confirmatory t-test was employed to understand if respondent perceptions differed between the categories of IS success components. Elaborations of the tests are presented in the following sections.

5.3.2.1 Difference between the Private and Public sector Organisations –

General view

Respondents in private sector organisations perceived that IS innovativeness, IS policies and guidelines, and cooperation and sharing of ideas between organisations were the least effectively dealt with in organisations. IS applications are implemented by outsourcing, therefore IS application development projects in the organisations was minimal. In addition, they felt that there was lack of vendor support, availability of IS documentation and IS ownership by management. Again, the provision of IS training was inadequate. Respondents felt that the working relationship between the CIO and CEO and strategic IS planning was ineffectively dealt with. User and management awareness and understanding of IS, and knowledge transfer were among those viewed as ineffectively addressed.

There appears to be little difference between the mean scores of the 10 least effectively addressed IS success elements in the public sector organisations. The results are similar to that of the private sector organisations. Respondents in government agencies were of the view that the development of skills and competencies including awareness and the accumulation of knowledge and documentation were least effectively dealt with. The provision of IS training in the organisations was also considered to be least effectively addressed. Similarly, respondents felt that there was lack of innovativeness, systems development and inability to adapt changing technology, software and methodology in PNG organisations. In addition, respondents felt that strategic IS planning was ineffectively dealt with.

The graph in Figure 5.3 suggests similarities between private and government organisations regarding how effectively components of IS success are dealt with in organisations. While agreeing on the IS training, user awareness and understanding of IS and the lack of IS documentation, private sector organisations felt that IS application development and vendor support were ineffectively addressed.

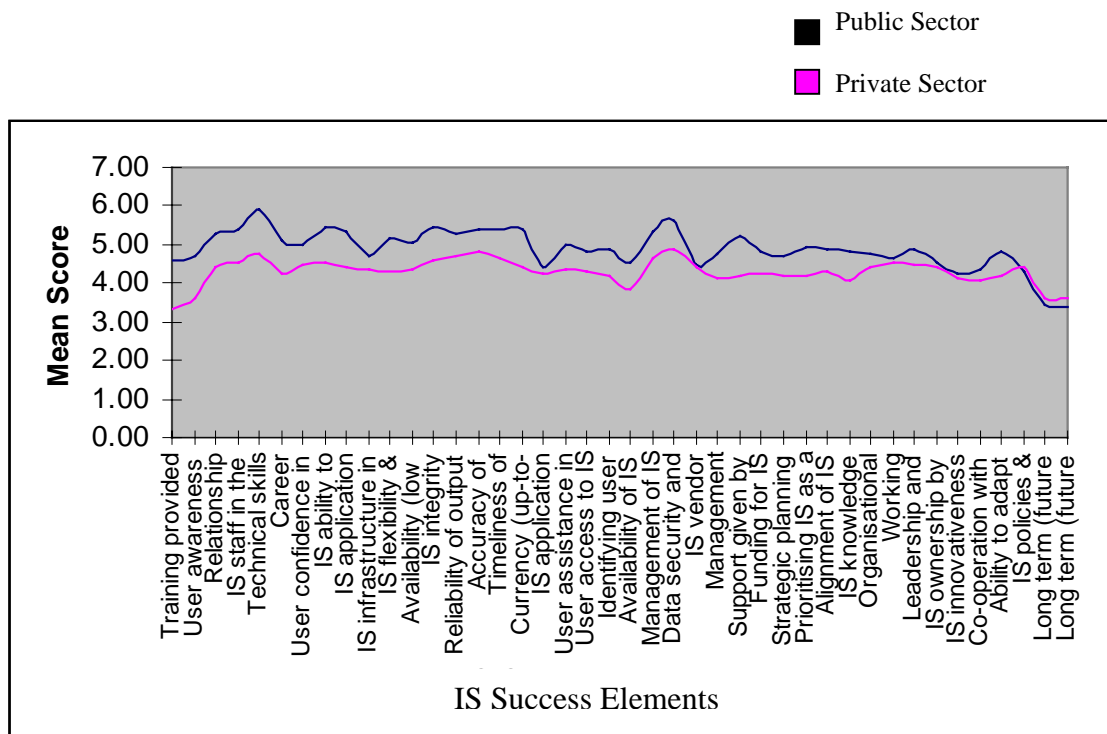


Figure 5.3: Effectively Addressing IS Success Elements (Public Vs Private Sector Organisations)

Confirmatory tests show if there was a statistically significant difference as shown by the aggregate mean scores.

5.3.2.2 Confirming Difference between Private and Public sector

Organisations

Generally, there were similarities between respondents in private and public sector enterprises regarding the perception of how effectively organisations dealt with the elements. Only six elements differed as shown in Table 5.6.

Public & private organisations differ in their perception of ...	Public			Private			t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	T	Df	Sig. (2-tailed)	Mean Diff
IS Success Elements											
Technical skills and competence of IS staff	163	4.93	1.131	44	5.32	1.177	1.209	-2.022	205	.044*	-.39
Support given by top management for IS applications	153	4.27	1.411	42	5.05	1.268	.931	-3.212	193	.002**	-.77
Funding for IS application for the organisation	144	4.30	1.410	39	4.97	1.181	1.917	-2.743	181	.007**	-.68
Training provided for users in IS capabilities	173	3.35	1.489	44	4.07	1.129	9.251	-3.501	85.317	.001**	-.72
User awareness & understanding of IS in the organisation	174	3.71	1.290	44	4.18	1.167	1.401	-2.222	216	.027*	-.47
Career advancement & remuneration for IS staff	127	4.31	1.264	39	4.95	1.255	.770	-2.743	164	.007**	-.63

* $p < .05$, ** $p < .01$ (2-tailed)

Table 5.6: Confirmatory t-test - Public Vs Private Sector Organisations

The procedure for confirmatory t-test is described in Chapter 3 Part 2. Briefly, in the two level process, homogeneity of the variance in the population being compared is Levene’s Test for Equality of Variance. Using this test the significance (2-tailed) was derived next. Table 5.6 shows the confirmatory t-test for difference in private and public sector organisations.

The result of the confirmatory t-test for technical skills and competency of IS staff was: $t=-2.022$, $df=205$, $p= 0.044s$. Therefore, a statistically significant difference exists between the public and private sector organisations in their

perception of how effectively technical skills and competency of IS staff in organisations is addressed. That is, more respondents in public agencies were of the view that the availability of skilled and competent IS staff was ineffectively addressed. With superior remuneration and employment conditions private sector organisations were able to employ and retain skilled IS professionals. The influx of IS skilled staff from the public sector to private sector is well documented in the literature (Higgo, 2003).

Confirmatory tests also revealed that perceptions also differed between respondents in two elements: support given by top management for IS applications ($t=-3.212$, $df=193$, $p=.002$), and funding for IS application for the organisation ($t=-2.743$, $df=181$, $p=.007$). More respondents in private organisations were of the view that top management support and IS funding were effectively addressed in private sector organisations.

There was also statistically significant difference between public and private sector organisations for three other elements: training provided for user in IS capabilities ($t=3.501$, $df=85.37$, $p=0.001s$), career advancement and remuneration for IS staff ($t=-2.743$, $df=164$; $p=.007$), and user awareness and understanding of IS ($t=-2.22$, $df=216$, $p=.027s$). Statistically significant difference exists between public and private sector organisations in their perception of how effectively the three elements were addressed. More respondents in private agencies perceived that IS training was adequately addressed, thus increasing enduser awareness and knowledge of IS. Similarly, more respondents in private sector organisations were of the view that private sector organisations provided better remuneration packages for IS

professionals. A full listing of the t-test can be found in Appendix 14.

5.3.2.3 Difference between Non Managers Vs Middle Managers

As discussed earlier in section 5.3.1.2 there is little difference in the mean scores between non manager and middle manager perceptions of how effectively IS success elements are dealt with by organisations. This is illustrated in Figure 5.5. That result is statistically confirmed as shown in Table 5.7. That is, no significant difference was revealed for elements except for a single element-- "Timeliness of output information from IS". There was a moderate difference in the mean scores between the two groups with a mean difference of 0.31. More managers were of the view that output information from IS was available on a timely basis. The result is $t=2.301$, $df=223.073$, $p=.022s$. Significant at $p<0.05$. The full t-test list can be found in Appendix 15. Comparison of SEM is presented in the next section.

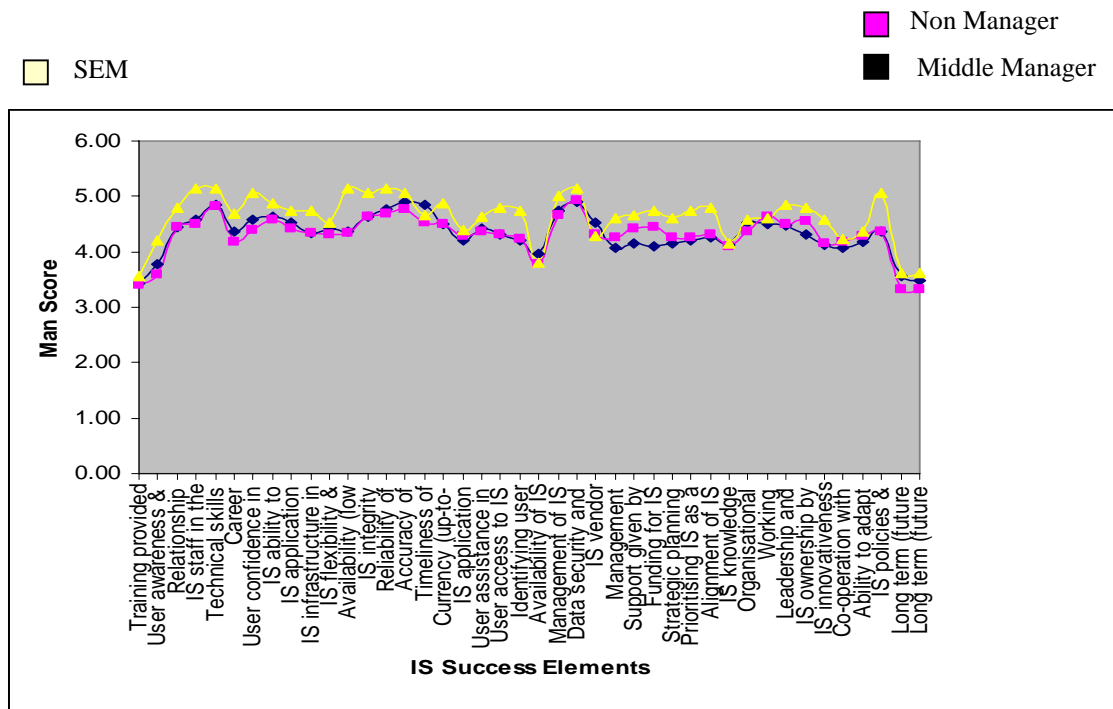


Figure 5.4: Mean Scores for IS Success Elements between Non Manager and Middle Managers

5.3.2.4 Difference between SEM and Middle Managers

The confirmatory t-test to confirm difference between groups is attained for tests between SEM and middle managers.

Apart from the five elements shown in Table 5.7, there was little difference in SEM and middle managers' perceptions of how effectively IS success elements were addressed. This is illustrated in Figure 5.6, a comparison of the aggregate mean scores between SEM and middle managers. Results show that more SEM were of the view that system quality and strategic level aspects of IS were being effectively addressed. Comparison of non manager is discussed in section 5.3.2.3.

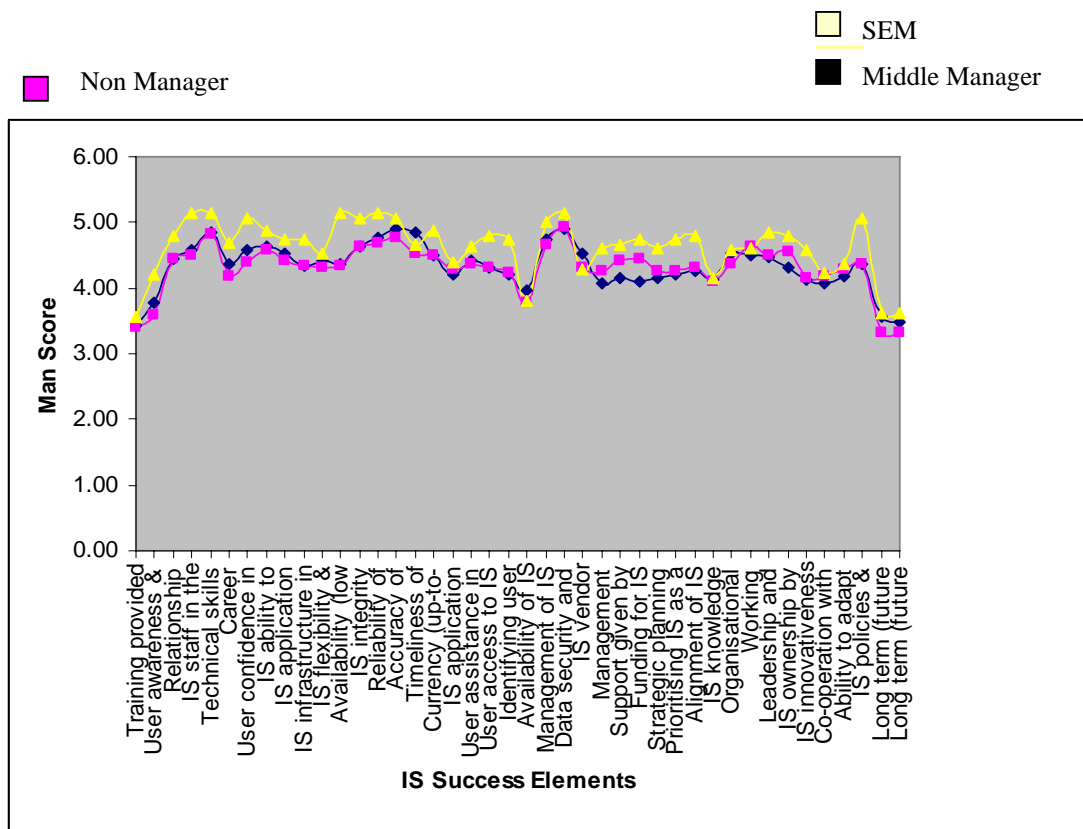


Figure 5.5: Mean Scores for IS Success Elements between Middle Manager and SEM

IS success Elements	SEM			Middle Managers			t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	T	df	Sig. (2-tailed)	Mean Diff
User awareness & understanding of IS in the organisation	15	4.20	.676	100	3.58	1.148	3.807	2.036	113	.044*	.62
IS staff in the organisation	15	5.13	.915	97	4.49	1.110	4.079	2.438	20.9	.024*	.64
User confidence in the computer system	15	5.07	.961	98	4.40	1.002	1.611	2.418	111	.017*	.67
Availability (low percentage of downtime) of IS	14	5.14	1.167	96	4.33	1.012	.177	2.742	108	.007**	.81
IS policies & guidelines in the organisation	15	5.07	1.100	96	4.36	1.189	1.313	2.147	109	.034*	.70

*p < 05 ** P < 01

Table 5.7: Difference between SEM and Middle Managers

5.3.2.5 Difference between Managers in Private and Public organisations

Statistically significant difference exists for six elements between managers in private and public sector organisations pertaining to how effectively these elements were addressed in organisations (see Table 5.8).

IS success Elements	Private			Public			t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	T	df	Sig. (2-tailed)	Mean Diff
Training provided for users in IS capabilities	77	3.35	1.365	23	4.00	.798	8.272	-2.852	63.276	.006**	.65
Career advancement & remuneration for IS staff	60	4.15	1.176	22	4.86	1.424	.533	-2.298	80	.024*	.71
Data security and administration	72	5.19	1.171	23	4.61	.988	.287	2.164	93	.033*	.59
Support given by top management for IS applications	72	4.38	1.49	22	5.14	1.356	.120	-2.238	92	.028*	.76
Funding for IS application for the organisation	66	4.39	1.391	22	5.09	1.151	1.292	-2.119	86	.037*	.70
IS ownership by management	67	4.48	1.352	21	5.14	1.236	.054	-2.006	86	.048*	.67

*p < 05 ** P < 01

Table 5.8: Difference between Managers in Private Vs Public Sector Organisations

Managers in the public sector organisations were of the view that all the elements shown in Table 5.8 were ineffectively addressed except for one, 'Data security and administration'. Conversely, managers in private sector organisations felt that data security and administration was ineffectively addressed. Apart from 'IS Ownership by management', the results corresponded to those obtained in section 5.3.2.2, regarding difference between respondents in private and public sector organisations. That is manager perceptions were similar to the general feelings.

5.3.2.6 Difference between SEM and Non Managers

Only three elements showed significant difference ($p < 0.05$) between SEM and non managers as shown in Table 5.9. These results are similar to the test between SEM and middle managers.

IS success Elements	SEM			Non Managers			t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	t	Df	Sig. (2-tailed)	Mean Diff
IS staff in the organisation	15	5.13	.915	137	4.58	1.304	4.538	2.102	20.806	.048*	.55
Availability (low percentage of downtime) of IS	14	5.14	1.167	126	4.37	1.331	.494	2.076	138	.040*	.77
IS policies & guidelines in the organisation	15	5.07	1.100	126	4.37	1.619	3.979	2.178	21.987	.040*	.69

* $p < 05$ ** $P < 01$

Table 5.9: Difference between SEM and Non Managers

Table 5.9 shows the confirmatory t-test results for three elements that showed significant difference between SEM and non managers.

5.3.2.7 Difference between Non Managers in Private and Public sector Organisations

Similar to the results in section 5.3.2.3 there was a general consensus among the non managers in all the organisations except for four elements.

IS success Elements	Private			Public			t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	t	Df	Sig. (2-tailed)	Mean Diff
Training provided for users in IS capabilities	96	3.35	1.589	21	4.14	1.424	2.004	-2.096	115	.038*	.79
User awareness & understanding of IS in the organisation	97	3.72	1.382	21	4.43	1.535	.563	-2.083	116	.039*	.71
Technical skills and competence of IS staff	88	44.93	1.192	21	5.57	1.287	1.532	-2.176	107	.032*	.64
Support given by top management for IS applications	81	4.19	1.415	20	4.95	1.191	.893	-2.228	99	.028*	.76

*p < 05 ** P < 01

Table 5.10: Difference between Non Managers in Private and Public sector Organisations

As shown in Table 5.10, a significant difference exists between non managers in private and public sector organisations for four elements: training provided for users in IS capabilities (t=-2.096, df=115, p=.038); user awareness and understanding of IS in the organisation (t=-2.083,df=116,p=.039); technical skills and competence of IS staff (t=-2.176, df=107, p=.032); support given by top management for IS applications (t=-2.228, df=99, p=.028). More non managers in public agencies were of the view that the four elements were ineffectively addressed. Similar results for the same elements are shown in the corresponding tests between managers in private and public sector organisations (see section 5.6.7).

5.3.2.8 Difference between Indigenous and Non-Indigenous

Confirmatory t-test was conducted to determine if indigenous and non-indigenous employees differ in their perceptions of how effectively IS success elements are addressed in PNG organisations. The results show that there was no significant difference between indigenous and non-indigenous respondents for all the elements.

5.4 Importance of IS Success Elements

Sub question 2.2 in this study is addressed in Section A Part 2 of the survey. Managers were requested to rank their perception from a Likert scale ranging from 1 (Extremely Important) - 7 (Extremely Unimportant). NA or blank represented a “no response”.

5.4.1 Descriptive aggregates

To measure the degree of importance, descriptive aggregate data of survey items in Part 2 were calculated, again focusing on the top and bottom 25% of the mean score rank (ranking of mean scores in ascending order - important to unimportant). A summary of the general rank order is presented in Figure 5.6. There was no “missing” or “no responses” score.

Data security and administration, IS funding and data accuracy from IS were the three most important elements as perceived by managers. This was followed by technical skills and competence of IS staff, IS vendor support, and timeliness of output information from IS. Future oriented planning and budgeting were also perceived to be important. The results show that managers emphasised the availability of skills and support to effectively

manage and support IS in the organisation. They also thought it important to maintain data integrity and attain reliable information on a timely basis. In other words reliability and integrity of data and output information were perceived to be important by managers. Managers were also of the view that IS funding was an important contributor.

