Return on Investment in Information Technology in the South African Post Office

A Research Report
presented to the

Graduate School of Business Leadership
University of South Africa

In partial fulfilment of the
requirements for the

MASTERS DEGREE IN BUSINESS LEADERSHIP
UNIVERSITY OF SOUTH AFRICA

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30 November 2006

Abstract

The South African Post Office is investing large amounts of money in IT. Organisations were encouraged by the notion that investing in IT correlates with higher returns and the delivery of expected results by replacing the human component in organisations. The employment of IT within business has often resulted in the replacement of old problems with new and the expected business benefits of IT not realised.

The primary research objective was to determine the relationship between IT expenditure and the financial performance of a firm. The secondary research objective was to explore the perceived value of IT investment in SAPO.

The study followed an exploratory case study approach. In addressing the primary research objective, statistical techniques were employed to determine the relationship between IT expenditure and the financial performance of the firm. The secondary research objective was addressed using survey research to explore the perceived value of IT investment amongst a sample of management within SAPO.

Results indicated that a significant positive relationship existed between IT expenditure and net profit at a lag of around six to eight months. This suggests that IT expenditure does in fact have a positive effect on the financial performance of the SAPO, but as was found in similar other studies, only after a time period.

The findings suggested that IT is considered a strategic and tactical component within SAPO and therefore a necessary business expense. It is also perceived by the majority to be efficient. However, the findings also suggested that respondents were not convinced that IT is able to increase sales, reduce cost or meet customer requirements.

In the light of the above, it is recommended that the value of IT, both on a financial basis and perceived basis, be measured regularly. It should be

incorporated into review reports such as the Balanced Scorecard, to ensure that personnel and management takes cognisance of IT expenditure and that real effort should be made to evaluate its effect on the business at all levels.

Acknowledgements

This report is dedicated to my wife Rietha, sons Zander (10) and Waldo (8) and the South African Post Office with my sincere thanks and appreciation.

I certify that, except as noted above, the report is my own work and all references used are accurately reported.

SG Gaybba

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CHAPTER 1: ORIENTATION

1.1 Introduction

The South African Post Office with turnover of more than four billion rand and assets worth more than three billion recorded their first operating profit during the 2003/4 financial year (SAPO, 2004). Since then, their operating profit has increased marginally during 2004/5 and 2005/6.

According to the South African Post Office's five year strategic plan that was published in 2004, they have set a very ambitious operating profit target of one billion rand to be reached by the 2009/10 financial year. For 2005/6 the operating profit was reported to be R270,3 million (SAPO, 2006). This would be a remarkable achievement when viewed from the world wide phenomena that the traditional postal industry shows trends of a decline (SAPO, 2005).

In essence, the delivery of letters and parcels can be viewed as written communication delivered manually and any electronic substitution will have a direct impact on the South African Post Office letter volumes and subsequent revenue. The evolution of information technology therefore has a profound impact on the South African Post Office as a threat to decreasing traditional postal revenue. However, it is also seen as an enabler to introduce new products and services into the market.

SAPO, as with every other high ranking organisation in South Africa has undergone a process of reform in the past few years. It has readdressed the historical operational and service imbalances, while improving the scope, scale and quality of service. It had significantly reduced and ultimately eliminated cost and service inefficiencies and repositioned the postal service to benefit from the growth in the overall communications world-wide. This was done by also investing in information technology to meet the challenges of the economy and their customers.

This chapter will highlight the purpose of the research and problem statement. The research objectives will be stated and the importance of the study noted.

1.2 Objectives of the study

The primary research objective was to determine the relationship between IT expenditure and the financial performance of a firm.

The above research objective was supported by a secondary research objective. The objective was:

- To explore the perceived value of IT investment in a company.

The study followed an exploratory case study approach, focusing on data gathered from the South African Post Office.

1.3 Scope of the study

Based on the case study of the South African Post Office, the research determined the relationship between IT expenditure and the perceived returns.