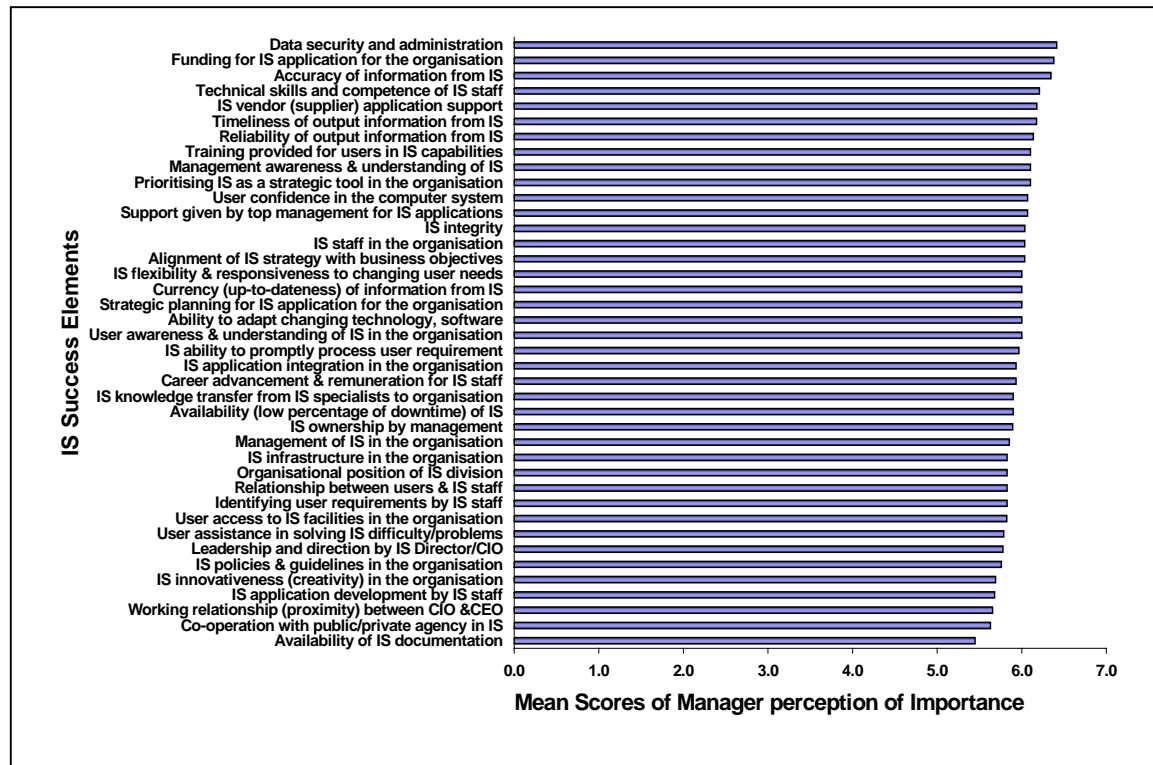


Figure 5.6: Mean Score Rank Order of Manager Perception towards Emphasis on IS Elements

Conversely, managers were of the view that availability of documentation, cooperation with other organisations, and working relationship between CEO and CIO were least important. IS application development, innovativeness and IS policies and guidelines were also perceived to be least important.

There appears to be little cooperation between organisations in the country in both the private and public sector. Thus sharing of knowledge and experience

among organisations, particularly for public sector organisations, was lacking. In organisations, IS structure is not viewed as a strategic and integral part of the organisation but a support unit. Since external consultants were prominent in IS development and implementation in most organisations, IS staff were less likely to be involved. Thus IS application development was viewed to be one of the least important elements.

Results also show that vendor support is one of the most important elements, as vendors were required to support and maintain IS applications. Furthermore, less emphasis was placed on innovativeness in organisations and no emphasis on full-scale application development. Thus organisations were passive adopters of IS, designed, developed and implemented by external consultants. Hence organisations rely heavily on external support. IS professionals were involved in maintaining the systems in the organisations. These elements were ineffectively addressed as shown in Figure 5.6.

5.4.2 Comparison with other studies

A comparative analysis of the studies by Li (1997) and Al-Abdul-Gader (1999) reveal the following outcome. The first five most important elements by managers according to Li are: accuracy of output, reliability of output, timeliness of output, realisation of user requirement, and user confidence in the system. The top five factors identified by Al-Abdul-Gader (1999) are: lack of appropriate planning, lack of organisational strategic plan, scarcity of qualified workforce, insufficient IT staff training and career development, and lack of sufficient computer knowledge at the middle and top management level. Table 5.11 shows a matrix of the top five ranked elements by managers.

Five Most Important Elements: Ranking for the Current study	Li (1997) (39)	Al-Abdul-Gader (1999) (30)
(1) Data security and administration	27	Not incl.
(2) Funding for IS application for the organisation	Not incl.	6
(3) Accuracy of information from IS	1	Not incl.
(4) Technical skills and competence of IS staff	10	1
(5) IS vendor (supplier) application support	34	24
Five Least Important Elements: Ranking for the Current study		
(43) Availability of IS document	Not incl.	Not incl.
(42) Cooperation between organisations	Not incl.	11
(41) Working relationship between CIO and CIO	Not incl.	Not incl.
(40) Application development by IS staff	Not incl.	Not incl.
(39) IS innovativeness	Not incl.	Not incl.

Table 5.11: Comparison of Top 5 Elements with Prior Studies

5.4.3 Difference between categories on importance of IS Elements

The objective of sub question 2.3 was to determine the difference in manager perceptions of the importance of IS elements in the organisations. This question is addressed in Section A Part 2 of the survey. Table 5.12 presents results of the test that determines if perceptions of the importance of IS elements differ between managers in private and public sector organisations.

Public & Private differ in their perception of importance of ...	Public		Private		F	T	df	Sig. (2-tailed)	Mean Dif
	Mean	SD	Mean	SD					
Career advancement & remuneration for IS staff	6.38	.768	1.10	.951	.023	2.812	18	.012*	1.10
Technical Skills and competency of IS staff	6.54	.877	1.11	1.272	.985	2.308	18	.033*	1.11

* p< 0.05

Table 5.12: Confirmatory t-test of Importance between SEM and Middle Managers in Public and Private Sector Organisations

Confirmatory independent sample t-test was employed for the forty elements categorised in the user and organisational environments in this study.

As shown in Table 5.12, there was little difference between managers in private and public sector organisations in their perception of the importance of IS success elements except for two elements: career advancement and remuneration for IS staff and technical skills and competency of IS staff.

Descriptive results in Table 5.15 show that more managers in public agencies were of the view that career advancement and remuneration for IS staff was an important element for IS success. Confirmatory testing affirms that a statistically significant difference exists between managers in public and private sector organisations on their perception of the importance of career advancement and remuneration ($t=2.812, df=18, p=.012$) for IS staff in organisations.

Similarly, more managers in public agencies perceive that technical skills and competency of IS staff was an important IS success constituent. Again, the confirmatory test shows that a statistically significant ($t=2.308, df=18, p=.033$) difference exists between managers in public and private organisations in their perception of the importance of technical skills and competency of IS staff in organisations.

5.5 Importance of IS Elements and how Effectively they are Addressed

The aim of sub question 2.4 was to determine if there was a relationship between SEM and Middle Manager’s perceptions of the importance of IS success elements and how effectively these elements are addressed in organisations. This is addressed in Section A Part 1 & 2 of the survey.

Most Effectively Addressed			Most Important		
IS Success Elements	Mean Score	SD	IS Success Elements	Mean Score	SD
Data security and administration	4.93	1.357	Data security and administration	6.41	.867
Accuracy of information from IS	4.86	1.145	Funding for IS application for the organisation	6.38	.942
Technical skills and competence of IS staff	4.85	1.249	Accuracy of information from IS	6.34	.814
Reliability of output information from IS	4.76	1.140	Technical skills and competence of IS staff	6.21	1.082
Management of IS in the organisation	4.73	1.160	IS vendor (supplier) application support	6.18	.983
Timeliness of output information from IS	4.71	1.048	Timeliness of output information from IS	6.17	.966
IS integrity	4.67	1.244	Long term (future oriented) IS budgeting	6.14	1.008
IS ability to promptly process user requirement	4.63	1.328	Reliability of output information from IS	6.14	.915
IS staff in the organisation	4.58	1.216	Long term (future oriented) IS planning	6.10	1.145
Working relationship (proximity) between CEO & CIO	4.56	1.228	Prioritising IS as a strategic tool in the organisation	6.10	.939

Table 5.13: IS Success Element: 10 Most Effective Vs 10 Most Important

Descriptive statistics and the mean order of the ranking (ascending – most important to the least important) of the perceptions of the importance of IS elements and how effectively these elements are dealt with can be found in Figures 5.1 and 5.4. Tables 5.13 and 5.14 present mean scores of the top and bottom 10 elements for each category: importance and effectiveness in addressing IS success elements.

As shown in Table 5.13, managers were of the view that data security and administration, accuracy of information from IS, reliability of output information and timelines of output information from IS were important and effectively dealt with in the organisation. Also, managers perceived that IS integrity, and IS ability to promptly process user requirements were effectively dealt with. Similarly, the elements of IS staff in organisation, and technical skills and competency, were effectively addressed in the organisation. These results show that managers were satisfied with the outcome from IS staff. However, managers felt that strategic elements such as prioritising IS, long-term planning and budgeting and funding were important but inadequately addressed.

Results in Table 5.14 shows that end user awareness and understanding of IS, and IS training were least effectively addressed. Similarly strategic elements such as long-term planning and budget, strategic planning, and industry cooperation were the least effectively addressed. Creativity and innovativeness were considered as least important and least effectively addressed.

Least Effectively Addressed			Least Important		
IS Success Elements	Mean Score	SD	IS Success Elements	Mean Score	SD
Strategic planning for IS application for the organisation	213	4.23	Identifying user requirements by IS staff	5.83	.848
IS innovativeness (creativity) in the organisation	231	4.16	User access to IS facilities in the organisation	5.82	.772
Management awareness & understanding of IS capabilities	234	4.13	User assistance in solving IS difficulty/problems	5.79	.876
Co-operation with public/private agency in IS implementation	210	4.12	Leadership and direction by IS Director/CIO	5.78	1.121
IS knowledge transfer from IS specialists to organisation	231	4.12	IS policies & guidelines in the organisation	5.76	.830
Availability of IS documentation	238	3.87	IS innovativeness (creativity) in the organisation	5.69	1.105
User awareness & understanding of IS in the organisation	257	3.72	IS application development by IS staff	5.68	1.188
Long term (future oriented) IS planning	195	3.46	Working relationship (proximity) between CEO & CIO	5.65	1.018
Training provided for users in IS capabilities	255	3.43	Co-operation with public/private agency in IS implementation	5.63	1.006
Long term (future oriented) IS budgeting	188	3.41	Availability of IS documentation	5.45	.948

Table 5.14: Success Element: 10 Least Effective Vs 10 Least Important

Sub question five tests if there is relationship between the emphasis placed on the IS success elements and whether these elements are seen to be dealt with effectively in the organisations. Pearson's Product Movement Correlation

analysis was run to test relationship between the importance of IS success elements, and how effectively these elements are addressed by organisations as perceived by managers.

Correlation Coefficient (r) between Importance & how Effectively IS Success Elements are addressed

IS Success Element	Pearson's Correlation Coefficient (r)	N	P
IS vendor (supplier) application support	.254	25	.221
Technical Skills and competence of IS staff	.021	28	.914
Timeliness of output report	.076	28	.700
Data security and administration	.174	28	.375
Funding for IS application for the organisation	.172	28	.382
Accuracy of information from IS	.254	28	.191
Availability of IS documentation	-.025	28	.899
Cooperation with public/private agency in IS	.203	25	.330
Working relationship(proximity) between CEO & CIO	.278	28	.199
IS application development by IS staff	.178	28	.364
IS Innovativeness(creativity) in the organisation	.049	27	.810
IS policies and guidelines in the organisation	-.196	28	.317

Table 5.15: Correlation (r): Importance and how Effectively IS Success Elements are Addressed

No significant positive relationship existed between the importance of the IS elements and how effectively the elements are addressed in organisations. For instance, data security and administration in general was perceived as an important component for IS success, and also perceived to be most effectively addressed by organisations. However, the Pearson's Product Movement correlation coefficient ($r=.174$, $p=.375$) shows that there is no significant

positive relationship between the importance and how effectively data security and administration was addressed in organisations. Thus, high mean score in both importance and effectiveness rank order ranking is not statistically correlated.

Similarly, managers perceived that the availability of IS documentation was the least important and one of the three least effectively addressed elements in the organisation. Again, results of the Pearson's correlation coefficient tests ($r=.454$, $p=.343$) show that there is no statistically significant positive or negative relationship between the importance and how effectively the element is addressed in the organisation as viewed by managers. Also future oriented planning and budget were perceived to be the two of the 10 most important elements (see Table 5.13) by managers. They are however the least effectively addressed elements. There is no significant correlation (positive or negative) for either of these elements.

However, association exists between some elements, although, the Pearson's Product Movement correlation test does not reveal any relationship. For instance, data security and administration was perceived to be an important IS success element. Managers were also of the view that data security and administration was effectively addressed in the organisation. Similarly, IS training was perceived as an important contributor to IS success, however, it was viewed as one of the least effectively addressed elements. Generally, Pearson's Product Movement correlation tests do not show any positive or negative relationship.

5.6 External Environment Factors

External factors can affect either directly or indirectly the way organisations function. IS is embedded in organisational environments which interact with the external environment in which they exist. The question to be answered in this section was: Is the effectiveness of IS in organisations affected by the external environment factors?

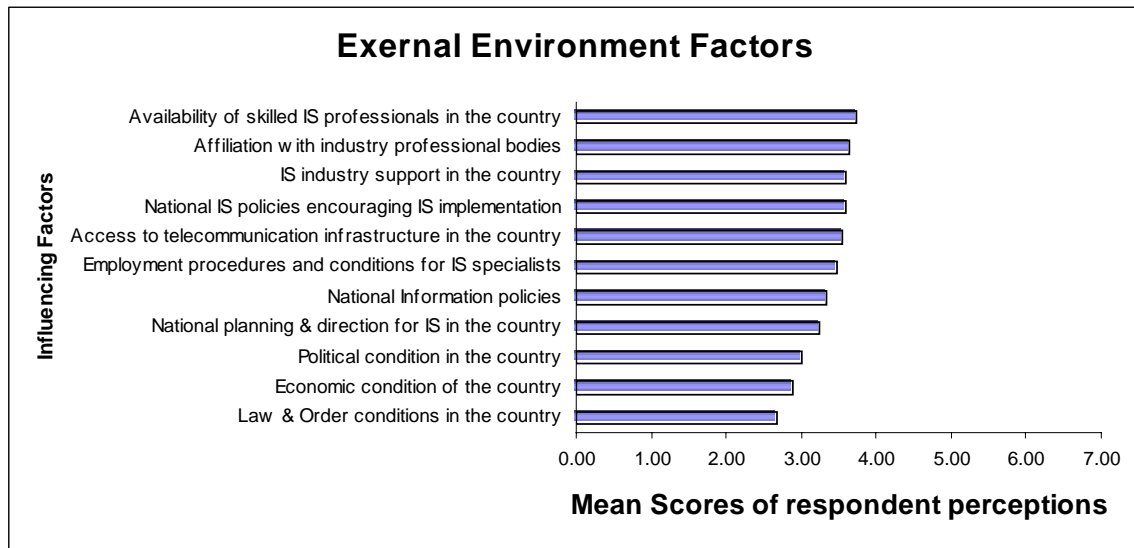


Figure 5.7: External Environmental Factors

External environmental factors were perceived to be important factors that influence organisation information systems. Organisations operate within these constraints as they are beyond the control of the organisation. Results from this study show that the majority of the respondents were of the view that external factors influenced the organisation's IS.

5.7 Respondent Mode of IS Training

The objective of sub question 2.5 is to understand how respondents ascertain training in the aspects of IS. Question 3 in Section B of the survey addresses this issue.

Mode of IS Training	Respond Category			Total	
	Non Manager	Middle Manager	Senior Management		
	Count	59	31	4	94
	% of Total	22.5%	11.8%	1.5%	35.9%
IS Vendor Courses	Count	13	6	0	19
	% of Total	5.0%	2.3%	.0%	7.3%
Courses by Consultants	Count	3	8	1	12
	% of Total	1.1%	3.1%	.4%	4.6%
In-House training	Count	24	12	3	39
	% of Total	9.2%	4.6%	1.1%	14.9%
Training by Service Organisation	Count	9	3	0	12
	% of Total	3.4%	1.1%	.0%	4.6%
Self Study/Training	Count	29	33	5	67
	% of Total	11.1%	12.6%	1.9%	25.6%
Others	Count	9	8	2	19
	% of Total	3.4%	3.1%	.8%	7.3%
Total	Count	146	101	15	262
	% of Total	55.7%	38.5%	5.7%	100.0%

Table 5.16: Respondents' Mode of IS Training

Of the total responses (N=246), 89 (36.2%) respondents attained their training through colleges/universities, 60 (24.4%) through self study/training, and 14 (16.7%) through in-house training provided by the organisation. Vendor sponsored training was only 14 (5.7%) and consultant 9 (3.7%). The results show that IS training was inadequately dealt within organisations. Self

study/training 27 (32.4%) and in-house training 20 (24.1%) were the popular IS training avenues for most organisations. Training through college and self-study/training were the most popular for the IRC.

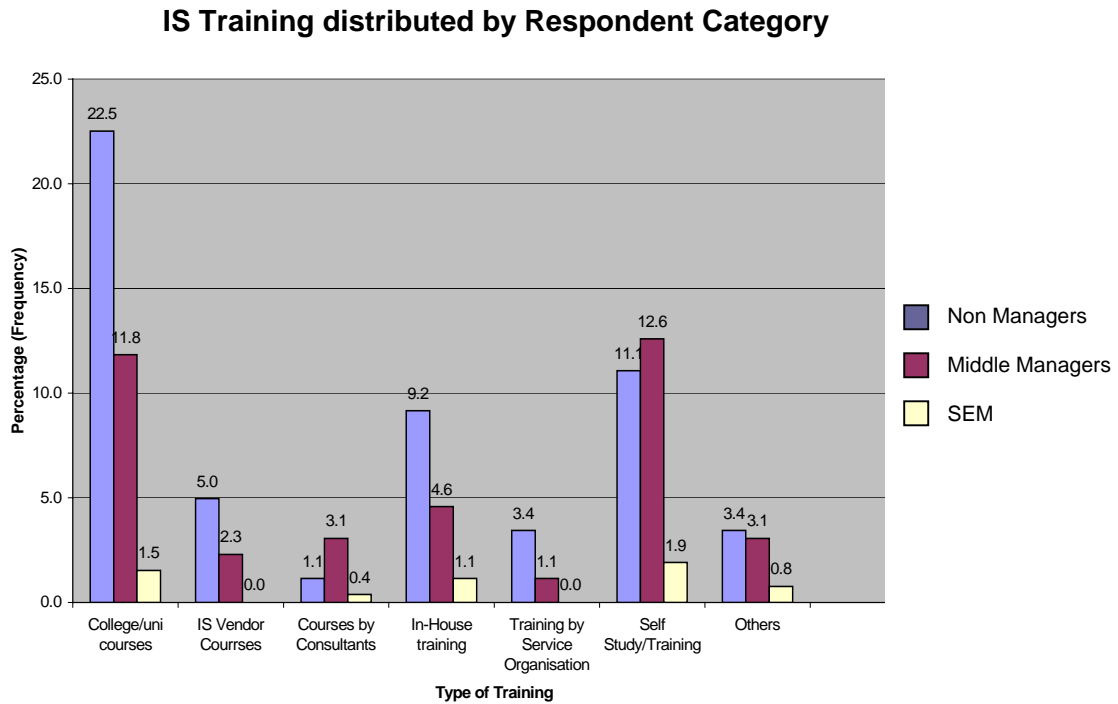


Figure 5.8: Respondent IS Training

Most middle managers and senior executive management attained IS training through self study/training. Few had college training. A high rate of non managers (76) obtained their training through colleges. Similarly 25 % (33) of non managers gained IS training by self study/training. These, results reaffirm the need for IS training in organisations.

IS Training (Private vs. Public vs. Higher Education and Research(HER))

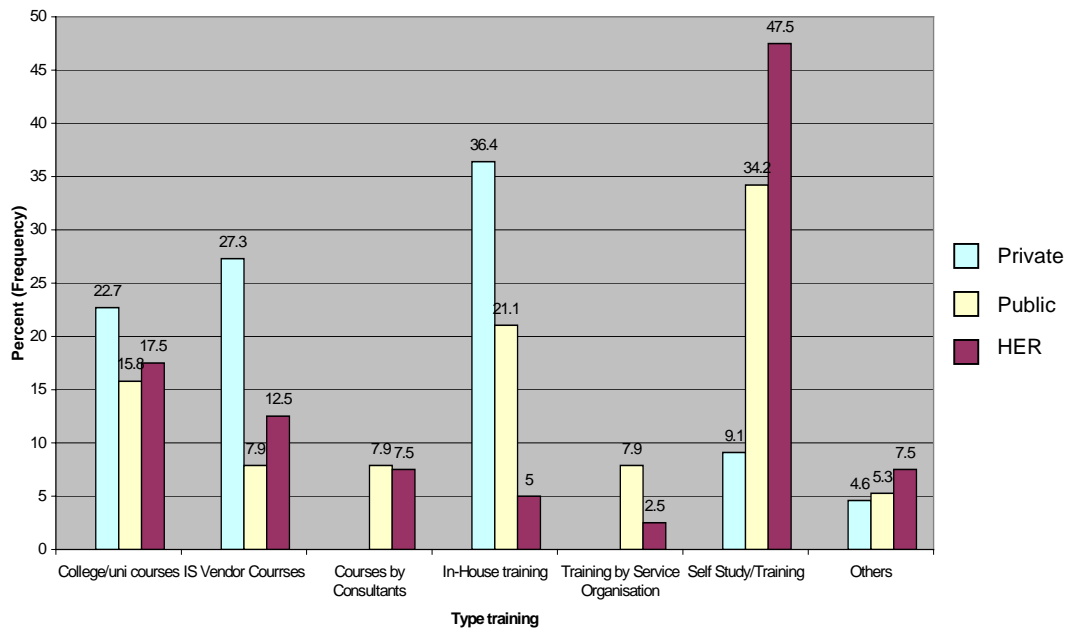


Figure 5.9: Comparison of Respondent IS Training between Participating Organisations

For the three categories, there seems to be a close distribution of scores on respondents attaining computer training in colleges and universities. As shown in Figure 5.9, most respondents in government institutions (public and HER) get their training through self study/training while in-house training is emphasised in private sector organisations.

5.8 Provision of IS Assistance

Almost 50% of the respondents stated that they sought IS assistance from IS staff, 16% indicated that IS assistance was unsatisfactory and 14% got assistance from their ‘wantoks’. Close to 50% thought IS assistance from IS staff was unsatisfactory and sought assistance elsewhere.

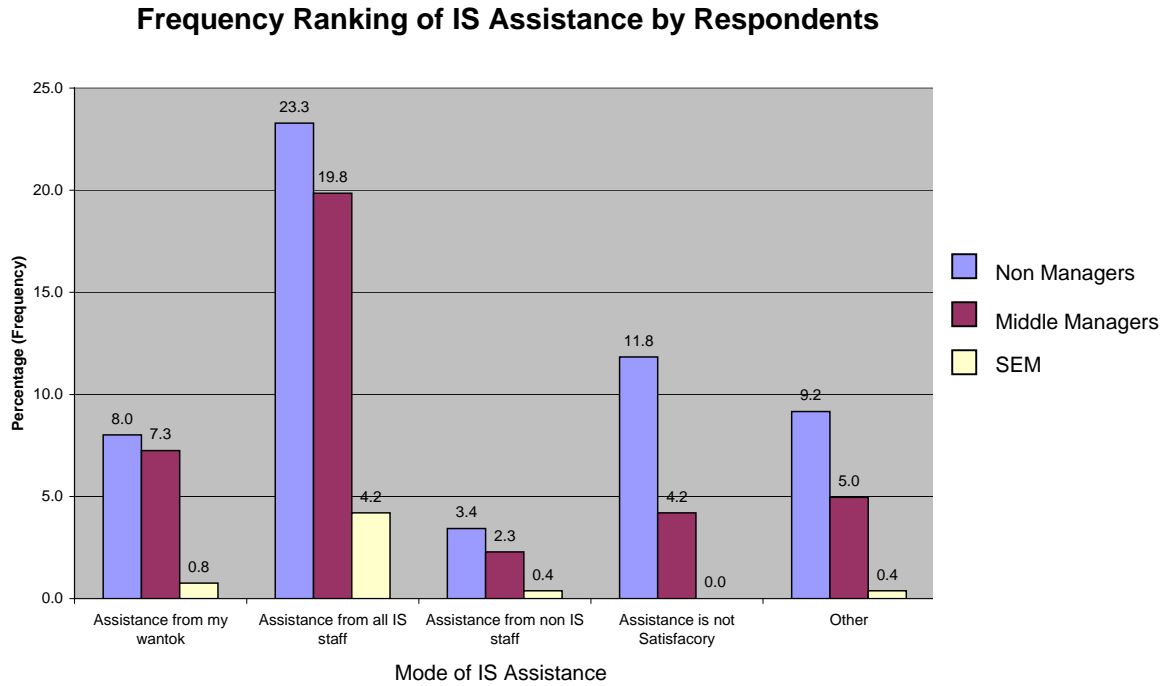


Figure 5.10: IS Assistance by Respondent Categories

Figure 5.10 shows where each category of respondents sought IS assistance. Middle managers and senior executive management most often sought assistance from their ‘wantoks’. Similarly more than 30% of users were not satisfied with the assistance they received from IS staff, and therefore attained assistance from other sources.

The majority of the respondents received assistance from IS staff, particularly for private organisations. A moderate level of users in the three categories sought assistance from their ‘wantoks’. There is a high level of dissatisfaction from the HER respondents, and from other public sector organisations with the assistance they receive from IS staff. Respondents from the same group also seek assistance from elsewhere.

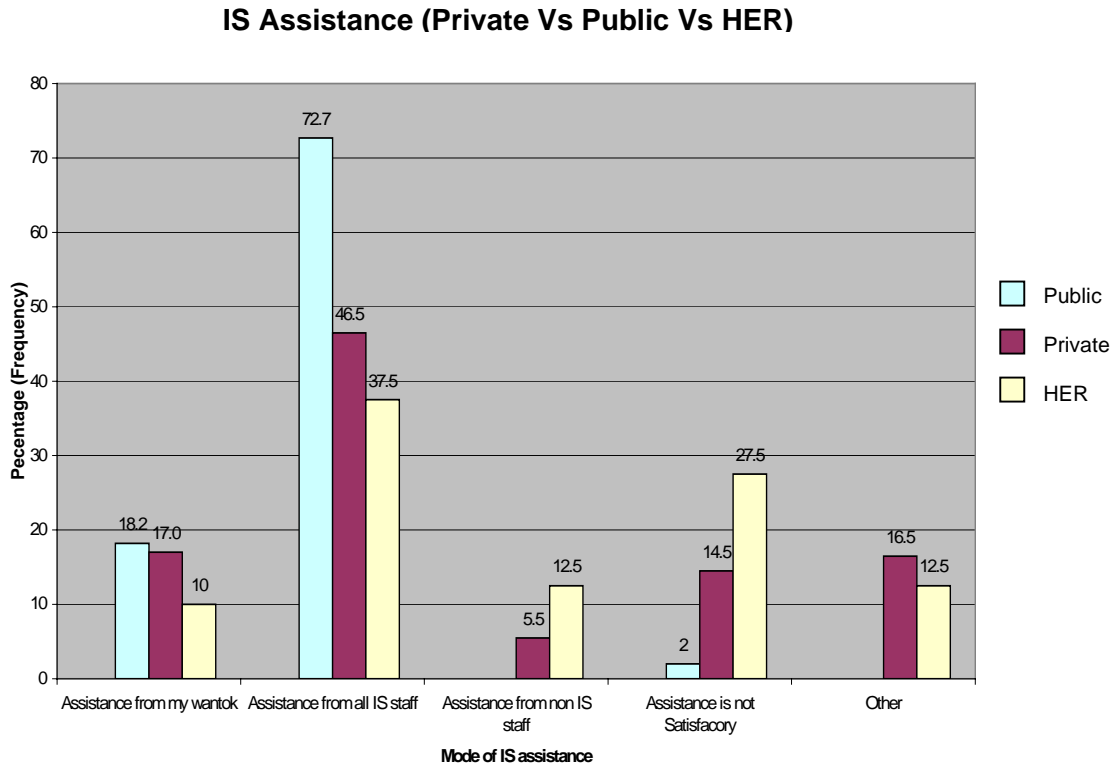


Figure 5.11: IS Assistance by Organisations

The results in Figure 5.11 show that private organisations effectively addressed the level of skilled IS staff in the organisation, thus, the end user is able to acquire help from IS staff. However the recruitment and employment of IS staff was difficult for public sector organisations. This is reflected in Figure 5.11, showing a high level of dissatisfaction, and end users seeking assistance elsewhere.

5.9 IS Usage Behaviour

Respondents were requested to rank their frequency of use from a Likert scale ranging from 1 (Occasionally) - 7 (Intensively). The scale was collapsed to four as shown in Table 5.17.

Scale	Frequency (N=262)		SEM	Percentage
	Non Managers	Middle Manager		
Occasionally	12	8	0	20 7.7%
Regularly	31	22	5	58 22.2%
Frequently	25	18	3	46 17.6%
Intensively	76	57	6	139 50.8%
Missing				5 1.9%

Table 5.17: Respondents' Frequency of IS Usage

There was a high degree of IS usage in organisations as shown in Table 5.17. Of the total of 257 usable responses, 132 (50.8%) used the IS intensively and 46 (17.6%) frequently. Just over 20% used the system on a regular basis. The majority of the respondents used the system either intensively or on a regular basis. Hence the results show a high level of IS usage in PNG organisations.

5.10 IS Success Rating

The aim of sub question 2.6 was to understand respondent's perception of how successful IS was in their organisations. The criterion question in Section C Part 7 of the survey addressed this issue. To answer this question respondents were requested to rank their views on a Likert scale ranging from 1 (Complete Failure) to 7 (Very Successful).

For clarity and practicality the results were condensed to only three scales as shown in Table 5.18.

Aggregated scores show that sixty-five (24.8%) of the total respondents (N=262) were of the view that IS in their organisation was 'Very Successful'. Only a few (6) respondents thought that IS in the organisation was a 'Complete Failure'. SEM thought IS was a success. The rest were of the view that IS success was moderate in organisations.

Scale	Frequency (N=262)			SEM	Percentage
	Non Manager	Middle Manager			
Complete Failure	4	2	0	6	2.3%
Moderate	99	83	9	190	72.5%
Very Successful	42	17	6	65	24.8%

Table 5.18: Organisation IS Success Rating

Sub question 2.6 also determined if organisations in PNG were employing any evaluative criteria to measure IS effectiveness. This is addressed in Section C Part 8 of the survey. Table 5.19 presents a summary of respondent perception of the evaluative criteria.

Success Measures employed in organisation?	Respondent Category			Total
	Non Managers	Middle Managers	Senior Management	
Yes	4	7	3	14
No	33	28	9	70
Do not know	109	66	3	178
Total	146	101	15	262

Table 5.19: Success Measurements by Respondent Category

An overwhelming 178 (67.9%) did not know of any evaluative criteria being employed in the organisation. Seventy were of the view that no IS success measure was employed. The rest thought there was some form of criteria for measuring IS success.

The results show that hardly any form of measurement criteria was employed in PNG organisations at the user or organisation levels to evaluate IS success.

5.11 Chapter Summary

This Chapter presented the findings of the Stage 2 study. The objective of the Stage 2 study was to determine the extent to which IS success elements identified in the Stage 1 study were dealt with in organisations. The emphasis placed on these elements by the respondents are also presented. Comparison between private and public sector revealed differences in the human resources dimension while emphasising data and system integrity. Public organisations were strapped with resource constraints. Conversely private organisations were able to overcome the human resource barriers. The findings are discussed next in Chapter 6.

Chapter 6

Discussions

6.0 Introduction

The purpose of the current study was to explore IS implementation and elucidate the elements that contribute to the success of IS in PNG organisations. The study also investigated the extent to which the identified elements were dealt with to ensure IS success in the organisations. PNG was chosen for a number of reasons including:

- First, PNG is classified as an LDC. It is demographically close to Australia (DC) and South East Asia (emerging economies), and yet fraught with contextual difficulties, and continues to struggle to come to terms with issues that inhibit development.
- Second, there has been an increased uptake of IT in PNG, accelerated by international support from donor agencies and other similar organisations such as the Virtual Colombo Plan¹⁴.

¹⁴ The Virtual Colombo Plan is an initiative by the World Bank and the Australian Government. The initiative is to promote accessibility to education, information and knowledge to individuals in LDCs -- thus bridging the 'digital divide' between LDCs and DCs. The Virtual Colombo Plan builds on the concepts of the original Colombo Plan, a regional plan focused on economic and social development. PNG is a beneficiary of this initiative. <http://www.usaid.gov/au/keyaid/vcp.cfm>

- Third, there is a paucity of empirical research and data in the IS domain, and as a result, insufficient understanding of the plethora of issues associated with IS implementation PNG and among the PINs.

Interestingly though, a multitude of countries are accorded a generic classification as LDCs, with the assumption that they are all alike. Such notions distort the distinct differences among the nations, and diversity in each society. Each society is unique: geographically, politically, economically and culturally. Thus, challenges to IS implementation and research in these settings are multiple and diverse.

Nevertheless, organisations in both DCs and LDCs are faced with similar underlying difficulties. For instance, the shortage of human resource is a problem experienced worldwide. The difference, however, is the extent to which these barriers are addressed in their respective settings. Therefore, understanding the elements that contribute to IS success, and how organisations deal with these barriers is important for LDCs. Hence, this study sought to answer the following two major questions:

- 1. What are the elements that influence the success of IS in PNG organisations? and**
- 2. How effectively are these elements dealt with to ensure the success of IS in PNG organisations?**

A multi method study was undertaken to address the questions. The justification in adopting the multi method strategy is explained in Chapter 3. The case study method was employed in the Stage 1 study, followed by the formal survey in Stage 2.

The objective of the Stage 1 study was to provide detailed analysis of IS, the context in which it was implemented, its interaction with organisational and external settings, and elicit the underlying elements associated with IS success. The objective of the Stage 2 study was to consolidate and extend the Stage 1 findings, illuminate relationships between entities, and draw conclusions from the perspective of a wider population. Employing multiple methods and data sources ensured that, findings were crosschecked and validated, and information generated from the findings was comprehensive.

The results of the multi method study were presented earlier in Chapters 4 and 5. The purpose of this Chapter is to provide an analysis of the results and present the key findings. The key findings are discussed in the context of previous literature, and the research questions formulated for this study. The rest of the Chapter is presented as follows. Section 6.1 describes the status of IS in organisations, the IS industry, the context in which IS is embedded, and the elements that influence IS success. In section 6.2, a summary of the key findings in this study is presented. The varying perspectives of the elements established in this study are discussed in section 6.3 followed by the conclusion of the Chapter in section 6.4.

6.1 The General Scope of IS in PNG

Analysis of IS in PNG provides a general basis of the nature and progress of IS and how the industry has evolved. IS and the related technologies are not new to PNG. In fact PNG has been exploiting IS over the last four decades, and the impact is ubiquitously evident: for example in the banks, finance and shipping, and customs. Hence the rapid development and diffusion of IS has had a huge impact on the way PNG organisations do business.

However, little is known and documented about IS, and the ensuing difficulties in PNG organisations, because of the absence of research activity and paucity of empirical data in this domain. The lack of documentation is further discussed in Chapter 7.3.

Results in this study show that a diverse set of IS technologies were implemented in the PNG organisations. However, IS implementation in the country was impeded by a plethora of issues and fraught with difficulties. In this regard, the investigation undertaken and the subsequent results discussed are significant contributions to IS studies in PNG.

The growth rate of the IT industry in PNG was estimated at 12% (Sinebare, 1998). IT has proliferated in all sectors of the society, since it was first introduced in the 1960s. In recent years, enterprise wide system platforms such as Oracle Relational Database Management System were widely introduced in the country. For example, the SIS in PNG Unitech migrated from a Prime mainframe based hierarchical database system to an Oracle RDBMS

system on a PC based wide area network environment. In a similar vein, the Provincial Government Accounting System, implemented in public organisations and provincial headquarters nationwide, is based on a Unix platform utilising the X.25 protocol. Similar technology was utilised by the banking industry for a period in the country. The use of office automation systems are prevalent in almost all organisations, either on local or wide area networks, or on standalone desktop computers.

Findings from Stage 1 of this study also show that organisational information systems were implemented on integrated networks of workstations, minicomputers, and mainframes connected through local and wide-area networks. This structure can be categorised as being in the *distributed era*. The IT growth framework discussed in Chapter 2.3.1.2 can provide the basis for explaining the general status of IS in PNG organisations. Based on the model, and the results of this study, it can be inferred that organisations in PNG have, in general, evolved from the *mainframe era* and were at the *distributed era*. The third, *Web-based era*, emphasising the use of Internet and Web protocols to drive both internal and externally oriented IT applications, is limited to only a few organisations. Besides, the inadequate infrastructure restricts full utilisation of the Internet technology in PNG.

The Internet technology was introduced to PNG in 1997¹⁵. The utilisation and success of this technology has also been impeded by the socio-economic,

¹⁵AT&T Easylink Services was contracted to implement the Internet Gateway for PNG in May 1997 with an initial bandwidth of 256K under the Network name of Tiare providing all the International Internet connectivity between PNG Internet Service Providers and the rest of the world'. <http://www.tiare.net.pg/pmc/company.html#gateway>

human resource, and technical implications, particularly the telecommunication infrastructure.

The development and the use of Internet and related services in the country are primarily concentrated in private and multinational organisations, with limited use in the public service (Waieng, 2000). Recently, a report on the information and communication technology infrastructure in the Pacific by UNESCO (2002) suggested that close to 25% of the PNG population have Internet access at homes, at workplaces, at schools and public access centres¹⁶. Findings in this study reveal that only one (PNG Unitech) of the four cases investigated in this study had limited Internet access and service. Internet access was isolated to only one or two “dial-in” services in the other three organisations. Nevertheless, there is increasing interest in Internet technology in the country as more institutions, agencies and individuals emphasise the significance and advantages of utilising the Internet. For instance, a search on the Internet shows over 200 sites ranging from business to education organisations¹⁷. The majority of the government departments and statutory bodies maintain websites.

The findings suggest that the majority of the organisations, private and public, are actively utilising IT at varying degrees. However, disparities in education, economic, experience and IT infrastructure do not allow for a uniform and S-curve adoption of IT in organisations as in DCs. For example, in an analysis of IT in Latin America, Garcia-Murillo (2003) found that IT adoption in those

¹⁶ UNESCO report on ICT infrastructure – Internet access in Pacific Island Nations. [Http://www.unesco.org/webworld/publications/2002_internet_survey_report.rtf](http://www.unesco.org/webworld/publications/2002_internet_survey_report.rtf)

¹⁷ http://www.datec.net.pg/directoryPNG_buiness/html

countries was a patchwork of technologies. Similar to the Latin American economies, there are those with sophisticated IS, and others that are still using manual typewriters in the PNG context.

The majority of the respondents in this study were of the view that little is being done at the national level to propel the industry. A national policy on Information and Communication was drafted in 1994, however, according to the Office of Information website, no further work has since been undertaken¹⁸.

Thus, with the lack of a policy framework and direction at the national level, IT is still struggling to find its direction and niche in the market. In addition, results reveal that stakeholders at the organisational level were unaware of the policy initiatives by the government, highlighting the lack of communication and collaboration between the industry and the government. The UNESCO (2002) report concluded that none of the 15 PINs have an IT policy in place. Hence, the desired national IT policies and legal framework are yet to be developed for the country, preferably along the lines taken by other economies such as Singapore, India and Malaysia. It is however encouraging that interest is mounting at the national and political level, as concluded in the same report.

Similar to other studies, findings in this study show that an overwhelming number of respondents in both private and public sector organisations considered telecommunication as a major factor influencing the success of IS.

¹⁸ <http://communication.gov.pg>. Accessed on the 26th Feb 05.

Ironically, a recent study by UNESCO (2002) contends that PINs including PNG were implementing the latest technologies in telecommunication. Yet telecommunication infrastructure and services in the country were inadequate and costly. Telikom PNG, the government statutory body, is the sole carrier monopolizing the PNG market¹⁹.

In three of the four cases evaluated in this study, IS was used to support the organisation's distributed operations. Electronic data transmission was, in most instances, distorted and data and information quality compromised. Unless telecommunication related issues are clearly understood and adequately addressed, it will continue to be a barrier impeding development including IS implementation. Thus the greatest challenge for PNG organisations to effectively utilise IT as a developmental tool is the lack of basic communication infrastructure (Gaimea, 2001). This statement mirrors the general consensus about telecommunication in PNG by the stakeholders investigated in this study.

The availability of human resource is another major barrier to the success of IS in PNG organisations. The availability of skilled IS professionals is a critical issue in both DCs (Van Hellens, Wong & Orr, 2000; Delone & McLean, 1992; Myers & Tan, 2002) and LDCs (Kelegai & Middleton, 2000; Al-Abdul-Gader, 1999; Jain 1997a). Findings in this study show that the scarcity of skilled IS professionals in PNG threatens the effective implementation of IS in organisations. However, as shown in this study, these concerns do not deter

¹⁹ The Telikom Act was amended to incorporate the socio-economic and privatisation process. The privatisation of Telikom has been controversial and sensitive. The debate is ongoing. <http://www.thenational.com.pg/1109/nation4.htm>, <http://www.telikompng.com.pg/>

the utilisation of IS in the majority of the organisations, particularly those in the public sector who function within these constraints. In this regard, the engagement of external expertise is a norm among these organisations. Hence, organisations in the public and the private sector continue to engage skilled IS personnel from abroad incurring considerable expenses.

In conclusion, the severity of the human resource issue is immense, thus a national focus is urgently required. It is therefore important that a human resource management strategy is developed to address the trends in industry and the socio-economic system. Human resource is discussed in section 6.2.3.

PNG is an agricultural based economy, thus it is not surprising that it relies on IT manufactured externally. Like other LDCs, technology is transferred to PNG from DCs and emerging economies such as Asia. Similarly, there appears to be little activity pertinent to software development in the country, giving rise to the dependency on the off-the-shelf packages and customised packages usually developed by external organisations. Except for Oracle, there were no other popular IS suppliers established in the country. Service organisations, acting as distributing agents provide hardware and software sales and support in the country. As shown in Table 2.2, organisations were passive adopters of IS with limited ability for creativity.

Experiences from other economies suggest that the government's approach to the socio-economic and technical conditions is reflected by the growth of IT in that country. For example, India's neo-liberal approach to IS industry

development has had positive effect on the IS industry. However, findings in this study reveal that significant elements required for the development and growth of the IT industry in PNG - *knowledge base, financial base and government support* as advanced by Vinig et al. (1998) - were lacking and inadequately addressed. Such economic frameworks are necessary for PNG.

The overall scope of IT including IS is far too dependent on external forces. The impeding factors have not slowed down to give an opportunity for the establishment of the IT industry and its growth. Compounded with the inherent difficulties, PNG faces huge challenges to support and sustain the rapidly evolving technologies.

In conclusion, this study diverges from the common tendency to describe the IT industry as being at its “infancy”. The concept of early or formative years does not reflect the context of the current status of IT in the country. IS has been introduced in PNG since the 1960s, and yet, the IS industry is still at its formative years. Findings show that IT in PNG is patchwork of technologies as advanced earlier. IT in the country is a collection of technologies and information systems, fragmented and indiscriminately used.

The framework advanced by Vinig et al. (1998) can provide the basis to illuminate the status of the IS industry. The *knowledge base* is a major barrier and concern as also discussed earlier in section 6.2.3. The *government support*, although widely published in the media, is inadequate. *Financial base and set up of business venture* in this domain is impeded by the prevailing

conditions. Therefore, in conclusion, the IS industry is dormant and is still undeveloped. If there is any improvement, it is at the embryonic stage.