1.4 Importance of the study

When computers were first introduced to organisations, they carried lots of promise for the immediate achievement of results. Organisations started investing in Information Technology (IT) with an insight that this would provide a solution to all their organisational problems. Brynjollfsson (1993, 1994) and Strassmann (1990) showed that computers carried a lot of promise. Organisations were encouraged by the notion that investing in IT correlates with higher returns and the delivery of expected results by replacing the human component in organisations. Marketers continuously sell new and

emerging technological solutions to organisations, thereby pressurising them to invest into IT.

Guerreiro and Serrano, (2006) noted that firms invest in IT in order to improve their economic performance and increase their net worth. IT can improve information sharing, decision-making, coordination, product quality, responsiveness and distribution (Al-Mudimigh 2001; Shin 2001) as well as to differentiate their products, reduce the cost of their products or services, provide innovative products or services, support growth, or form alliances with suppliers and customers. IT is often designed to support and improve medium to long-term business, based on a variety of corporate goals. The employment of IT within business has often resulted in the replacement of old problems with new and the expected business benefits of IT not realised. Despite increasing expenditure on IT, productivity has not increased and this has given rise to a productivity paradox (Love & Zahir, 2004).

For most of the past half-century, organisations have been increasing their investments in IT, primarily because of the belief that IT has a significant impact on organisational performance (Osey-Bryson & Ko, 2004). The initial enthusiasm for IT during the 1970 and 1980 has long since been overtaken by a sense of pragmatism. Management now seeks more concrete evidence of the business and the real value of their often extensive IT investments (Serafeimidis & Smithson, 2000). Despite massive investment in IT by both the public and private sectors, there seems to be an apparent lack of evidence concerning the impact on productivity and business performance of such investments. During the past decade a great deal of attention has focused on the impact of IT investment. However studies have frequently generated controversial or inconsistent results. Success stories give impressive examples of the effects of investment in IT on a firm's performance and competitive advantage, and therefore, become one of the key areas in organisational investment strategies. At the same time, several empirical studies have failed to find any positive relationships between extensive use of IT and organisational efficiency, performance and success (Guerreiro & Serrano, 2006). At firm, industry and economy level there is contradictory

evidence on whether IT expenditure has resulted in business value. The statistical uncertainty adds substance to a continuing business worry about how the value of IT expenditure can be measured. Although it is important that a firm should invest in IT and the competitive advantages from superior IT investments be widely recognised (Brynjolfsson & Hitt, 1998), some research (Harris & Katz, 1989) has shown that it is unlikely that higher expenditures on IT alone will ensure a firm's superior performance and actual returns received on IT investments vary widely (Brynjolfsson & Hitt, 1998). It is opined that the greatest benefits of IT appear to be realised by organisations when IT investment is coupled with other complementary investments, such as organisational reengineering, restructuring and redesign (Lee & Bose, 2002). IT investments may not automatically improve financial performance; instead, it is one essential tool, but needs to be coupled with organisational factors such as business strategies to be truly effective (Shin, 2001).

Brynjollfsson (1993; 1994); and Strassmann (1990) revealed in their studies, the following reasons why organisations invested in IT:

- a need to create wealth;
- with the idea to improve output levels in production;
- to benefit by producing quality products;
- to improve service delivery;
- to control communication activities;
- with the expectation to achieve customer satisfaction.

Organisations also expected IT would assist in the production of products with a high level of speed and responsiveness. Firms expected to benefit from IT by improving efficiency through gaining competitive advantage over their competitors and increasing profits in organisations. They aimed to improve the quality of life of the information worker by enabling them to share information and knowledge and that IT would improve workers' performance. They also thought IT would enable workers to manage their work effortlessly by saving time. Managers invested in IT with expectations that it would facilitate their decision making processes.