This is similar to that of a number of Arabic Gulf Countries (Al-Abdul-Gader, 1999; Higgs, 2003) and the PINs. IT in PNG is industry driven, with the government playing a participative role. The industry is impeded by major intervening factors such as national policy and guidelines, legal framework, national direction, human resource issues, IT infrastructure, and socio-economic problems. Issues at the national level continue to threaten the effective use of IT and the industry's growth.

Findings in this study also cast some light on the potential implications on the continued dependency on external industry forces. The IT industry is dictated by the same external forces, giving rise to the "dependency syndrome". Therefore, national level intervention to facilitate and support the knowledge and financial base is urgently required for a sustained growth of the country's IT industry.

6.2 Key Findings

The key findings are derived from results of the current study. A set of principles pertinent to IS implementation in PNG is proposed based on the key findings. Similarly a set of recommendations in relation to IS implementation and management in PNG is presented based on the outcome of this study. The findings also yield several important insights to the research questions on IS implementation in PNG organisations. These findings are presented in Table 6.1.1

No.	Key findings in this study	Discussed in section
1	More than fifty elements were established in this study. The characteristics of these elements correspond with findings from other studies in DCs and LDCs. Hence, similar underlying problems are faced by managers in disparate settings. Four additional factors, not revealed elsewhere, were identified in this study as a contribution to knowledge.	6.2.1
2	There was a general consensus among managers that all the elements identified in the study were important relative to the organisation's needs. There is relatively strong emphasis on data security and system quality by management in PNG organisations.	6.2.2
3	The insufficient level of human resource planning and development was a serious concern for organisations. This impediment is manifested in the scarcity of skilled IS professionals in the country and insufficient level of IS training for end users in PNG organisations.	6.2.3
4	There is lack of knowledge, awareness, and understanding by top management relating to the principles and the fundamental concepts of IS, its capabilities and its role in the organisation. This inhibits top management 's ability to comprehensively address the issues pertaining to IS in its totality.	6.2.4
5	Little or no attempt is being made to address strategic level issues at the national, and organisational levels. In this respect, there is no alignment of strategies, policies or planning between these levels.	6.2.5
6	There was an emphasis on data and information quality by managers in PNG organisations.	6.2.6
7	External environmental factors have a major influence on the success of IS in PNG organisations.	6.2.7
8	There is insufficient level of understanding of IS success criteria, and lack of measuring its success in PNG organisations.	6.2.8
9	The primary role of IS in PNG organisations is perceived as supportive within a technical service unit.	6.2.9
10	The public sector organisations were severely constrained by the lack of resources and relied on assistance through the form of aid and donations from donor countries and international aid organisations.	6.2.10
11	IS in PNG is a collection of technologies fragmented and adopted in pockets. There is dependency on externally developed hardware and software, thus, organisations were passive adopters of IS and relied on foreign expertise.	6.1

Table 6.1: Summary of Key Findings in Study

6.2.1 Key Finding 1: Elements that contribute to the success of IS

This study found the presence of multiple elements that can contribute to the success of IS in PNG organisations. The four case studies employed in Stage 1 of the study revealed more than 50 elements in the user, organisational, and external environments. Fifty of the identified elements were present in prior literature and confirmed in this study. The findings were consistent with results from prior studies including the work by Al-Abdul-Gader (1999), Li (1997), Ang et al. (2001), and Jain (1997a). In other words, the elements determined in this study were consistent with those established in DCs and other LDCs. The contributing elements to IS success are presented in Table 4.9.

In addition to the 50 elements, four elements (see Table 4.8) not identified elsewhere emerged in this study. As presented in Chapter 4.3.2.4, the elements are: IS integrity; skills transfer from consultant to organisation; employment procedures and conditions for IS specialists; and a cultural factor – the ‘wantok’ system. These variables could be useful in other LDC studies. The list was, however, not exhaustive and was in response to the PNG context.

The overall answer to the first question is that there are a multitude of elements that contribute to IS success. Consistent with the research framework, and in congruence with that of other studies in both DCs and LDCs, over fifty elements were identified in Stage 1 of the current study.

The current study affirms that contextual differences exist between DCs and LDCs, and between LDCs, and asserts the disparity in the settings in which IS

is embedded. However, the findings in this study illustrate that organisations are faced with a common set of problems that impede IS success. Thus a generic set of IS success elements can be found in these disparate settings. This study concurs with Farhoomand (1992), that the “*behaviour of successful systems is influenced by a universe of properties common to all successful systems, on one extreme, and by a set of properties specific to each type of system, on the other*” (p.46).

Hence, it can be concluded from this information that generally, the underlying elements identified in this study can be found in other LDCs and in DCs. This study contributed to the body of knowledge by eliciting four new elements that influence IS success in PNG organisations.

6.2.2 Key Finding 2: Emphasise on IS success Elements

The findings illustrate that respondents in both the private and public sector organisations perceived that elements established in this study were important contributors to IS success relative to the organisational needs. Rank order of the perceived importance of IS success elements was presented in Figure 5.6. The rank ordering eliminates the differences in individual perceptions of IS success elements and shows relative levels of importance (Li, 1999).

Findings in this study reveal that managers emphasised system and output information quality. The sensitivity of data and output information required several levels and measures of security control in one particular organisation, thus emphasis on information and system quality was paramount. Hence, the results in this study may be slightly skewed. This limitation is further discussed

in Chapter 7.4. Nevertheless, the rank ordering contributes to eliminating the subjective level of measurement and the individual degree of emphasis (Li, 1999).

Similarly, and consistent with other studies, findings in this study illustrated that insufficient resources including funding was a major barrier to IS success, particularly for the public sector organisations. Survey results in the Stage 2 study reiterate the emphasis on IS funding.

Managers also emphasised the availability of competent IS staff and IS vendor support. The focus and emphasis for managers was the availability of quality output information useful for decision-making. Thus, vendor support, and the availability of skilled and competent IS staff are required to provide the underlying technical support in maintaining system quality. Vendor support was important in providing product support.

There appears to be little cooperation between organisations in the country in both the private and public sector. Partnership with the private sector, varying from external consultants, IS vendors, and local companies with their wealth of experience in developing IS applications can be useful for the public sector organisations (Bhatnagar, 2002). However, sharing of knowledge and experience among organisations, particularly for public sector organisations, was lacking.

The use of off-the-shelf packages is encouraged so as not to “reinvent the wheel” (Bhatnagar, 2002). Thus, IS application development was perceived as

one of the least important elements. The adoption of established standards and protocols and off-the-shelf software, such as the ASYCUDA system in the IRC, is encouraged in many LDCs (Bhatnagar, 2002). However, implications in relation to technology transfer such as vendor support, and economic implications should be considered. Furthermore, less emphasis was placed on innovativeness in organisations. Thus, organisations were passive adopters of IS which is designed, developed and implemented by external consultants. Moreover, external consultants were prominently involved in the IS development and implementation processes in most organisations. Organisations rely heavily on external support while IS staff were more inclined to assist in system maintenance and service.

A comparison of the results in this study reveal that slightly over 40% (22) of the elements revealed in this study are present in the factors identified in Bailey and Pearson's analysis as adopted by Li (1997). Less than 20% were present in the factors identified by Al-Abdul-Gader (1999). Findings are also consistent with those identified in Jain's study. Close review of the 10 most important and 10 least important reveal similarities has shown in Tables 6.2 and 6.3 respectively.

The emphasis in LDCs is on the availability of resources (human and financial), and planning. Information quality also appears to be important for managers in DCs. In contrast to the result in this study, IS planning and organisational elements were highly rated in Al-Abdul-Gader's study.

Rank (this study)	Description of element identified in this study	Li (1997)	Al-Abdul- Gader(1999)
1	Data security and administration	27	Not incl.
2	Funding for IS applications	Not incl.	6
3	Accuracy of information from IS	1	Not incl.
4	Technical skills and competence of IS staff	10	1
5	IS vendor support	34	22
6	Timeliness of output information	3	Not incl.
7	Reliability of output information	2	Not incl.
8	Training provided for users	35	12
9	Management IS awareness/ understanding	Not incl.	5

Table 6.2: Comparison of Most Important Elements with Rankings from Other Studies

As shown in Tables 6.2 and 6.3 some of the elements identified and ranked in this study were not included in the studies by Li (1997) and Al-Abdul-Gader(1999). The omissions are represented by the ‘*Not incl.*’ statement in the respective columns.

Rank (this study)	Description of element identified in this study	Li (1997)	Al-Abdul- Gader(1999)
39	Long-term planning	Not incl.	1
38	Availability of documentation	23	Not incl.
37	Cooperation between organisations	Not incl.	11
36	Proximity between CEO/CIO	Not incl.	13
35	IS application development	Not incl.	19
34	IS innovativeness	Not incl.	Not incl.
33	IS policies and guidelines	Not incl.	1
32	Leadership and direction by CIO	Not incl.	Not incl.
31	User assistance	Not incl.	Not incl.

Table 6.3: Comparison of Least Important Elements with Rankings from Other Studies

The sub question to be addressed was, ***Do perceptions of the importance of IS success elements differ between managers in the public and managers in the private sector organisations?***

Except for two elements, results of the confirmatory test shows that there is no difference between managers in private and public sector organisations, in their perceptions of the importance of the elements for IS success.

Firstly, findings from the study show that slightly more managers in public sector organisations perceived that career advancement and remuneration packages is an important element, significant at the 0.05 level ($p < 0.05$). Secondly, it was also revealed that a statistically significant difference exists between private and public sector managers' perceptions of the importance of technical skills and competency of IS staff. Again, this is significant at the 0.05 level ($p < 0.05$).

The human resource is an important underlying dimension for IS success. Technical skills and competency of IS staff was rated as one of the four most important elements. Career advancement and remuneration was given a moderate rating. The findings illustrate that private organisations offer better employment conditions and career advancement opportunities. Hence, they are able to attract and retain skilled IS professionals.

The Expectancy Theory proposed by Vroom (1964) posits that the individual's behaviour is based on the desirability of the rewards. In other words, individuals will engage in an event if they expect some sort of reward, even

though it may not be useful to them. By applying the Expectancy Theory in this scenario, we can explain at least one major reason why IS professionals prefer to work in private sector organisations – expected rewards. Besides, remuneration packages in the public sector are unattractive compared to rewards offered by the private sector organisations (Gauch, 1993).

Similarly, the '*perceived consequence*' is a concept similar to the Expectancy Theory. Thompson et al. (1991) define perceived consequence as an '*outcome that may payoff for future*' (p.129). For example, IS professionals may join the private sector if they perceive that there is a better career prospect in the private sector organisations.

Managers in the public sector organisations expressed disappointment in the organisation's inability to retain IS staff. Apart from the scarcity of IS professionals, public sector organisations are confronted with another problem -- the stringent bureaucratic process of staff recruitment. The recruitment process in the public service was slow and cumbersome. Additionally, the Public Service Act sets salary and conditions for all government employees. The current salary scales for IS graduates are far lower than those that are currently being offered to their counterparts in the private sector. There are some salary variances between public sector organisations, however these variances are insignificant compared to the remuneration packages offered by the private sector.

Findings in this study also reveal that more managers in the public sector were concerned with the availability of competent and skilled IS staff. A major

implication was that IS in the public sector was stagnated because of the lack of a skilled and competent workforce. A further implication was that the government investment in educating and developing IS professionals was high. However, there was a far greater chance of the graduates joining the private sector soon after training for reasons explained earlier.

The overall answer for this question is that all the elements identified in this study were important contributors for the success of IS in PNG organisations. Information and system quality dimensions were given a high ranking. Human resources elements also feature prominently. The significance of IS staff is a self assurance for managers that system and output quality are maintained. Without sufficient knowledge, understanding and awareness of the intricacies of IS, managers feel threatened that they are unable to control IS.

The nature of IS advocates organisational change, however, in the organisations that have been studied, IS is annexed and changed to suit the organisation. Thus, the process is secondary, but the outcome of the system is emphasised.

6.2.3 Key Finding 3: Human Resources Management

Human resource is a serious concern for managers in organisations in DCs (Seddon, et al., 1999; Meyer, 1998; Delone & McLean, 1992) and LDCs (Monteaglere 1998; Heeks, 2002; Al-Abdul-Gader, 1999; Jayasuriya, 1999). Human resource elements were among the most predominately mentioned by the key actors emphasising the importance of these elements in the study. Hence, findings in this study exhibit the seriousness and reveal the severity of

the shortage of skilled IS professionals in PNG. However, organisations, particularly those in the public sector, were unable to effectively address human resource problems. The human resource issue is a culmination of numerous elements that are closely related. For instance, the availability of skilled IS professionals is an element beyond the control of the organisation and must be addressed at the national level. This should be done in conjunction with the major stakeholders, employers, educational institutions and the government. The relevant government organisations include: the Department of Personnel Management, Department of National Planning, Finance Department, Department of Education, Office of Higher Education and Education Institutions.

The general consensus is that there is a high demand for skilled IS professionals. This imbalance is caused by the acute shortage of the skilled professionals in the country as expressed by the participants in Stage 1 of this study, and consistent with studies elsewhere (Al-Abdul-Gader, 1999; Heeks, 2002; Ang et al., 2001). However, rank ordering of respondent perceptions show that the two elements - IS staff in the organisation (4th), and the level of technical skills and competency (9th) - were effectively addressed by organisations. This is contradictory. One possible reason is the engagement of IS consultants to solve organisational problems. Private and public sector organisations continue to employ foreign consultants to supplement the acute shortage of IS professionals in the country. However, the general consensus among the respondents was that experience and knowledge was not transferred from the consultants to organisations.

Similarly, the study revealed the insufficient level of training for IS professionals, users, and managers in PNG organisations exacerbating the lack of literacy, knowledge and awareness of the capabilities of IS. Findings in this study show that IS training was predominately mentioned by the three actors. IS training at the user and SEM levels would increase awareness, knowledge and understanding of the IS. Even though there were mixed feelings about training in the private sector, the issue was being addressed. On the contrary, IS training was ineffectively addressed in the public sector.

Findings in Stage 2 of this study confirm and reiterate outcomes from prior studies, that is, that IS training is perceived as an important element, but is least effectively addressed by organisations. Results from this study affirm that IS training was ineffectively addressed in PNG organisations. Confirmatory tests ($p < 0.01$) concur with the results in Stage 1, that is, that more informants in public sector organisations perceive that IS training was inadequately addressed. Statistically significant difference was found between managers ($P < 0.01$) in the private and public sector. Statistically significant ($P < 0.05$) difference was also found between non managers in the private and public sector.

The conclusion made from this finding is that IS training was perceived as an important element, however, private sector organisations showed a high degree of addressing IS training. The degree of effectiveness in addressing IS training is influenced by many variables including the availability of resources such as sufficient funding, availability of IS staff and management support which were lacking in the public sector.

Findings reveal that almost 36% of the total (N=246) respondents attained IS training through University or Colleges. However, the training was attained prior to the staff joining the organisation. Of the total (N) respondents, 88% (229) were employed for less than 4 years. A high number of these staff may be recent graduates, thus, possess generic level IS knowledge attained through college studies.

A further comparison of mean scores between public sector organisations and the private sector reveals that more staff in the private sector attained their training through “in-house” training programs. On the other hand, more staff in the public sector attained their training through “self study/training”. Interestingly, the majority of middle managers and senior managers attained their training through self study/training. Results show that most managers in the public sector attain their IS training through self study. These findings again concur with findings presented earlier in this section, that is, that there were inadequate training provisions in the public sector organisations. Conversely, private organisations realise the need for staff to possess skills that will enhance their performance and increase self-esteem. What is encouraging however is that employees were beginning to realise the usefulness of IS and the impact in their work environment. Hence, findings in this study show that end users were keen in upgrading their knowledge and skills, in many instances bearing costs oblivious to the management.

This finding reiterates what was advanced earlier, that is, that there is an insufficient level of IS training in organisations in the country, particularly the

public sector. Although most managers engaged in self study/training, such studies may not necessarily provide managers with a higher conceptual level of understanding. Furthermore the type and level of training, and accreditation issues were not evident in this study. Hence, a broader level of training is required for managers to fully understand the socio technical aspects and the underlying principles of IS management.

Insufficient training and career advancement opportunities for IS professionals can result in the high turnover rate of IS staff as exemplified by the severe shortage of skilled IS staff at PNG Unitech. Similarly, public sector organisations as compared to the private sector were often unable to retain IS professionals. Restrictive employment conditions applied in the public service do not allow for these organisations to offer better remuneration packages similar to that offered by private sector organisations. In addition, limited funding and the stringent recruitment policies do not allow any flexibility for public sector organisations to recruit additional IS staff. The implication was that more highly skilled IS professionals were seeking employment with the private sector. Hence, the notion of 'brain drain' to the private sector needs to be addressed at the national level.

6.2.4 Key Finding 4: Top management IS knowledge and awareness

Findings in this study show that insufficient IS knowledge, awareness and training among the top management in organisations is a major and critical barrier to IS effectiveness. Monteaglere (1998) concluded that informed and resourceful managers were pivotal to the success of IS. Similarly, Al-Abdul-Gader (1999) stressed that top management knowledge and awareness of the

capabilities of IS was an important factor for IS success. That is, that a major barrier to the success of IS in PNG organisations is the level of IS knowledge, awareness and understanding by top management. Management support, funding and other strategic issues depend on how management perceive IS. That is, management awareness and knowledge of IS influences how management perceive IS.

A concept advanced by Heeks (2002) and other authors to address the shortage of IS skills and knowledge in organisations is to produce hybrid IS graduates. The graduates were proficient and skilled in the areas and concepts in IS and business and people skills. Adapting a similar concept, a hybrid top management possessing adequate IS knowledge as well as an aptitude in business skills is necessary for PNG organisations.

Leadership and direction from IS staff are crucial in organisations. However, top management do not perceive IS as a strategic tool and an integral part of the organisation. With little support from top management, and without any planning or policy direction, IS management is difficult. Sound IS management principles and guidelines, within a structured framework, is necessary. The knowledge and understanding of IS and its capabilities by the top management would assist in implementing better management strategies.

In sum, what was highly rated in this study as well as in studies by Al-Abdul-Gader (1999) and Jain (1997a) is the lack of sufficient computer knowledge within middle and top management. Higgo (2003) stated that, "*managerial competence is the basic critical success factor for harnessing the benefits of*

the computer based management information systems” (p.11). Findings in this study are consistent with those in other LDCs, that is, that top management knowledge and understanding of IS concepts can pave the way for beneficial implementations.

6.2.5 Key Finding 5: Strategic Issues

The findings in this study established that the strategic elements of policy, planning, budgeting, and strategies at the national, organisation and the IS division influenced IS success. Participants in the four case studies expressed the importance of these elements. They were also of the opinion that the organisations were giving little time and resources to address the elements. Findings in Stage 2 reiterate the case study findings and that of prior studies, in particular Al-Abdul-Gader (1999). The three categories of respondents in the Delphi study by Al-Abdul-Gader also rated IS planning as the most significant factor. Effective IS planning is an essential element for IS success. IS planning helps to address other issues such as human resources, budget, technology uptake and coordinating partnerships with industry.

The findings in this study show that there was inadequate IS planning, and insufficient consideration of IT policies and guidelines at the national and organisation levels. IS planning, as argued by numerous scholars including Al-Abdul-Gader (1999), is a critical component for the success of IS in organisations. The absence of planning and political support at the national level might well be one of the most significant factors inhibiting the growth of Internet infrastructure in PNG and other PINs (UNESCO, 2002).

The findings show that none of the four cases investigated in this study developed an organisation IS policy or strategic plan. In addition, there appears to be little thought about the alignment of the IS division strategies and organisation goals. Similarly, there was no alignment between organisation strategies and national government planning pertaining to IS in the public sector. The study by Al-Abdul-Gader shows a similar scene for Arabic Gulf Countries. In that study, stakeholders ranked IT planning as the most important barrier to IT diffusion. Al-Abdul-Gader proposed that *'organisations with better planning practises have a higher effective levels of computer base information systems diffusion'* (p. 82). This quote mirrors the criticisms of the lack of proper IS planning efforts in the foregoing discussions.

The literature is abound with useful material emphasising the significance of IS policy and planning. By learning from the experiences of other countries, a serious effort is urgently required at the national level for PNG. Additionally, development of IS policy and strategic plan at the organisation level can address issues such as human resources and funding.

The dynamic nature of IS requires attention to details at the strategic level. The policy, planning, budget and strategies were required to efficiently manage IS and maximise its potential. The alignment of organisation and IS plans was necessary for these entities to interact and in the process achieve defined goals. However little attention was paid to address strategic level issues in most organisations investigated in this study.

6.2.6 Key Finding 6: Information and Data Quality

Findings in Stage 1 of the study show that three out of the four cases investigated emphasised the need for IS integrity and information quality. Due to the sensitivity of data, both the private and public sector organisations showed greater concern for data security and administration. Findings in Stage 2 concur with results established in Stage 1. Information quality elements including data security, accuracy of information, reliability and timeliness of output information were ranked as the most effectively addressed elements by organisations. Systems quality elements including IS integrity and prompt processing of user requirements appear to be effectively addressed.

Participants in the four organisations investigated in this study were concerned about the quality of output information and the system quality. Information and system quality are two dimensions supported by Delone and McLean as discussed in Chapter 2.

In Delone and McLean's model, system quality and information quality influence IS utilisation and user satisfaction. User satisfaction influences utilisation as well as the reverse being true. This can be justified by the theory of attitude and behaviour, Theory of Reasoned Action (Fishbein & Ajzen, 1975) as investigated in numerous studies (Delone & McLean, 1992; Thompson, Higgings & Howell, 1991; Al-Khaldi & Wallace, 1999). IS integrity ensures that proper guidelines and audit trails are followed to justify the quality of output information.