Today's IT industry challenges to assist organisations to survive the global economy competition and the information and knowledge-driven society. The emergence of the internet, sophisticated IT tools, and communication solutions influence managers' perceptions towards IT as a solution. Organisational expectations are being met through the changes that IT brings towards improving organisational processes, and the way workers fulfil their daily tasks. Information technology enables knowledge sharing, collaboration, and supports management processes. IT allows for communication on projects at any time and any place. New and emerging technology helps in preserving the knowledge and information generated in organisations, and delivers expected results although there are still some challenges or pitfalls with such tools.

1.5 Study environment

The study follows an exploratory case study approach, focusing on data gathered from the SAPO.

1.6 Clarification of concepts

Balanced scorecard – A frame work for setting and monitoring business performance. Metrics are structured according to customer issues, internal efficiency measures, financial measures and innovations.

Competitive advantage – In order to survive or expand, organizations must seek to gain dominance over their competitors in the market place. This can be achieved by using a variety of strategies to gain control of a market or prevent others from gaining control.

Cost of ownership – The cost of ownership describes a range of different expenses incurred by purchasing and maintaining a computer system. Such

costs include the original cost of the hardware and software, upgrades, maintenance, technical support and training.

Information technology - refers to the technology whereas Information Systems refer to technology as well as how it is applied and managed to contribute to business.

1.7 Outline of the research report

Chapter 1 served to orientate the reader. The concept of IT investment was noted, the objectives of the research were stated and the importance of the study defended. Chapter 2 focuses on the theoretical foundation of the study. In chapter 3 prior theory and literature were discussed that has guided the researcher in understanding the salient issues of this study. In chapter 4 the research problem is formulated. The research methodology that was followed in this study is spelled out in chapter 5. Chapter 6 depicts the results from the research conducted. Chapter 7 provides a discussion of the results, conclusion and recommendations.

CHAPTER 2: THEORETICAL FOUNDATION OF THE STUDY

2.1 Introduction

The use of Information Technology (IT) has since the beginning been targeted for evaluation whether it pays off or not. The research entered a new phase in the 1980s. This was mainly initiated with a statement from Solow (1987) as cited by Loveman (1994), that IT investments were not giving a return to its investors. This sparked further research and many jumped on the new hot topic. Many researchers were following different approaches to investigate and research around this area, some agreeing to what Solow stated (Loveman 1994), and some not (Brynjolfsson, 1993; Brynjolfsson & Hitt 1996, 1998 & 2003). These different views are supported by Kohli and Devaraj (2003) that noted in their study that payoff from IT has generated interest and debate from both academics and practitioners. Various studies have found mixed results when having investigated the relationship between investment in IT and firm performance (Goh & Kauffman, 2005). From the many empirical studies, there are probably as many different viewpoints and findings to whether investing in IT is good or not. The one thing most researchers agree with is that the outcomes of investments in IT are difficult to measure.

Today's economic climate has forced the control of IT investments into becoming a necessary and vital part of business behaviour. IT managers are no longer able to approve large expenditure without a strong commercial business case showing a high return on investment (ROI). Another factor driving a commercial focus amongst IT managers are statistics that show that a very high percentage of IT projects fail to deliver a ROI over an acceptable time frame. The business environment is now dominated by prudent investment decisions and recessionary attitudes. It is common practice that organisations firstly consider the returns or value outcomes before making any IT investments.

Traditionally however when IT professionals and top-management discuss the return of an IT investment, they mostly think of the financial benefits. Today, business leaders and technologists also consider the non-financial benefits of IT investments.

2.2 Finding suitable proxies for measuring ROI

Measuring the value of an investment is an inextricable part of business planning. A Return on Investment (ROI) calculation is only a small part of the total value of an investment. It is an internally focused metric giving a dollar value only. An ROI calculation for a particular investment may, in fact, be negative, but the intangible benefits such as customer satisfaction and easy access to information, may justify the expense. ROI is an important metric, but it needs to be balanced with a rigorous analysis of all the value factors in an organisation.