Al-Abdul-Gader (1999) concluded that “*insufficient computer knowledge by middle and top management*” (p.107) was a barrier highly rated by a panel of experts. This study as mentioned earlier also found that management lacked knowledge and awareness of IS. Top management’s lack of IS knowledge and awareness was reflected in the way IS was approached in the organisations. Without IS know-how, top management were sceptical and apprehensive about the system and how the organisation secrets are protected. An implication in these circumstances is that managers in uncertain situations require system integrity and validation to ensure that information quality is maintained. Such behaviour can also be related to computer anxiety.

Computer anxiety is defined as the fear of an object. Individuals with high computer anxiety possessed lower outcomes compared to those with low computer anxiety. Insufficient knowledge and understanding of IS by managers contributes to computer anxiety, and leads to imposing control, and stringent IS and data validation procedures.

This behaviour can also be attributed to cultural implications. Countries with high Uncertainty Avoidance tend to have a need for security and a strong belief in experts (Katz & Townsend, 2000). Hence, insufficient IS knowledge and cultural orientation can lead to computer anxiety resulting in the emphasis on security and reliance on experts.

6.2.7 Key Finding 7: External environmental factors

Findings in this study show that external factors influence the way organisations manage IS. IS is embedded in organisational socio-economic

and political settings. These settings influence the way IS is implemented. Similar to the Al-Abdul-Gader study, and a plethora of other studies, the political, and economic and law and order are major factors that impede IS success in PNG organisations. For instance, concern about security is a major barrier. Vandalism of telecommunication equipment by thieves imposes severe impact on business. Foreign IT contract officers are often victims of the social upheaval and tend to prefer safer environments other than PNG.

The acute shortage of IS professionals in the country also has adverse effects on the success of organisational systems. Human resources issue is discussed in section 6.2.3.

Foreign investment is also impacted by the social and political instability (UNESCO, 2002). These forces contribute to the economic condition of the country. Public sector organisations depend entirely on government funding. National government funding depended on the economic conditions, which in turn are influenced by many market forces and socio-political conditions.

These problems are not specific to IS, but constitute the plethora of developmental problems faced by LDCs. Unless, and when, political and top echelon in organisations understand the value of IS, LDCs will continue to struggle to fully utilise these technologies. The role of the government in providing direction and a framework at this stage is crucial.

Although the characteristics of an LDC environment immediately insinuates attention to a notion of dysfunction, this study has revealed that organisations

can implement and benefit from IS in these settings. Private organisations have shown that they can function within the external constraints. However, it is important that the government creates an environment conducive for IS growth. It is also necessary to set practical and achievable objectives within the environmental constraints drawing on experiences from other LDCs and NIEs in the region.

6.2.8 Key Finding 8: IS Success Measures in PNG Organisations

Literature is abound with studies on establishing IS success measurement criteria, and debate on the appropriateness of these criteria is ongoing. These measures are useful for both managers and users. However, findings in this study show that there is hardly any form of evaluative criteria employed in PNG organisations. Thus, standards, best practice or recommended practice for IS evaluation were not considered. This is of concern, because without employing established and appropriate evaluative criteria, perceptions about the significance and success of IS would be inconclusive and subjective.

Evidently, accountability and evaluation of IS investment is lacking particularly in the public sector. As discussed earlier, IS investments in most public organisations were donor-funded and supported. Sustainability and ongoing support has been emphasised. However, the lack of resources and proper management practices contribute to organisations neglecting these responsibilities. Hence, accountability and planning as key ingredients were again ineffectively addressed.

However, when requested to rate how successful IS was in their organisation,

an overwhelming number of respondents perceived that IS was successful. Users were of the view that IS implementation in organisations was successful in both private and public sector organisations. The findings show that despite the impeding factors and organisational constraints respondents perceived that IS was achieving its goals.

User satisfaction and IS use are two popular surrogates used predominately to measure IS success (Delone & McLean, 1992; Igbaria & Nachmun, 1990). Nearly 60% of the 257 respondents intensively utilised the IS in their organisations. Slightly less than 8% used the system occasionally. The findings illustrate that generally IS usage in the country was intense.

Findings also reveal that there was a high level of IS success in organisations. Igbaria and Nachman (1990) and Baroudi et al. (1986) found that more use increases the level of satisfaction. Thus, there is correlation between the level of use and IS success in PNG organisations. This can be theoretically justified by TRA (Fishbein & Aizen, 1975). The Theory of Reasoned Action states that belief influences attitude (user satisfaction), attitude influences behaviour (use/utilisation) and behaviour (experience) influences belief. In this regard it can be proposed that the higher degree of IS usage has a positive correlation to user satisfaction and conversely higher degree of user satisfaction has a positive correlation to IS use/utilisation. Hence, the high level of use impacts on organisational IS success (Delone & McLean, 1992).

The high level of IS use in organisations correlates to the high rate of success perceived by the respondents. Although almost all the organisations were not

implementing an evaluation criteria, a subjective measure was applied to understand respondent perception of IS use in their organisation.

6.2.9 Key Finding 9: Organisation Structure

Findings in this study show that managers placed less emphasis on the relationship between the CEO and CIO. This is not surprising because the placement of the IS division in the organisation structure reflects how top management perceive IS and the importance of close proximity with the CEO. In the organisations, IS division is not viewed as a strategic and integral part of the organisation, but as a support unit. Willcocks et al. (1997) and Galiers (1991) among others assert that it is essential to maintain close proximity between the CEO and CIO in the organisation. Managers in PNG organisations do not perceive this as important.

Findings in this study revealed that organisations, despite the past IS experience, failed to consider IS as a priority and an integral component of the organisation. The placement of the IS division in the organisation structure reflects how top management perceive IS and the role it plays. Except for the IRC, the IS division in the three other cases was positioned two levels below the CEO. The functions of the IS division in Boroko Motors, and PNG Waterboard were the responsibility of the finance division. Similarly, at the time of this study, the IS division at PNG Unitech was positioned below the Pro Vice Chancellor Administration.

IS, as a change agent encourages changes in the structure and the organisational process. It is not surprising that the operations of the units are

not systematically interrelated, because the unit is attached to a division for convenience rather than for a strategic purpose. A more systemic view is necessary. In other words, it is difficult to harness the benefits of the vast technological base given such a context, as the organisational structure does not replicate a sensible organisational chart based on systemic principles.

The structures do not promote communication between the components in the organisations, particularly between the top management and IS unit. What is also evident is that IS are entire entities, which promote formalization. However, the bureaucratic and authoritarian structure of the public sector is in conflict with IS. Hence, managers play a key role to advocate and champion the changes.

6.2.10 Key Finding 10: Funding and Sustainability

Organisations, particularly in the public sector, are severely restricted with funding. These organisations rely on the national government funding. Indeed, their operational capacity and survival is totally dependent on the national government budget allocation. In turn, the national government funding depends on the socio-economic condition of the country (see section 6.2.7).

The distribution of organisational resources including funds is influenced by many factors such as the strategic value and significance of the role the divisions play. IS is not perceived as a strategic tool. In this regard, IS funding and resource allocation is often limited. For example, PNG Unitech's capital allocation for a number of years has been less than PNGK20,000.00.

A far greater challenge for the public sector organisations is that of sustainability. IS implementation in the majority of the government departments and statutory bodies were either funded or donated by international agencies and donor countries. For example, the major systems at the IRC and PNG Unitech are donor-funded. Indeed international bodies have been the driving force, not only in terms of the hardware and software, but more importantly expertise in developing and formulating strategies, and awareness at the political level and top echelons of the organisation. A view often expressed in the literature is that poor financial, technical and human resources would perpetuate dependency on economic, technical and expert assistance from DCs. Unless there is augmented effort to provide a strategic framework for IT at the national level, public sector organisations in PNG will continue to struggle to come to terms with the advances in IT and rely on foreign assistance. Hence, managing, maintaining and sustaining the information systems is a far greater challenge for organisations in PNG.

6.3 Varying Perspectives of IS Success Elements

Although functioning within the same environmental constraints, it is not surprising managers in private and public sector organisations differed in their perceptions of the availability of resources. A further analysis between non managers in public and private sector organisations revealed similar results. Objectives and values in the private sector hold profitability as their primary goal, while budget or output maximisation were more plausible objectives in the public sector (Heeks, 2002). With management support and resources, private organisations are in a better position to employ skilled IS professionals

and provide better training facilities to reach their objectives. Higgs explains that public organisations suffer from high turnover of staff because;

'the pay in the public sector was not competitive compared with the private sector ...thus, the graduates came only to gain basic experience and then left for better paid jobs...the high turnover was the basic factor jeopardizing the computerization process in the public sector'(p.10).

A further area of concern for government organisations is the stringent bureaucratic process involved in IS staff recruitment as indicated earlier. Managers at the top echelon need to understand the industry demands on the labour force. They urgently need to address human resource management policy to cater for the *"bottlenecks that face the country and the loss of its qualified and experienced staff"* (Higgs, 2003:p.11).

6.4 Chapter Summary

Despite the ominous conditions, and the plethora of barriers, PNG organisations are continuing to utilise and invest in IS. By employing a multi method strategy this study has illuminated more than fifty elements that influence IS success in PNG organisations.

The findings show that human resources planning and development for both the IS professionals and users was particularly significant. The unavailability of skilled IS professionals in the country was a major factor impeding IS success. Users, managers and senior executive management realise the

significance of IS, however they were hindered by the lack of necessary literacy and skills. Despite respondents concern about the provision IS training it was not perceived as important and also ineffectively addressed. A human resources strategy is urgently required in organisations and at the national level.

The inadequate government support at the national level is manifested in the lack of attention to strategic level issues such as IS planning and policy, short and long-term strategies and national direction. As a consequence organisations were working in isolation, with no or little effort made to align organisation strategies and policies between the organisation and national level goals. This also contributed to the lack of futuristic planning and budget in the public sector.

Similarly, the IS industry is a patch work of technologies fragmented solely driven by the industry. Organisations are reliant on externally manufactured hardware and foreign expertise. IS plays a supportive role reflecting managements' attitude towards IS in the organisation. There is less priority given to IS, thus IS in the majority of the public sector organisations is funded by donor and international aid agencies.

The majority of the elements identified in this study were similar and consistent to those determined in other LDCs and DCs. Thus findings in this study can be generalised and a generic set of elements advanced.

The next Chapter presents concluding discussions on the findings of the study.

Chapter 7

Conclusion

7.0 Introduction

Chapter 1 introduced the purpose of this thesis, the research problem and the underpinning data collection and analysis procedures undertaken to answer the research problem. A review of the related literature presented in Chapter 2 consolidated prior studies, illuminated the gaps, and lead to the two major research questions. Then, in Chapter 3, the relevant research strategy was identified, and the problems encountered during the fieldwork and their consequences were discussed. The results of case studies and the survey were presented in Chapters 4 and 5 respectively. Key findings for the study were highlighted and discussed in Chapter 6.

The purpose of this Chapter is to present the conclusions to the two major questions, and in doing so solve the main research problem. Hence, this Chapter presents the concluding discussions on the findings of the current study. It proposes a set of IS implementation principles for PNG organisations based on the research findings. The Chapter also highlights the research implications, advances a set of recommendations and identifies areas for further research. Finally this study contributes to the domain of the study, and to IS research in PNG, where no similar studies have been undertaken.

7.1 The Multi Method Study

A multi method study was undertaken to address the questions proposed in the study. The initial research strategy adopted for this study was a dominant less dominant design that encompassed multiple cases and an embedded survey. The multi method approach was later adapted because of difficulties encountered during the fieldwork as discussed in Chapter 3.7. Stage 1 was qualitative in nature: case studies of eight organisations. Only four cases, PNG University of Technology, Internal Revenue Commission, PNG Waterboard and Boroko Motors Ltd are reported. The main method used in the Stage 1 study was semi-structured interviews. In each organisation, representatives from three groups of actors: SEM, middle management, and non managers were interviewed. The interviewees were chosen randomly, ensuring however that different tasks, work groups, and departments were represented equitably. The case studies were conducted on site in PNG between May 2002 and August 2002.

The objective of the Stage 1 study was to provide detailed analysis of the IS, context in which the IS was implemented, its interaction with organisational and external settings, and elicit the underlying elements associated with IS success. The use of a multiple case study strategy in Stage 1 of this study enhanced validity and reliability issues.

The objective of the Stage 2 study, a questionnaire survey, was to consolidate and extend the Stage 1 findings from the perspective of a wider population. Survey questionnaires were self administered to representatives from the groups as in the Stage 1 study, and in other selected PNG organisations. The

survey was undertaken in September 2003. The methodological triangulation provided breadth and depth in understanding and enabled comparison to be made across a variety of cases and between findings from studies elsewhere. Implications pertaining to the research strategy are elaborated later in section 7.4 in this Chapter.

7.2 Conclusion to Research Questions

The findings in this study reveal several major insights into IS implementation in PNG. These insights are summarised relative, and in conclusion to the research questions.

7.2.1 Research Question 1

What are the elements that influence the success of Information Systems in PNG organisations?

Investigation of the four case studies in Stage 1 revealed more than fifty elements that are contributors to the success of IS in PNG organisations. These elements were identified at the user, organisation and external environment levels conforming to the underlying framework advanced by Ives et al. (1980). The list is presented in Tables 4.9 and 4.8. Fifty elements identified in this study were present in findings in similar studies in DCs and LDCs. Four new elements were identified in this study, and can be used in other LDCs. The four elements presented in Chapter 6.2.1 may be useful for LDCs with similar contextual settings.

The influence of external factors on IS is difficult to measure. These constraints influence the way organisations function and are managed. For instance, telecommunication infrastructure is a major impediment to the organisations' operations. Its dysfunctions impede the functions of IS. In this regard, a broader and more systematic approach is required to better understand the influence of factors beyond the control of the organisation.

The first important aspect of the findings is that the majority of the identified elements are similar and consistent with the outcomes from studies in LDCs and DCs. In this regard, it can be concluded that in spite of the disparate contextual settings and the limitations of this study, managers are faced with a similar set of constraints that are detrimental to the success of IS. However, the degree of difficulty varies relative to the environment in which IS is embedded. Nevertheless, a common set of dimensions can be defined and set of principles developed to address these barriers.

The second aspect of the findings is that four elements not present in the prior studies were identified relevant to the organisational and social settings. These elements can be useful for other similar contextual settings.

The list is inconclusive, and subjective to temporal and contextual settings. It accommodates the perceptions of only two stakeholders, users and management. Similarly, other dimensions defined in the Ives et al. (1980) framework were not investigated for reasons explained in Chapter 2.6. Nevertheless, these findings can provide leverage for further research, and for

managers to develop and implement strategies to manage the barriers and improve the chances of IS success.

7.2.2 Research Question 2

How effectively are these elements dealt with to ensure the success of IS in PNG organisations?

The second important finding in this study is the extent to which stakeholders addressed the constraints. Organisations in LDCs and DCs are faced with similar difficulties, however, the degree of success depended on how each stakeholder confronted and dealt with the constraints.

Results show that data security and information quality related elements were effectively addressed. Hence, it can be inferred from these findings that users were satisfied with IS in the organisation. User satisfaction is the prevalent surrogate to measure IS success (Delone & McLean, 1992). Implications are discussed later in section 7.2.2.6.

The issue of IS staff was also pointed out as effectively dealt with. There is a general consensus that IS professionals are scarce, and yet results indicate there is adequate skilled IS staff. One explanation is that the scarcity of skilled IS professionals is compensated by the continued engagement of consultants, and contract officers. Apart from the difficulty in justifying their employment, particularly in the public sector, there are two major implications. Firstly, it was costly to engage consultants, and secondly, there is dependency on external expertise, thus, the “dependency syndrome”. In addition, there is awareness

and general consensus among the employees that skills and knowledge are not transferred from the consultants to the organisations. The level of skill and knowledge is a significant strategic asset for organisation, and must be addressed.

7.2.2.1 Sub Question 2.1

How important are these elements to ensure IS success in PNG organisations?

Managers in both private and public sector organisations perceived that the identified elements were important contributors to the success of IS relative to their needs. Aggregate mean rankings show that data security and administration and output information quality were perceived as most important. Organisations were utilising IS to manage data critical to the organisation. Thus, managers placed an emphasis on initially protecting and securing vital organisational data. Their next concern was that the IS produced accurate and reliable output information on a timely basis.

Management were also concerned about and emphasised the availability of technical assistance and support in the form of competent IS staff and vendor support.

User IS training is crucial to IS success in organisations. Management awareness and knowledge of IS is also critical to IS success (Higgo, 2003; Al-Abul-Gader, 1999). With the lack of appropriate training, managers, particularly those not in the IS profession, were ineffective in understanding and comprehending the rapidly evolving technologies.

IS funding in the organisation was also perceived as an important element for IS success. However funding was a major barrier, particularly for the public sector organisations. Managers in these organisations were faced with severe budget constraints, and relied on assistance from foreign aid organisations.

7.2.2.2 Sub Question 2.2

Is there a difference in individual perceptions of how effectively IS success elements are dealt with in the organisations?

Public and private sector organisations differed in the manner in which they addressed the IS success elements. Firstly, private and public sector organisations, although operating within the same contextual settings, differed in their characteristics. For example, private sector organisations were more profit and market oriented as opposed to the public sector organisations that are driven by a service provision foci. Private sector organisations were able to invest in factors such as IS personnel and training in order to create a pool of personnel with sufficient IS knowledge and skills.

One of the characteristics of the private sector is that they provide far better and more attractive conditions of employment as compared to the public sector. A composite of elements such as remuneration packages, career advancement and training contributed to the influx of skilled IS professional to the private sector. A common implication was the concept of 'brain drain'. The government needs to address these issues because public sector organisations continue to engage consultants as a short-term measure to alleviate the inadequate IS staff levels at huge costs.

There is also a greater support from the management and availability of resources, in particular funding in the private sector.

7.2.2.3 Sub Question 2.3

Is there a difference in respondents perception of the importance of IS success elements in organisations?

There was no difference between managers in private and public sector organisations in their perception of the importance of the IS success elements except for two: career advancement and remuneration packages, and technical skills and competency of IS staff. Results show that more managers felt that private sector organisations provide better employment conditions and career opportunities. In addition employee terms and conditions in the public sector are set by the public service, which are less attractive to that of the private sector. Hence skilled IS professionals prefer employment in the private sector. An implication is that IS in the public sector is stagnated. Therefore there is a need to review employment conditions, particularly in the public sector as it is a barrier to employing skilled and competent IS professionals.

7.2.2.4 Sub Question 2.4

Is there a relationship between respondent perceptions of how effectively IS success elements are addressed in organisations and the importance of these elements?

There was no statistical significance between manager perception on the emphasis placed on certain elements and the extent to which these elements were addressed. Some observations were made, however, statistically they

could not be supported. For example, management felt that data security and administration was important. Similarly, they felt that the element was effectively addressed. However there was no statistical significance showing either a positive or negative relationship between the importance of data security and administration, and how the element was addressed in PNG organisations. Hence, no inference can be made in regard to the relationship between the importance of the identified elements, and how effectively they are addressed in PNG organisations within the limitations of this study.

7.2.2.5 Sub Question 2.5

How do respondents ascertain training and assistance in the aspects of IS in the organisation?

IS training was deemed as an important factor and critical to IS implementation and success. It is also perceived as an important element in this study (see section 7.2.2.1). However, it is also one of least effectively addressed elements in the organisations. Organisation staff predominantly mentioned the lack of IS training in the public organisations.

Generally, the majority of respondents in the public sector organisations acquire their training through self study. However in-house training was popular in the private sector.

IS assistance was sought from the IS staff in the organisation. However the results also show that more managers sought assistance from their “wantoks”. These results are not only indicative of the level of skilled IS staff in the

organisations, they also show that cultural issues were impediments to IS success.

7.2.2.6 Sub Question 2.6

How successful was IS and what success criteria were used in the organisation?

Findings in this study show that IS was highly utilised in organisations. It also showed a high percentage of success. Results, as discussed in Chapter 5.10, indicate that a high percentage of respondents perceived that IS was successful in their respective organisations. Further discussions in Chapter 5.10 reveal that more than 50% of the respondents utilised the system intensively. Thus, there is a high level of IS use in PNG organisations.

Discussions in sections 7.2.2.1 and 7.2.2.2 suggest that elements pertinent to user satisfaction were effectively addressed and ranked as very important.

These results are interesting and encouraging, considering the inherent difficulties under which IS is embedded and implemented.

User satisfaction and IS use are popular surrogates for measuring IS success (Delone & McLean, 1992). Strong relationships have been found between computer use and user satisfaction (Baroudi et al., 1986; Igbaria and Nachman, 1990). TRA states that belief influences attitude (user satisfaction), attitude influences behaviour (use/utilisation) and behaviour (experience) influences belief. In other words, high level of IS use increases the level of IS

satisfaction, thus increasing further use, and subsequently having an impact on the organisational IS success. Hence, it can be inferred that higher degree of IS usage has a positive association to user satisfaction, leading to the success of IS in PNG organisations.

7.3 Research Limitations

Given the paucity of empirical studies in IS in PNG, this exploratory study has contributed to the understanding of IS and the context in which it is implemented and managed. It illuminated the status of IS in PNG, identified the elements that influence its success and elaborated on the extent to which these elements were dealt with by organisations. However, the limitations of the research undertaken must be acknowledged.

The organisations that participated in this study resembled as much as possible the total population. There was however limitation in the number of participants in both Stage 1 and Stage 2 studies, particularly at the top management level. Only two CEOs in the Stage 1 study, and four out of the twenty organisations in Stage 2 study showed any interest. Although the overall response rate of the survey was close to 40% (262 out of 650 sets of questionnaire), these were replies from only eight organisations. Significantly, close to 62% of the responses originated from a single organisation. Thus, there is the potential that findings may be skewed and emphasising a single organisation's characteristics. Therefore, the random sample population in this study may not be an exhaustive representation of the population. Hence, total confidence in the population and the extrapolation of the result is difficult.

However, the fact that results from other studies in both LDCs and DCs showed similar results indeed reflect positively on the study.

Another limitation is that the study was cross-sectional in nature. Thus, it presents a snapshot of the current status of IS at the time of this study. Given the exploratory nature of the study, and the dynamic nature of IS and rapid changes over time, the results may not necessarily reflect the current status of IS in the organisations. Hence, it is highly likely that some issues discussed here may have already been addressed. Also, while attempting to capture a wider picture of the general status of IS in the country, other organisation specific issues may have been omitted or overlooked.

A further limitation in this study was the difficulty in acquiring documentation in the number of organisations studied. There may of course be historical evidence which is useful in tracing when IS was introduced and how the industry has evolved over the years. However, a search of the major databases and the Internet revealed very little in regard to the history of IS in PNG. The generalisation of the current state of IS in that country is based on the findings of the case studies, and the subsequent survey results. Further research in this direction is necessary.

In addition, the absence of research and the lack of knowledge and awareness in the study domain, contributed to the difficulty in understanding the scope of the research by the contacts and participants. In this regard, it may have had an impact on the way questions were answered. In some instances managers declined to participate in the study.

Finally, data integral to the outcome of the study were lost in circumstances beyond the control of the author (see Chapter 3.9). The data were reconstructed and reflects responses from the organisations.

7.4 Research Implications

It is well documented that external environmental factors influence the implementation and success of IS. This study in particular noted widespread discontent with the government's lack of inactivity in this domain. Government intervention is necessary if IS is to play a strategic role as a developmental tool. Similar to developments in other regions, particularly those in Asia, there is a need for the national government to actively participate and advocate the development of IS in the country. Apart from the socio-economic and political agenda, an IS policy framework is extremely necessary. Experiences from other countries such as Malaysia, Singapore, and India with cultural similarities and economic ties can be useful in establishing the desired framework to propel IS in PNG. In this regard an holistic approach is necessary. For example, to achieve national and organisational goals a pool of skilled IS professionals and informed managers with a deep understanding of the capabilities of IS and the underlying concepts must be recruited.

The concept of capability building must be vigorously addressed as it denotes one of the major barriers of IS success- resource constraint. In this instance, the concept refers to the development of skilled IS professionals and general literacy and knowledge of IS for all stakeholders. The criticality of the human resource is manifested in the acute shortage of skilled IS staff in the country.

In addition, the ongoing engagement of foreign IS consultants is of concern, not only because it reflects the acute shortage of skilled IS professionals, but the “dependency syndrome” which organisations have developed. Even though the engagement of consultants may solve the immediate problems, it however, does not in the long run address the knowledge capacity and human resource development in the country. The transfer and accumulation of knowledge in the organisations has been neglected as the focus is on keeping the current system afloat. Hence, there is a need to immediately streamline this practice with coordinated efforts from the national government and public sector organisations.

Similarly, modification must be made to focusing on human resources development. In addition to the acute shortage of IS professionals, the study has particularly identified the inadequate level of IS knowledge, and awareness by top management in PNG organisations. Currently, decisions pertaining to IS were in most instances deliberated by consultants who quite likely possessed little knowledge of the organisation and the constraints under which it functioned. The provision of industry based IS training targeting specific groups would be prudent. This again requires the coordinated efforts between the industry, government and other relevant bodies.

7.5 Principles of IS implementation in PNG

Despite the limitations, this study has contributed to the body of knowledge on IS implementation in an LDC environment, in this case PNG. The study identified several elements not present in prior studies. In addition, the study

revealed the insights of the importance of each element and how the organisations dealt with them. It has also raised issues for further discussions and research, in particular the role the government has to play, and the issues that need immediate attention.

A contribution from this study is a set of principles pertaining to IS implementation in PNG. The principles are based on two sources: the key findings in this study, and underlying issues and implications from prior studies in the IS domain.

These principles will be useful to managers in PNG organisations because they summarise the insights based on empirical evidence revealed in this study. The principles however, are not a set of rules that can be immediately applied. The emphasis of each principle is arbitrary, however, it is the discretion of the incumbent to decide on the appropriateness of each principle, and deliberate when and how they should be applied. The principles are also interdependent, hence an holistic view is necessary.

The key findings in this study and findings from prior studies form the underlying basis for the principles for IS implementation in PNG. The proposed principles are:

- Promote and contribute to the development of skilled and competent IS professionals in the country. In addition, contribute to the development and training of non IT graduate managers, hence alleviating the major disparity in the managers level of IS knowledge and awareness in the

country. Similarly industry based training must be instituted and promoted as a strategy for human resource planning and development. A coordinated effort between major stakeholders - IS industry, education institutions and government organisations - is required. Sinebare (1999) also called for a coordinated effort from these stakeholders.

- Strategic level issues such as policy and planning must be immediately addressed at the national, organisational and IS divisional level. In this regard, contribute to IS policy development and planning at the national level.
- The streamlining of the relevant government departments and the creation of a think-tank group that can coordinate policy, develop short and long-term national IS strategies, standards, legal framework, human resources, promote research and development and drive the government's visions and policies. Representation of major stakeholders including the industry, education institutions, public and private sector in the think-tank group is necessary for better dialogue and coordination. Furthermore the umbrella group can oversee and promote special interest groups, building interest from multiple groups, as a bottom-up approach.
- Sustainability of IS implementation in the public sector. This will require future-oriented planning, budgeting, and human resource development. Strategies to address these elements should be developed.

- Standards, best practice and quality management must be adhered to for optimal performance.
- IS success measurement criteria must be instituted in the organisations.
- The nature of IS is dynamic, and constantly evolving. The key ingredients for IS industry growth (knowledge base, economic ventures, government support) should be supported.
- Strategies and guidelines should be developed and adhered for the engagement of IS consultants.
- Streamline IS staff recruitment and provide competitive remuneration packages and provide better incentives.
- Alignment of IS strategies and goals with organisation goals. In this regard, IS divisions should be positioned strategically to propel IS and cohesively implement the changes.
- IS training in organisations be prioritised and supported on an ongoing basis.
- Develop strategies to address conflicts and issues relating to the influences of national culture.

7.6 Recommended course of action

The key findings of this exploratory study were presented and discussed in Chapter 6.2. These findings were further summarised relative to the research questions in section 7.2 in this Chapter. Based on the findings, a set of principles useful to guide IS management in PNG organisations was introduced in section 7.5.

This study has identified and highlighted a number of issues that are detrimental to IS and its success in PNG organisations. These issues need to be seriously addressed by managers at the organisational and national levels if PNG is to successfully harness these technologies.

This thesis also proposes a set of recommendations, which if properly instituted and implemented, will propel the IT industry in PNG and contribute to the successful implementation of IT including IS in PNG organisations. These recommendations are not exhaustive, but can provide some guidance for managers. The recommendations are primarily based on the outcomes of this study, and must be seriously considered by the top echelons in the organisations and the national government. The recommendations can be useful to other LDCs, particularly PINs with similar contextual settings.

A summary of the recommendations is outlined in Table 7.1.

No.	Recommendations	Discussed in section
1	Develop human resource.	7.6.1
2	Address the lack of IS knowledge and understanding by middle and top level managers.	7.6.2
3	Provide for ongoing IS training in organisations.	7.6.3
4	Transfer and accumulate IS knowledge in organisations.	7.6.4
5	Address strategic level issues. Immediate attention to the development of national IS policies, strategies and plans and aligned with other economic and social strategies.	7.6.5
6	Build a national information infrastructure, particularly the telecommunication infrastructure.	7.6.6
7	Coordinate IT implementation in the public sector organisations.	7.6.7
8	Address strategic level issues at national level.	7.6.8
9	Implement IS success evaluative criteria in organisations.	7.6.9
10	Work at government level to provide a conducive environment establishing an IT industry and nature its growth.	7.6.10

Table 7.1: Summary of Recommended Course of Action

7.6.1 Recommendation 1: Human resources development

The acute shortage of skilled IS professionals is a serious concern for organisations in PNG. Issues pertaining to human resource have been major barriers to the development of PNG, particularly in relation to the diffusion and utilisation of IT. The insufficient level of human resources planning and development is a key finding in this study and discussed in Chapter 6.2.3. To address this issue it is recommended that:

- A coordinated effort is required between the government, education institutions and the employers. Ongoing liaison between employers and the institutions is significant to produce graduates who possess and are equipped with the relevant skills industry requires. This can be

achieved by Initiating and incorporating an integrated industry oriented IS curriculum, reviewed periodically in conjunction with industry and socio-economic demands.

- Institutions should provide adequate training facilities and suitable and qualified staff to take on the responsibilities in delivering the curriculum.
- Human resource policy and planning pertaining to IT must be defined at the national level with coordinated effort from relevant institutions such as the National Planning, Office of Higher Education, Finance, and Education Departments. Hence a holistic approach and the coordinated effort from all stakeholders is necessary to address the acute shortage of the skilled IS professional in PNG.

7.6.2 Recommendation 2: Addressing the lack of IS skills and knowledge by managers

Top management's lack of knowledge and awareness of the principles and concepts of IS is a key finding discussed in Chapter 6.2.4. This is a major concern because management involvement and support depends on how top management perceive IS in the organisation. In many instances IS is not viewed by managers as a strategic tool, and when harnessed properly, can increase organisation output. A contributing factor is that majority of the top managers have limited IS training as evident in this study. To address this issue it is recommended that:

- Education institutions should consider offering industry oriented postgraduate diploma/certificate or professional masters courses to cater for the middle/top managers. Although managers possess professional qualifications, they may not have necessarily attained the desired IS training. Section 7.6.1 discusses the development of relevant curriculum suitable for PNG settings.
- Similarly, suitable courses tailored for managers should be conducted by the organisations in conjunction with the organisations IS training policies on an ongoing basis.

7.6.3 Recommendation 3: Provision of IS training in organisations

This study has identified the inadequate level of IS training by PNG organisations as amplified by the relatively high concerns by the respondents. Insufficient level of training in PNG organisations is a key finding discussed in Chapter 6.2.3. It is recommended that:

- IS training should be immediately addressed by organisations on an ongoing basis. Training should be tailored for the different level of users.
- A government wide IT training framework be developed to rationalise and manage IS literacy and skills development in the public sector organisations. Thus promoting uniformity in IS literacy and training among employees.

- Based on the IT training framework, and an adequate assessment of existing IT systems, a set of core competencies should be defined. This initiative will identify competency gaps, and employees trained to achieve these competencies. The program will develop employees, an integral component in human resource development to building IT capacity in organisations.

7.6.4 Recommendation 4: Transfer and accumulation of IS knowledge

Findings in this study show that organisations continue to rely on foreign expertise. In addition, there was a general consensus that knowledge and skill was not transferred to the organisations. To address this issue it is recommended that:

- Policies and guidelines put in place to address concerns of the lack of knowledge and skills transfer. In this regard enforce and nature the transfer of IS knowledge from consultants and contracted expatriate IT specialists to organisations.
- A national initiative with a coordinated effort from organisations is required to develop strategies and guidelines and awareness of the significance of amassing a knowledge base pertaining to IT in PNG. Organisations must advocate and promote the acquisition and accumulation of IS knowledge in organisations.

7.6.5 Recommendation 5: Organisational strategic issues

The lack of attention to strategic level issues has been highlighted in this study as discussed in Chapter 6.2.5. It is recommended that:

- Managers must recognise IS as a strategic tool and give prominence to developing IS policies and strategies and aligning them to the organisation visions and goals.
- Organisational strategies in the public sector should be aligned to the national government's mid and long-term strategies.
- The dynamic nature of IT brings challenges for managers. Futuristic planning and budgeting must be advocated particularly to sustain the evolving ICT.
- Review and change organisation structure and strategically position IS to give it prominence.

7.6.6 Recommendation 6: Telecommunication Infrastructure

One of the major impediments to IS success highlighted in this study is the inadequate telecommunication infrastructure. There is growing concern for the national government to urgently address this issue. It is recommended that:

- In addition to more funding from the government there is a far greater need to streamline and institute sound management principles.

- Implement guidelines to negate political influence.

7.6.7 Recommendation 7: Coordination in the public sector

The disparity, incompatibility and the lack of cooperation and strategic alliances was highlighted in this study. It is paramount that there be a certain degree of control, instituting standards and applying and adhering to quality management principles. It is recommended that:

- There is coordination, control and uniformity in IT diffusion in organisations, particularly in the public sector.
- The individualistic approach and territorial protection by organisations must be discouraged by establishing virtual communities that encourages transparency and good governance to achieve a common set of goals.
- Immediately review recruitment and employment conditions for IS professionals in the Public Service.

7.6.8 Recommendation 8: Strategic issues at national level

The lack of policies, planning and development of mid and long-term strategies at the national level pertaining to IT in the country is a key finding and discussed in Chapter 6.2.5. It is recommended that:

- Immediate attention must be paid to the development of national IS

policies, strategies and plans and aligned with other economic goals and social strategies.

- The government must institute the creation of a national body consisting of members from the industry, educational institutions and other relevant bodies. This body should formulate strategic level policies and provide advice and direction to the government.
- IT education and awareness of its usefulness is paramount for political leaders.

7.6.9 Recommendation 9: IS success evaluation

Findings in this study show that majority of PNG organisations do not employ any evaluative criteria or standards. The key finding is discussed in Chapter 6.2.8. It is recommended that:

- IS success measures be identified and implemented in organisations.
- Standards and the principles of best practice be initiated and integrated in organisations operations.

7.6.10 Recommendation 10: External environmental factors

External environmental factors have a major impact on IS implementation in the organisations. The finding is discussed in Chapter 6.2.7. It is recommended that:

- The national government provide economic, social and political stability for a conducive environment for IS industry growth.
- The national government must take a leading role and provide a strategic framework to propel the IT industry in the country.
- A working group should coordinate IT investment in the public sector organisations, and provide feedback to the government, donor agencies and international organisations.

7.7 Related Future Studies

This study revealed several related areas that could extend the current research.

Information and views on the benefits and the degree of IS success in PNG organisations are anecdotal. Numerous studies have already been conducted elsewhere, and as many IS success criteria and measures developed. Literature suggests that IS success is multi-dimensional, thus, a common consensus on measuring the construct has been difficult. Therefore, these instruments need to be applied and tested within the PNG settings. Appropriate new instruments can be developed or the previous ones modified to suit the organisation's requirements. This is significant because limited resources can then be distributed accordingly.

Issues surrounding the cultural impact on IS utilisation, particularly with the diverse PNG background would be useful.

A further study would be to look at the development of extra curricula and skill development for PNG managers. Further research is necessary in this area because senior and middle managers consist of graduates in other professions who possess little or no formal IS training. An analysis of the requirements leading to the formulation of the underlying framework would be a useful contribution to IS research.

The PINs possess similar characteristics in the cultural, socio-economic and political settings. The findings in this study can be applied in these countries. A study to determine how organisations deal with the success elements involving the 15 countries in the region along the lines taken by UNESCO (2002) would be useful. Determining the perceptions of stakeholders at a country level would assist in developing regional programmes and would share experiences among the PINs and contribute to knowledge and IS research.

The involvement of donor agencies and international organisations such as the UNESCO is evident. It is also beneficial for these organisations that IS implementation is successfully managed and achieving organisational goals. Similarly, sustaining these investments in the long run is achieved. A follow up research on the relationship with donor agencies, stakeholder perception of IS assistance and how IS is managed would be a significant contribution to knowledge.

7.8 Chapter Summary

The question underlying this thesis is: **what major elements influence the success of Information Systems, and to what extent are these elements dealt with in PNG organisations?** The impact of IS on society has been phenomenal, particularly for the LDC's point of view where the uptake of IS has increased exponentially. The observations made here illustrate how basic social, political, and economic factors can fundamentally hinder the establishment of effective IS in PNG organisations. Understanding some of the impeding elements can assist managers alleviate the dangers of failure and better manage IS. Such barriers identified in this study may want to be looked into by organisations and at a wider scope by the government. The broader issues affecting the country are acknowledged. However, with careful management and encouragement, IS might be given a better head-start in more PNG collective bodies, commercial and government.

Successful IS in organisations is extremely important to enable PNG to embrace the benefits of a modern computer-assisted society. In this regard success of a developing country can be measured in many ways, for example, by economic, educational, health, quality-of-life, agricultural, research, or law and order parameters. Each of such areas in an LDC, when not functioning optimally, could eventually improve greatly from consistent and well-managed implementation of IS systems in public and private organisations. This in turn may assist the people of Papua New Guinea on the road to a better quality of life.

Although computers were introduced decades ago, and despite the rapid improvements and advancements in these technologies, IT is viewed as a support tool with no strategic value in most PNG organisations. IT implementation in the country is sporadic and fragmented with little or no strategic guidance from the government. Hence IT is implemented on an ad hoc basis with little planning and policy framework at both the organisational and national levels.

Governments in the past and present have overlooked the significance of IT and the contribution it can make to national development. Hence, vital ingredients for IT growth in the country have been neglected. These ingredients include: human resource development, IT infrastructure, policy, planning and legal framework, economic incentives and political direction.

In addition, IT in the public sector organisations have been “added on” to the organisation structure which was implemented prior to independence. Compounded with the lack of IT knowledge and understanding among top managers, and cultural background, very little attempt has made to change the status quo. Furthermore public sector organisations are more individualistic and territorial, competing for scarce government funding. Hence there is very little cooperation among these organisations. For instance, the failure of the Academic Research Net Work (ARNET²⁰), is a prime example of the lack of collaboration between the public sector organisations in PNG.

²⁰ ARNET was an initiative for collaboration between higher educational institutions for research activities assisted by the internet technology.

At the organisational level, public sector organisations are severely constrained with the lack of resources. Almost all the IT projects in the public sector are funded by donor agencies and international organisations. Without external assistance, IS implementation in public sector organisations will cease to function. This is a serious concern because the government is not economically and politically positioned to sustain the capital intensive IT investment in the country.

It is also a major concern that organisations have become more dependent on foreign contract IT professionals at huge costs. A contributing factor is the scarcity of skilled IT professionals in the country. In addition the stringent recruitment and remuneration packages further burdens organisations ability to compete with the private sector.

The set of broad principles and recommendations postulated in this study are useful for managers. Unless and when steps are taken to address the barriers, organisations will continue to function in stringent conditions. IT itself will become a technological burden and organisations unable to sustain its operations. Hence top echelons in the organisations and the government must seriously consider the recommendations outlined in this thesis.

This study has demonstrated the usefulness of the multi method study, where the outcome of one stage contributed to the next. Elements elicited in Stage1 study and the relationships are statistically tested in the Stage 2 study. Useful results were achieved using this strategy. Overall, the research questions that drove the study were answered. It also raised issues and topics for further

debate. The exploratory study has raised many issues that require further research.

Hence it can be concluded that organisations in PNG are faced with major organisational, social, technological, resource and political problems. These are a common set of barriers that impede IS success in both LDCs and DCs. However, the difference is the manner by which the elements are addressed, relative to the contextual settings. Thus, organisations must heed the warnings and make an attempt to address the issues identified in this study.

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APPENDIX 1

Letter Requesting Organisations Participation

The Director
Information Technology Services
PNG University of Technology
Private Mail Bag
Lae, PNG

Date: 15th Feb 2002

Dear Sir/Madame

Re: Request for Participation in a study on Information Systems Utilization and Success in organisations in Papua New Guinea.

I am a Papua New Guinean PhD student attached to the Information Systems Management Research Centre (ISMRC), at the Queensland University of Technology, Brisbane. I am contacting organisations and institutions in PNG as part of a study by the ISMRC on determining Information Technology (IT) utilization and success factors in enterprises in Papua New Guinea.

The success of IS as a strategic tool in organisations is dependent on many factors. The focus of this investigation is to determine those factors that influence IS success in organisations in PNG. The study will consist of multiple case studies of organisations in PNG and involve a survey and interview of executive managers, division managers and computer systems users in the organisation.

I believe this study will make a significant contribution to IS development, implementation and utilization in organisations in PNG. No data from the study will be published or disclosed in any way, which could discriminate individuals or the organisation. The maintenance of confidentiality of research data will have my highest priority.

I am appealing to you for your organisation to participate in the study. Your involvement will bring about a greater awareness of the factors that influence IS success in PNG. Therefore your participation in this study is important. The study will commence in April/May 2002. Full details of the investigation will be made available upon receiving your affirmation.

Please contact the undersigned at your earliest convenience. Any concerns regarding the ethical conduct of the study should be directed to The Secretary, University Human Research Ethics Committee, QUT on (617) 3864 2902.

Thank you for your assistance and looking forward to hear from you soon.

Limbie Kelegai

Email: l.kelegai@student.qut.edu.au

Phone: (617) 3864 2639 School of Information Systems

APPENDIX 2

QUT Ethical Clearance



University Human Research Ethics Committee

Mr Limbie Kelegai
178 Baysuime Road
Holland Park West, QLD 4121

19 October 2000

Dear Mr Kelegai

I write in relation to a *Checklist for Researchers* submitted for the project, 'Towards an Information Society: Education IT Professionals in PNG' (QUT Ref No: 2112H).

The Chairperson of University Human Research Ethics Committee (UHREC) has considered your checklist and has confirmed that your project does indeed appear to be exempt from ethical clearance.

However, you are asked to:

- provide clarification in relation to how the participant pool will be identified (eg will you be accessing a list of potential participants (see below)); and
- revise the questionnaire coversheet to include all the standard features for informed consent purposes (refer to Booklet 11 of the University Human Research Ethics Manual).

If the research team will be accessing a list of potential participants approval to do so will need to be obtained from the "owner" of this list. It is generally preferred that the "owner" of the list actually distribute any "initial contact" correspondence, so that the confidentiality of these persons is not compromised.

QUT Ref NO 2112H. Please refer to Wendy Heffernan, UHREC, QUT for any inquiries.

A handwritten signature in blue ink, appearing to read 'Gary Allen'.

Gary Allen
Secretariat
Phone: 2902
Facsimile: 1818
Email: gx.allen@qut.edu.au
<http://www.qut.edu.au/traa/or/ethics.html>

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APPENDIX 3

Case Study Preparation Brief for Organisations

**The Vice Chancellor
PNG University of Technology
Private Mail Bag
Lae, Morobe Province**

Date: 30th April 2002

Preparatory Fieldwork Summary

Dear Sir,

RE: Study on IS Success in organisations in Papua New Guinea.

Thank you for your consideration to participate in the above study as per your letter dated 27th January 2002. I intend to commence the study on the 13th May 2002 and conclude on the 17th August 2002. The study in your organisation is significant because as a case pilot it provides direction for the rest.

Please note that a central point of contact is required in the organisation to minimize difficulties and effectively coordinate the study. The primary purpose of the contact is to function as a conduit between the investigator and the organisation. Please nominate an individual or section as a contact in your organisation if you are not performing this role.

Attached is a brief on the case study outline and a summary profile of the researcher.

Thank you and look forward to meet you.

Faithfully Yours



Limbie Kelegai
(PhD Candidate)

APPENDIX 4

Edited Version of Case Study Protocol

1. Introduction

The protocol provides a guideline and set of procedures for consistency for a series of case studies and conformity among organisations. The document was constantly updated to accommodate the dynamic nature of the study.

Literature is studded with a multitude of studies on IS implementation and success in varying environments. However, no conclusion is evident, as there appears to be varying degree of differences and perceptions regarding factors influencing IS success. Other issues raised in the literature with regard to the domain of this study include:

- The multi-dimensional aspects of IS (Ives et al., 1980)
- Concentration of IS success studies in developed countries and relatively few in least developed countries (Heeks, 2002)
- Increased IS proliferation in least developed countries and the high rate of implementation failures (Heeks, 2002)
- IS is embedded and interacts with the social, cultural, economic and political environment. Literature suggests disparity in the results from varying environments. Each environment and study is therefore unique (Seddon et al., 1998)

- The identification of varying antecedents influencing IS success and lack of conformity among researchers and stakeholders in differing social, economic, cultural and political environments (Seddon et al. 1998; Delone & McLean, 1992)
- IS effectiveness, benefits realisation including utilisation and success varies according to the perceptions of the stakeholders (Seddon et al., 1998)
- The lack of theoretical basis for IS success studies (Grovers et al., 1985)

The study will be conducted in two stages. The objective of Stage 1 is to identify the issues and factors inhibiting or influencing IS success in PNG organisations. Stage 2 determines the extent to which the elements were addressed by the organisations.

2. Research Background

Recently there has been an increase in the number of computers deployed into many LDCs, as organisations in these countries realize the significance of IS as an instrument in solving developmental problems (Harris & Davison, 1999). However, the rate of failure in IT is high in many LDCs.

IS is influenced by the contextual settings in which it is embedded. With the inherent economic, social and political difficulties, there is growing concern regarding the implementation, utilisation and success of IS in these countries.

Similarly, there is limited research and literature in relation to determining IS success or failure in LDCs in their various social, organisational, economic, cultural and political settings. The majority of IT utilisation and success studies have concentrated on developed countries, especially in North America and Europe (Anakwe et al., 1999) compared to the relatively few studies conducted in LDCs. In addition a large part of these studies are based on the experiences from the private sector (Jain, 1997a). IS is implemented within a social context consisting of economy, political, cultural and behavioural factors differing from country and societies (Harris & Davison, 1999).

The study and measure of IS effectiveness is difficult because of the multi-dimensional constructs, and is subjective to varying perceptions of stakeholders and evaluators (Bajwa, Rai & Brennan, 1998; Larsen & Myers, 1999). Similarly, Delone and McLean (1992) state that IS can be viewed from many perspectives. Thus, a multitude of factors have been identified. Furthermore, these factors may be differentiated between DCs and LDCs within their social/organisational and cultural settings. Failure to take into account these factors may inhibit adoption, utilisation and success of IT and increase the chances of failure.

With the rapid advances in IT and evolving business structure and process, assessing the success of computer-based information systems face a myriad of issues, including skilled workforce and IS implementation. The study is motivated by the numerous calls for more research to explore and identify factors that influence IS success in organisations in their varying

social/organisational settings in the context of IT utilisation and success in LDCs. Because of the differences between DCs and LDCs, generalisation of studies conducted in DC's may be inappropriate for LDCs.

IS success study in an LDC environment is important because of many varying reasons. One of these reasons is the dissimilar political, social and economic settings between DCs and LDCs, and between LDCs (Anakwe et al., 1999). The second reason is that attachments to national cultural and religious belief may have varying influence on IS acceptance, implementation and success (Igbaria, 1992; Anakwe et al., 1999). Hence IS studies and these studies employed elsewhere may not be appropriate for PNG with its disparate contextual settings.

PNG is an LDC with a small but slowly developing IS industry. It has cultural norms that are different to other nations. Like other DCs the public sector organisations are the channel for implementing government policies and are responsible for providing goods and services to the public. The utilisation of IS in these organisations can enhance performance and business process, accountability, increase productivity and encourage employee development. Numerous studies and factors have been identified in success factor studies in various settings. This study is undertaken to illuminate the status of IS in PNG and to elucidate the elements that contribute to IS success in organisations.

Major Issues

- a) The varying perceptions of success factors by different stakeholders.
 - b) The varying social, economic, cultural and political settings between developed countries and least developed countries.
 - c) The shortage of skilled IS professionals in least developed countries and IS users.
 - d) The cultural diversity between developed countries and least developed countries and between least developed countries and ethnic groups within a nation.
 - e) The relatively high rate of IS implementation failures in many least developed countries.
 - f) The inability by the organisations to harness IS as a strategic tool to enhance their operations in many least developed countries.
-

Table 1: Major issues highlighted

3. Key Features being investigated

Key features being considered in this study:

- a) Elements that influence the success of IS in PNG organisations. As indicated in the foregoing literature, these factors are classified into 3 dimensions; user, organisational and external.
 - b) Identifying the IT infrastructure, IS portfolio and the context in which it is embedded.
 - c) Perception of the usefulness of IS and its significance to the functions of the organisation.
 - d) Implications of the external environment.
-

4. Case Study Questions

During data collection, the investigator must observe these specific questions relating to the domain of study.

Issue	Data Source	Strategies
How can organisations successfully implement IS in Papua New Guinea	Literature CEO IT Professional	Literature Review CEO/ IT professional interview
What are the antecedent factors that contribute to IS success in organisations	Literature CEO IT Professional	Literature Review CEO/ IT professional interview
How do I identify the issues and factors that influence IS success?	CEO, IT Director/Manager IS Professional	Interview CEO, IT Manager/Director
How important are these factors and in what order?	IS Users Organisations Operating condition.	.Interview IS Professionals User Perception Survey Literature Review
How does the Information Systems Section fit into the organisational structure? IS structure? Who do they report to? CEO/CIO relationship?	IT Director/Manager Organisational Chart Job Description	Obtain organisational chart Who does the director report to? How many staff does the IT Director/Manager supervise
What Information Technology infrastructure is implemented in the organisations? What IS are implemented? What IS applications and platform? The availability of skilled IT personnel? Availability of resource/support from IT industry?	IT Director/Manager Organisational Chart Staff records	Obtain organisational chart Interview IT Director/Manager IT repair maintenance log Service Contract documents Creditors/Accounts Payable Staff Recruitment and staff record files
What type of users are there in the organisations? What are the training facilities (internal and External)	IT Director/Manager Infrastructure implemented IS Users Staff Training Records Qualification Occupation	Interview IT Director/Manager Staff records/Training Survey Respondent Details
What are the external factors and do these factors influence IS success in the organisation?	CEO, IT Director/Manager IS Professional IS Users Organisations Operating condition.	Interview CEO, IT Manager/Director .Interview IS Professionals User Perception Survey Literature Review

Table 2: Summary of Case Study Questions

The data sources relevant to this study are, documents, interviews and archival records.

5.1 Documents

Documents could be letters, memoranda, agendas, administrative documents, newspaper articles, or any document that is germane to the investigation. In the interest of triangulation of evidence, the documents serve to corroborate the evidence from other sources. Documents are also useful for making inferences about events. Documents can lead to false leads, in the hands of inexperienced researchers, which has been a criticism of case study research. Documents are communications between parties in the study, the researcher being a vicarious observer; keeping this in mind will help the investigator avoid being misled by such documents.

5.2 Interviews

Interviews are one of the most important sources of case study information. There are several forms of interviews that are possible: Open-ended, Focused, and Structured or survey. In an open-ended interview, key respondents are asked to comment about certain events. They may propose solutions or provide insight into events. They may also corroborate evidence obtained from other sources. The researcher must avoid becoming dependent on a single informant, and seek the same data from other sources to verify its authenticity.

Strategy

Participants: (a) The administrative head of the organisation. For example, Chief Executive Officer or the Vice Chancellor. This

participant will provide information from the perspective of the organisation.

- (b) Middle Managers. This participant will provide information from the perspective of a user section within the organisation. Particularly, in regard to issues relating to IS implementation and utilisation, IS services and user requirements in the organisation.
- (c) Users. Data from the users' perspective about IS in the organisation is useful.
- (d) IS Manager/Director. This participant will provide information from the perspective of a section within the organisation, particularly regarding issues relating to Information Technology development and implementation in the organisation.

5.3 Archival Records

Archival documents can be service records, organisational records, list of names, survey data, and other such records. The investigator has to be careful in evaluating the accuracy of the records before using them. Even if the records are quantitative, they might still not be accurate.

6. Interview Layout

The interview questions are divided into sub topics. Samples of the questions are shown.

Section I: IS in the organisation

- Q. Could you provide a background of the implementation of IT in your section, its goals, IS structure, its placement in the overall structure, and responsibilities in the organisation?
- Q. How useful is IS in achieving the section goals?
- Q. What are the IS sections role and in your opinion are your performing this roles and achieving your goals? Can you elaborate why (Yes/No)
- Q. What are your future plans for IS as a strategic tool in the section?
- Q. Could you elaborate on the organisation structure and if it is positive or negative in the sections functions (present structure).

Section II: Influencing Factors

- Q. In your opinion what are the most important factors that influence IS utilisation in the organisation?
- Q. In your opinion do organisation culture and social diversity have an effect on the functions and organisation output?

Section III: Organisational Support

- Q. In your opinion has the organisation supported the introduction of and development of IS in the organisation?
- Q. Does the organisation provide adequate funding and create an environment for IS development and growth? (Innovative)
- Q. What are the sources of funding IS in your section?
- Q. What are your views of the top management involved in IS in your organisation?

Q. What are your views on IS training?

Section IV: IT Infrastructure

Q. Could you elaborate on the IT infrastructure in the organisation and do you get adequate support from IS services?

Q. What applications are running and what platforms are used in your section?

Q. The availability of skilled professionals is crucial to achieving the goals in any organisation. What are your views on the availability of skilled IS professionals in the organisation and the country?

Q. To what extent is the influence of the rapid changes in hardware, software (OS and applications), development and management tools, networking, business process and internet and E- everything on the organisation and especially on IS in the organisation?

Q. Is the IS infrastructure compatible to the requirements of the organisation? What are the areas that need improving? What are the areas, attitudes that hinder IS development and growth in the organisation?

Q. What external assistance did you receive in acquiring the hardware, software, applications, planning and implementation (e.g IS packages were purchased by the organisation or donations from donor agencies, installed and supported by consultants.)

Q. Can you elaborate on the IS procurement policy in the organisation?

Section V: Policy

- Q. Can you elaborate on the organisation's IS policies and strategies and the alignment with organisation policy and goals?
- Q. What are your views on Government IS policy and other relating issues such as Acts of Parliament.
- Q. What are your views on the attitudes of senior management on IS policy and their role.

Section VI: External Factors

- Q. Could you elaborate on the sources of funding for section? Does the economic environment have any effect on the operations of the organisations especially IS?
- Q. What about the political environment, does it have any bearing on the operations of the organisation? In what ways?
- Q. Individuals tend to emphasis cultural orientation in their work environment. Elaborate if it has any influence on IS.
- Q. Could you elaborate on the inter departmental cooperation and collaboration (e.g sharing of resources)

Section VII: IS Services & skilled personnel

- Q. The availability of skilled professionals is crucial to achieving the goals in any organisation. What are your views on the availability of skilled IS professionals in the country and the organisation?
- Q. What are the areas you would like to see improved?

APPENDIX 5

Edited Version of PhD Field Diary

(Embargoed – refer to author)

APPENDIX 6

Sample of Interview Description

(Embargoed – refer to author)

APPENDIX 7

PNG University of Technology Case Description

(Embargoed – refer to author)

APPENDIX 8

Internal Revenue Commission Case Description

(Embargoed – refer to author)

APPENDIX 9

PNG Waterboard Case Description

(Embargoed – refer to author)

APPENDIX 10

Boroko Motors Ltd Case Description

(Embargoed – refer to author)

APPENDIX 11

Matrix of the Identified Elements

Identified aspects of Information Systems in organisation		Baily & Pearson (1983)	Miller & Doyle (1984)	Ang Et al. 2001	Jain 1997:	Al Abdu Gader (1999)
1	Training provided for users in IS capabilities	35	16	E33	J	A
2	User awareness & understanding of IS in the organisation	30	27			
3	Relationship between users & IS staff	5,6	3			
4	IS staff in the organisation					
5	Technical skills and competence of IS staff	7	2,15			
6	Career advancement & remuneration for IS staff			F4		A
7	User confidence in the computer system	32	17			A
8	IS staff ability to promptly process user requirement	11,13	5			
9	IS application integration in the organisation	39			J	
10	IS infrastructure in the organisation					
11	IS flexibility & responsiveness to changing user needs	13	29			
12	Availability (low percentage of downtime) of IS		13			
13	IS integrity					
14	Reliability of output information from IS	19				
15	Accuracy of information from IS	16	18			
16	Availability and timeliness of output information from IS	17	1			
17	Currency (up-to-dateness) of information from IS	20	11			
18	IS application development by IS staff					
19	User assistance in solving IS difficulties/problems	39		F2		
20	User access to IS facilities in the organisation	15	10			
21	Identifying user requirements by IS staff					A
22	Availability of IS documentation	28	6			
23	Management of IS in the organisation					
24	Data security and administration	27	25			
25	IS vendor (supplier) application support	12			J	A
26	Management awareness & understanding of IS capabilities			E2		A
27	Support given by top management for IS applications	1	33			A
28	Funding for IS application for the organisation	3	28	E4		A
29	Strategic planning for IS application for the organisation		19		J	A
30	Prioritising IS as a strategic tool in the organisation					
31	Alignment of IS strategy with business objectives			E5		
32	IS knowledge transfer from IS specialists to organisation					
33	Organisational position of IS division	37				
34	Working relationship (proximity) between CIO & CEO				J	A
35	Leadership and direction by IS Director/CIO					
36	IS ownership by management					
37	IS innovativeness (creativity) in the organisation					A
38	Co-operation with public/private agency in IS implementation					
39	Ability to adapt changing technology, software & methodology					
40	IS policies & guidelines in the organisation					A
41	National IS policies encouraging IS implementation			D3		A
42	Availability of skilled IS professionals in the country				J	A
43	Political condition in the country				J	
44	Economic condition of the country			D1		
45	Law & Order conditions in the country					
46	National planning & direction for IS in the country					
47	Employment procedures and conditions for IS specialists					
48	Affiliation with industry professional bodies				J	
49	National Information policies					
50	IS industry support in the country			D2		
51	Access to telecommunication infrastructure in the country					A
52	Long term (future oriented) IS planning					A
53	Long term (future oriented) IS budgeting					A
54	Cultural impact – wantok system					A

APPENDIX 12

Stage 2 Survey Cover Letter

REF NO:



Date: 10th September 2003

Dear Sir/Madam,

This is a follow up on my recent study visit to your organisation to identify Information Systems (IS) aspects that influence IS effectiveness in organisations in PNG. This survey is the second stage of the study. The survey attempts to determine the effectiveness of the identified aspects of Information System (IS) in your organisation.

The survey questionnaire will take less than 20 minutes to complete. Your involvement will bring about a greater awareness of the factors that influence IS success in organisations in PNG. Your commitment is limited to the completion and return of the questionnaire in the provided envelope, via the coordinating officer in your organisation.

No data from the study will be published or disclosed in a way which could allow the identification of an individual respondent. The maintenance of confidentiality of research data will have my highest priority. Upon request, interim results will be made available to participating organisations.

Your participation in this study is important. Please take time from your busy schedule to respond today.

The questionnaire is divided into 3 sections.

Section A contains a list of the aspects of Information Systems that were identified in stage 1 of the study, and from related prior studies. Please rate your perceptions on the IS aspects in your organisation.

Section B concerns IS use and experience, and **Section C** relates to organisation information.

There is room at the end of the survey for you to add additional comments

As a token of appreciation, 4 x K50.00 shopping vouchers will be presented to 4 lucky participants in the survey. The number at the top of this page represents your number in the draw. Hold on to this cover letter to claim your prize. You must participate in the survey to be eligible for the draw

Thank you for your assistance.

Limbie Kelegai

PhD Candidate

Email: l.kelegai@student.qut.edu.au

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APPENDIX 13 **Stage 2 Survey Questionnaire**

REF NO: 1

Section A: Aspects of Information Systems in your organisation

Part I of question

Part I asks you to comment on the identified aspects of Information Systems (IS) in your organisation.

Instructions

Consider the identified aspects of IS and evaluate the effectiveness of each aspect in your organisation. Evaluate each aspect on the basis of the scale of **1 to 7** and circle the appropriate number.

Example:

How effective do you think this aspect is in your organisation?									
			Very Poor	Poor		Good		Excellent	
		NA	1	2	3	4	5	6	
1	Training for users in IS capabilities								

If you circle **1**, it would indicate that you think that 'training for users in IS capabilities' is very poor in the organisation. If you circle **7**, you think that 'training for users in IS capabilities' is excellent in every respect. **4** is about the halfway mark.

Circle **NA only** if you cannot provide an answer, i.e. if you do not know.

If you do not understand the statement refer to the list of definitions.

Part I of Question

How effective do you think this aspect is in your organisation?			Very Poor		Poor		Good		Excellent
			1	2	3	4	5	6	7
1	Training provided for users in IS capabilities	NA	1	2	3	4	5	6	7
2	User awareness & understanding of IS in the organisation	NA	1	2	3	4	5	6	7
3	Relationship between users & IS staff	NA	1	2	3	4	5	6	7
4	IS staff in the organisation	NA	1	2	3	4	5	6	7
5	Technical skills and competence of IS staff	NA	1	2	3	4	5	6	7
6	Career advancement & remuneration for IS staff	NA	1	2	3	4	5	6	7
7	User confidence in the computer system	NA	1	2	3	4	5	6	7
8	IS staff ability to promptly process user requirement	NA	1	2	3	4	5	6	7
9	IS application integration in the organisation	NA	1	2	3	4	5	6	7
10	IS infrastructure in the organisation	NA	1	2	3	4	5	6	7
11	IS flexibility & responsiveness to changing user needs	NA	1	2	3	4	5	6	7
12	Availability (low percentage of downtime) of IS	NA	1	2	3	4	5	6	7
13	IS integrity	NA	1	2	3	4	5	6	7
14	Reliability of output information from IS	NA	1	2	3	4	5	6	7
15	Accuracy of information from IS	NA	1	2	3	4	5	6	7
16	Timeliness of output information from IS	NA	1	2	3	4	5	6	7
17	Currency (up-to-dateness) of information from IS	NA	1	2	3	4	5	6	7
18	IS application development by IS staff	NA	1	2	3	4	5	6	7
19	User assistance in solving IS difficulties/problems	NA	1	2	3	4	5	6	7
20	User access to IS facilities in the organisation	NA	1	2	3	4	5	6	7
21	Identifying user requirements by IS staff	NA	1	2	3	4	5	6	7
22	Availability of IS documentation	NA	1	2	3	4	5	6	7
23	Management of IS in the organisation	NA	1	2	3	4	5	6	7
24	Data security and administration	NA	1	2	3	4	5	6	7
25	IS vendor (supplier) application support	NA	1	2	3	4	5	6	7
26	Management awareness & understanding of IS capabilities	NA	1	2	3	4	5	6	7
27	Support given by top management for IS applications	NA	1	2	3	4	5	6	7
28	Funding for IS application for the organisation	NA	1	2	3	4	5	6	7
29	Strategic planning for IS application for the organisation	NA	1	2	3	4	5	6	7
30	Prioritising IS as a strategic tool in the organisation	NA	1	2	3	4	5	6	7
31	Alignment of IS strategy with business objectives	NA	1	2	3	4	5	6	7
32	IS knowledge transfer from IS specialists to organisation	NA	1	2	3	4	5	6	7
33	Organisational position of IS division	NA	1	2	3	4	5	6	7
34	Working relationship (proximity) between CIO & CEO	NA	1	2	3	4	5	6	7
35	Leadership and direction by IS Director/CIO	NA	1	2	3	4	5	6	7
36	IS ownership by management	NA	1	2	3	4	5	6	7
37	IS innovativeness (creativity) in the organisation	NA	1	2	3	4	5	6	7
38	Co-operation with public/private agency in IS implementation	NA	1	2	3	4	5	6	7
39	Ability to adapt changing technology, software & methodology	NA	1	2	3	4	5	6	7
40	IS policies & guidelines in the organisation	NA	1	2	3	4	5	6	7
What effect has this external factor had on your organisation's IS?									
41	National IS policies encouraging IS implementation	NA	1	2	3	4	5	6	7
42	Availability of skilled IS professionals in the country	NA	1	2	3	4	5	6	7
43	Political condition in the country	NA	1	2	3	4	5	6	7
44	Economic condition of the country	NA	1	2	3	4	5	6	7
45	Law & Order conditions in the country	NA	1	2	3	4	5	6	7
46	National planning & direction for IS in the country	NA	1	2	3	4	5	6	7
47	Employment procedures and conditions for IS specialists	NA	1	2	3	4	5	6	7
48	Affiliation with industry professional bodies	NA	1	2	3	4	5	6	7
49	National Information policies	NA	1	2	3	4	5	6	7
50	IS industry support in the country	NA	1	2	3	4	5	6	7
51	Access to telecommunication infrastructure in the country	NA	1	2	3	4	5	6	7
52	Long term (future oriented) IS planning	NA	1	2	3	4	5	6	7
53	Long term (future oriented) IS budgeting	NA	1	2	3	4	5	6	7

Part II of question

Part II determines the importance of the identified aspects for IS success in the organisation.

Instructions

State your perception of the importance of each aspect as a determinant for IS success in your organisation according to a seven-point scale: **1 to 7** in order of increasing importance.

Example:

How important are these aspects for IS success in your organisation?			nimpt		Little Impt		Impt		Very mpt	
1	Training for users in IS capabilities	NA	1	2	3	4	5	6	7	

*If you circle **1**, it would indicate that you think ‘training for users in IS capabilities’ is unimportant. If you circle **7**, it would indicate that you think ‘training for users in IS capabilities’ is very important in every respect. **4** is about the halfway mark.*

Circle **NA only** if you cannot provide an answer, i.e. if you do not know.

If you do not understand the statement refer to the list of definitions.

Part II of Question

How important are these aspects for IS success in your organisation			nimpt		Little Impt		Impt		Very mpt	
			1	2	3	4	5	6	7	
1	Training provided for users in IS capabilities	NA	1	2	3	4	5	6	7	
2	User awareness & understanding of IS in the organisation	NA	1	2	3	4	5	6	7	
3	Relationship between users & IS staff	NA	1	2	3	4	5	6	7	
4	IS staff in the organisation	NA	1	2	3	4	5	6	7	
5	Technical skills and competence of IS staff	NA	1	2	3	4	5	6	7	
6	Career advancement & remuneration for IS staff	NA	1	2	3	4	5	6	7	
7	User confidence in the computer system	NA	1	2	3	4	5	6	7	
8	IS ability to promptly process user requirement	NA	1	2	3	4	5	6	7	
9	IS application integration in the organisation	NA	1	2	3	4	5	6	7	
10	IS infrastructure in the organisation	NA	1	2	3	4	5	6	7	
11	IS flexibility & responsiveness to changing user needs	NA	1	2	3	4	5	6	7	
12	Availability (low percentage of downtime) of IS	NA	1	2	3	4	5	6	7	
13	IS integrity	NA	1	2	3	4	5	6	7	
14	Reliability of output information from IS	NA	1	2	3	4	5	6	7	
15	Accuracy of information from IS	NA	1	2	3	4	5	6	7	
16	Availability and timeliness of output information from IS	NA	1	2	3	4	5	6	7	
17	Currency (up-to-dateness) of information from IS	NA	1	2	3	4	5	6	7	
18	IS application development by IS staff	NA	1	2	3	4	5	6	7	
19	User assistance in solving IS difficulties/problems	NA	1	2	3	4	5	6	7	
20	User access to IS facilities in the organisation	NA	1	2	3	4	5	6	7	
21	Identifying user requirements needs by IS staff	NA	1	2	3	4	5	6	7	
22	Availability of IS documentation	NA	1	2	3	4	5	6	7	
23	Management of IS in the organisation	NA	1	2	3	4	5	6	7	
24	Data security and administration	NA	1	2	3	4	5	6	7	
25	IS vendor (supplier) application support	NA	1	2	3	4	5	6	7	
26	Management awareness & understanding of IS capabilities	NA	1	2	3	4	5	6	7	
27	Support given by top management for IS applications	NA	1	2	3	4	5	6	7	
28	Funding for IS application for the organisation	NA	1	2	3	4	5	6	7	
29	Strategic planning for IS application for the organisation	NA	1	2	3	4	5	6	7	
30	Prioritising IS as a strategic tool in the organisation	NA	1	2	3	4	5	6	7	
31	Alignment of IS strategy with business objectives	NA	1	2	3	4	5	6	7	
32	IS knowledge transfer from IS specialists to organisation	NA	1	2	3	4	5	6	7	
33	Organisational position of IS division	NA	1	2	3	4	5	6	7	
34	Working relationship (proximity) between CIO & CEO	NA	1	2	3	4	5	6	7	
35	Leadership and direction by IS Director/CIO	NA	1	2	3	4	5	6	7	
36	IS ownership by management	NA	1	2	3	4	5	6	7	
37	IS innovativeness (creativity) in the organisation	NA	1	2	3	4	5	6	7	
38	Co-operation with public/private agency in IS implementation	NA	1	2	3	4	5	6	7	
39	Ability to adapt changing technology, software & methodology	NA	1	2	3	4	5	6	7	
40	IS policies & guidelines in the organisation	NA	1	2	3	4	5	6	7	
41	National IS policies encouraging IS implementation	NA	1	2	3	4	5	6	7	
42	Availability of skilled IS professionals in the country	NA	1	2	3	4	5	6	7	
43	Political condition in the country	NA	1	2	3	4	5	6	7	
44	Economic condition of the country	NA	1	2	3	4	5	6	7	
45	Law & Order conditions in the country	NA	1	2	3	4	5	6	7	
46	National planning & direction for IS in the country	NA	1	2	3	4	5	6	7	
47	Employment procedures and conditions for IS specialists	NA	1	2	3	4	5	6	7	
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49	National Information policies	NA	1	2	3	4	5	6	7	
50	IS industry support in the country	NA	1	2	3	4	5	6	7	
51	Access to telecommunication infrastructure in the country	NA	1	2	3	4	5	6	7	
52	Long term (future oriented) IS planning	NA	1	2	3	4	5	6	7	
53	Long term (future oriented) IS budgeting	NA	1	2	3	4	5	6	7	

Section B: IS usage and experience

1. Put a tick in the box adjacent to the option that describes the type of computer systems implemented in the organisation. (*Select more than 1 if required*)

- | | | |
|--|--|---|
| <input type="checkbox"/> Accounting | <input type="checkbox"/> GIS/Mapping | <input type="checkbox"/> Personnel |
| <input type="checkbox"/> Asset Management | <input type="checkbox"/> Land Information | <input type="checkbox"/> Process Control |
| <input type="checkbox"/> Autocad/Drafting | <input type="checkbox"/> Library | <input type="checkbox"/> Project Planning |
| <input type="checkbox"/> Banking | <input type="checkbox"/> Management | <input type="checkbox"/> Shipping |
| <input type="checkbox"/> Billing Systems | <input type="checkbox"/> Medical Systems | <input type="checkbox"/> Stock Control |
| <input type="checkbox"/> Customs | <input type="checkbox"/> Multimedia | <input type="checkbox"/> Student Records |
| <input type="checkbox"/> Financial | <input type="checkbox"/> Office Automation | <input type="checkbox"/> Taxation |
| <input type="checkbox"/> Freight & Handling | <input type="checkbox"/> Payroll | <input type="checkbox"/> Transport system |
| <input type="checkbox"/> Other (Specify) | | |

2. From the above list specify (*only 1*) the computer system you mainly use.

.....

3. Put a tick in the box adjacent to the option that is your closest usage behaviour of the system you choose in question 2 (only one answer).

I use the computer system ..

Occasionally	Regularly		Frequently		Intensively	
1	2	3	4	5	6	7

4. Put a tick in the box adjacent to the option which describes how you attained your IS training.

I attained my IS training through

- General courses at College/University
- Training provided by Information Systems suppliers
- Training provided by consultants
- In-house training by IS staff in the organisation.
- Training through service organisation
- Self-study/training
- Other (Specify)

5. Put a tick in the box adjacent to the option that describes how you get IS assistance in your organisation (only one).

- I get better assistance for IS problems from IS and Non IS staff from my region, ethnic group, clan (wantok)
- I get better assistance for IS problems from all IS staff
- I get better assistance for IS problems from Non IS staff
- I get IS assistance is not satisfactory from all the above
- Other (Specify)

Section C: Organisational

The following questions relate to the respondent. Please fill in or tick appropriate option.

1. What is your organisation's name?

2. What gender are you? (Tick the appropriate box)

- Male
- Female

3. What is your Nationality? (Tick the appropriate box)

- PNG
- Other (Specify)

4. Put a tick in the box adjacent to the option that describes the category of your job with respect to your organisation?

- Executive/Top Management
- Middle Management
- Other (Specify)

5. How long have you been in this position? (Tick the appropriate box)

- < 6 months
- 6 months – 1 year
- 1-2 years
- 2-4 years
- 5-6 years
- > 6 years

6. How long have you been with the organisation? (Tick the appropriate box)

- < 6 months
- 6 months – 1 year
- 1-2 years
- 2-4 years
- 5-6 years
- > 6 years

7. How would you rate your organisations overall Information Systems effectiveness given the following scale? (Circle the number that best describes your rating).

<i>Complete Failure</i>							<i>Very Successful</i>	
1	2	3	4	5	6	7		

8. Is the organisation employing any evaluative criteria to measure Information Systems effectiveness? (Tick the appropriate box)

- Yes
- Do not know
- No

Please specify if you ticked "Yes".

.....

9. Comments

If you wish to add any comments or further observations, please use the space below.

.....

End of Survey

Thank you for your assistance in completing this questionnaire.

APPENDIX 14

Difference (Effectiveness): Public Vs Private (General)

IS success Elements	Public			Private			Levene's Test for Equality of Variances		t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff
Training provided for users in IS capabilities	173	3.35	1.489	44	4.07	1.129	9.251	.003	-3.501	85.317	.001	-.72	.204
User awareness & understanding of IS in the organisation	174	3.71	1.290	44	4.18	1.167	1.401	.238	-2.222	216	.027	-.47	.214
Relationship between users & IS staff	175	4.59	1.411	44	4.70	1.254	.395	.530	-.474	217	.636	-.11	.233
IS staff in the organisation	166	4.72	1.164	44	4.93	1.087	.267	.606	-1.104	208	.271	-.21	.195
Technical skills and competence of IS staff	163	4.93	1.131	44	5.32	1.177	1.209	.273	-2.022	205	.044	-.39	.194
Career advancement & remuneration for IS staff	127	4.31	1.264	39	4.95	1.255	.770	.382	-2.743	164	.007	-.63	.231
User confidence in the computer system	171	4.63	1.173	43	4.58	1.006	.832	.363	.222	212	.820	.04	.195
IS ability to promptly process user requirement	169	4.76	1.293	44	5.02	1.151	1.726	.190	-1.239	211	.217	-.27	.214
IS application integration in the organisation	161	4.66	1.048	39	4.82	1.097	.257	.613	-.826	198	.410	-.16	.189
IS infrastructure in the organisation	160	4.51	1.229	39	4.46	.996	1.228	.269	.240	197	.810	.05	.212
IS flexibility & responsiveness to changing user needs	171	4.51	1.303	43	4.67	1.169	.591	.443	-.760	212	.448	-.17	.218
Availability (low percentage of downtime) of IS	157	4.55	1.173	41	4.51	1.121	.008	.928	.206	196	.837	.04	.204
IS integrity	160	4.86	1.191	40	4.85	1.075	.410	.523	.030	198	.976	.01	.207
Reliability of output information from IS	167	4.94	1.068	42	4.79	1.024	.014	.908	.844	207	.400	.15	.183
Accuracy of information from IS	165	5.04	1.029	44	4.93	1.087	.264	.608	.592	207	.555	.10	.177
Timeliness of output information from IS	160	4.86	.994	44	4.77	1.054	.356	.551	.524	202	.601	.09	.171
Currency (up-to-dateness) of information from IS	154	4.60	1.213	41	4.73	1.073	1.497	.223	-.645	193	.520	-.13	.208
IS application development by IS staff	150	4.44	1.256	41	4.29	1.101	1.703	.194	.683	189	.496	.15	.216
User assistance in solving IS difficulty/problems	168	4.52	1.439	44	4.43	1.149	1.236	.268	.392	210	.695	.09	.235
User access to IS facilities in the organisation	171	4.44	1.364	42	4.40	1.170	1.278	.260	.173	211	.862	.04	.229
Identifying user requirements by IS staff	166	4.36	1.1376	43	4.40	1.094	1.905	.169	-1.50	207	.881	-.03	.226
Availability of IS documentation	162	3.94	1.380	38	4.08	1.302	.415	.520	-.546	198	.585	-.13	.246

Information Systems Management in Developing Countries

Management of IS in the organisation	158	4.94	1.07 2	42	4.86	.977	.131	.717	.470	198	.639	.09	.183
Data security and administration	161	5.22	1.21 4	42	4.95	1.18 8	.074	.786	1.262	201	.208	.27	.210
IS vendor (supplier) application support	134	5.51	1.20 0	37	4.38	1.06 3	.840	.361	.627	169	.531	.14	.218
Management awareness & understanding of IS capabilities	153	4.22	1.23 0	43	4.28	1.35 1	.013	.908	-.292	194	.770	-.06	.217
Support given by top management for IS applications	153	4.27	1.41 1	42	5.05	1.26 8	.931	.336	-3.212	193	.002	-.77	.241
Funding for IS application for the organisation	144	4.30	1.41 0	39	4.97	1.18 1	1.917	.168	-2.743	181	.007	-.68	.246
Strategic planning for IS application for the organisation	138	4.43	1.25 5	38	4.42	1.13 0	.077	.782	.061	174	.951	.01	.225
Prioritising IS as a strategic tool in the organisation	150	4.41	1.32 2	40	4.78	1.27 1	.059	.809	-1.550	188	.123	-.36	.233
Alignment of IS strategy with business objectives	148	4.47	1.24 2	38	4.82	1.18 2	.042	.838	-1.532	184	.127	-.34	.224
IS knowledge transfer from IS specialists to organisation	155	4.20	1.32 6	41	4.46	1.34 3	.107	.744	-1.128	194	.261	-.26	.234
Organisational position of IS division	146	4.64	1.14 3	38	4.58	1.10 6	.087	.769	.314	182	.754	.06	.207
Working relationship (proximity) between CIO & CEO	123	4.69	1.13 2	38	4.82	1.24 9	.808	.370	-.579	159	.563	-.12	.215
Leadership and direction by IS Director/CIO	131	4.75	1.21 7	37	4.68	1.10 7	.507	.477	.326	166	.745	.07	.222
IS ownership by management	128	4.48	1.31 6	35	4.77	1.43 7	.279	.598	-1.121	161	.264	-.29	.256
IS innovativeness (creativity) in the Organisation	154	4.25	1.38 9	41	4.37	.968	4.482	.036	-.599	88.838	.551	-.11	.188
Co-operation with public/private agency in IS implementation	135	4.24	1.36 3	40	4.33	1.02 3	1.629	.204	-.346	173	.730	-.08	.233
Ability to adapt changing technology, software & methodology	151	4.36	1.37 3	42	4.57	1.03 9	3.064	.082	-.937	191	.350	-.21	.288
IS policies & guidelines in the organisation	160	4.68	1.36 7	40	4.32	1.43 9	.483	.488	1.480	199	.141	-.36	.242

APPENDIX 15

Difference (Effectiveness): Middle Managers Vs Others

IS success Elements	Non-Manager			Middle Manager			Levene's Test for Equality of Variances		t-test for Equality of Means				
	N	Mean	SD	N	Mean	SD	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff
Training provided for users in IS capabilities	140	3.44	1.51	101	3.41	1.28	3.697	.056	.161	239	.872	.03	.185
User awareness & understanding of IS in the organisation	142	3.77	1.38	100	3.58	1.15	4.604	.033	1.196	233.126	.233	.19	.163
Relationship between users & IS staff	142	4.44	1.573	101	4.45	1.220	7.013	.009	-.010	239.150	.992	.00	.179
IS staff in the organisation	137	4.58	1.304	97	4.49	1.110	1.323	.251	.547	232	.585	.09	.163
Technical skills and competence of IS staff	132	4.84	1.381	98	4.83	1.084	3.884	.050	.085	228	.932	.01	.168
Career advancement & remuneration for IS staff	103	4.36	1.385	83	4.18	1.221	1.152	.285	.921	184	.359	.18	.194
User confidence in the computer system	139	4.59	1.267	98	4.40	1.002	5.502	.020	1.300	231.844	.195	.19	.148
IS ability to promptly process user requirement	138	4.64	1.439	99	4.59	1.195	3.182	.076	.334	235	.739	.06	.177
IS application integration in the organisation	130	4.53	1.295	93	4.43	.993	6.371	.012	.656	219.891	.512	.10	
IS infrastructure in the organisation	128	4.34	1.389	95	4.33	1.056	5.871	.016	.106	220.853	.915	.02	.164
IS flexibility & responsiveness to changing user needs	140	4.43	1.405	98	4.31	1.170	2.307	.130	.708	236	.480	.12	.173
Availability (low percentage of downtime) of IS	126	4.37	1.331	96	4.33	1.012	5.578	.019	.252	220.000	.801	.04	
IS integrity	126	4.64	1.371	97	4.64	1.043	6.465	.012	.023	220.974	.982	.00	.162
Reliability of output information from IS	132	4.77	1.282	99	4.70	.952	4.699	.031	.515	228.986	.607	.08	.147
Accuracy of information from IS	132	4.91	1.263	99	4.77	1.018	2.401	.123	.913	229	.362	.14	.155
Timeliness of output information from IS	130	4.85	1.151	96	4.53	.906	5.010	.026	2.301	223.073	.022	.31	.137
Currency (up-to-dateness) of information from IS	122	4.49	1.404	96	4.49	1.056	7.052	.009	.013	215.598	.989	.00	.167
IS application development by IS staff	123	4.20	1.486	90	4.29	1.084	8.124	.005	-.533	210.999	.595	-.09	.176
User assistance in solving IS difficulty/problems	135	4.43	1.529	99	4.36	1.208	4.829	.029	.369	230.680	.713	.07	.179
User access to IS facilities in the organisation	136	4.30	1.431	100	4.31	1.203	2.250	.135	-.048	234	.961	-.01	.176
Identifying user requirements by IS staff	133	4.20	1.500	99	4.24	1.153	4.210	.041	-.270	229.750	.788	-.05	.174
Availability of IS documentation	128	3.95	1.541	95	3.78	1.231	3.829	.052	.907	221	.365	.17	.192

Information Systems Management in Developing Countries

Management of IS in the organisation	129	4.74	1.325	94	4.67	.909	9.578	.002	.494	220.270	.621	.07	.150
Data security and administration	131	4.91	1.521	95	4.93	1.14 2	9.871	.002	-.101	223.722	.920	-.02	.177
IS vendor (supplier) application support	108	4.49	1.391	89	4.33	.914	10.509	.001	.998	186.332	.320	.16	.165
Management awareness & understanding of IS capabilities	124	3.98	1.352	95	4.25	1.07 2	.843	.360	- 1.63 9	217	.103	-.28	.169
Support given by top management for IS applications	123	4.16	1.462	94	4.43	1.37 2	.142	.706	- 1.34 8	215	.179	-.26	.195
Funding for IS application for the organisation	117	4.09	1.508	88	4.44	1.26 7	.927	.337	- 1.75 5	203	.081	-.35	.199
Strategic planning for IS application for the organisation	111	4.14	1.407	87	4.26	1.09 4	5.383	.021	-.676	195.992	.500	-.12	.178
Prioritising IS as a strategic tool in the organisation	121	4.21	1.512	91	4.25	1.29 6	2.698	.102	-.192	210	.848	-.04	.198
Alignment of IS strategy with business objectives	114	4.27	1.453	93	4.32	1.13 4	5.732	.018	-.282	204.625	.779	-.05	.180
IS knowledge transfer from IS specialists to organisation	124	4.12	1.496	93	4.11	1.14 6	5.269	.023	.075	214.887	.940	.01	.179
Organisational position of IS division	114	4.52	1.291	91	4.37	1.08 2	1.618	.205	.851	203	.396	.14	.169
Working relationship (proximity) between CIO & CEO	95	4.49	1.279	85	4.62	1.12 3	1.079	.300	-.714	178	.476	-.13	.180
Leadership and direction by IS Director/CIO	100	4.48	1.494	88	4.17	1.08 5	10.606	.001	-.078	175.104	.938	-.01	.184
IS ownership by management	96	4.22	1.431	88	4.50	1.31 3	.000	.987	- 1.38 5	182	.168	-.28	.203
IS innovativeness (creativity) in the Organisation	121	4.13	1.455	96	4.15	1.18 7	3.180	.076	-.074	215	.941	-.01	.184
Co-operation with public/private agency in IS implementation	109	4.06	1.547	88	4.17	1.08 5	9.251	.003	-.565	191.463	.573	-.11	
Ability to adapt changing technology, software & methodology	120	4.18	1.517	97	4.30	1.27 6	2.116	.147	-.599	215	.550	-.12	.193
IS policies & guidelines in the organisation	126	4.37	1.619	96	4.36	1.18 9	6.947	.009	.045	219.731	.964	.01	