IT's value is determined by the relationship between what the organisation will pay (costs) and what it will get back (financial and non-financial benefits). The larger the benefit in relation to cost, the greater the value of the IT project. This suggests by implication that the value or returns on investments need to be calculated. A review of the literature by Kohli and Devaraj (2003) cites inadequate sample size, lack of process orientation, and analysis methods amongst the reasons studies have shown mixed results in establishing a relationship between IT investment and firm performance. Another aspect noted in the literature relates to the absence of a proper way to measure IT's value-creating role and evaluate the payoffs of IT investments (Epstein & Rejc, 2005). They also noted that even approaches such as the Balanced Scorecard and shareholder value analysis, which do provide frameworks for analysis and management, were insufficient in measuring the value of IT.

2.2.1 Financial perspective

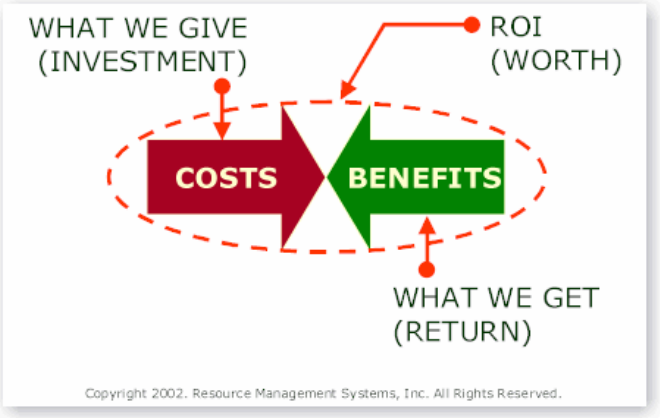
Westerlind (2004) noted that return on investment is often used in order to calculate whether an investment is paying off or not. If the value that appears from the calculations is negative the investment is undesirable and would use more resources than it would produce. The returns are usually divided in "hard-" or "soft returns". Hard returns are easy to calculate, while there lies more of a challenge to calculate soft returns. Soft returns are usually intangible assets e.g. the effect of IT investment on the productivity of a firm. Westerlind (2004) also postulated that Return on Investment indicator (ROI) conveys gain (capital remuneration) against total investment as a ratio. The Return of Investment indicator measures the productivity of an investment. The latter affirmation can be explained and demonstrated by a detailing process that starts from a company's productivity concept.

A company's productivity is the ratio between the total output and the total inputs, the total inputs being the external resources and the internal resources used by the company to make its activity work and the total output being the value of the production. In everyday life it is easy to calculate the payback period of an investment. When it comes to IT investments this is a factor that will be measured in usually a time unit. Payback period is therefore a key measurement of risk calculations; the shorter the period, the better. This becomes important as technology changes rapidly.

When someone asks about return on investments (ROI), they are really asking what they will get back for the money they have been asked to spend or invest. ROI measures how effectively the firm uses its capital to generate profit; the higher the ROI, the better.

The figure below sketches this scenario.

Figure 2.1: The Return-on-investment scenario (RMS, 2002)



Cresswell (2004) noted that more than ever, decision makers must make the most of scarce resources and at the same time respond to ever-increasing demands for improved performance and new technology. These competing demands generate close scrutiny of proposals for new information technology (IT) investments.

Return on investment is a tool known to analysts as a very versatile and simple method.

The ROI is dependant on five key points namely:

- life of project
- policy of capitalization
- rate of depreciation
- time lag in investment deployment of the projected cash flows
- rate of growth of the new investment

A meaningful return on investment (ROI) analysis in information technology is an analysis based on different components. It is a collection of methods, skills, tools, activities, and ideas. They can be combined and used in many different ways to assess the relative value of an investment over time. Applying this collection in a particular situation requires making many choices

among the ideas and methods available and conducting an analysis appropriate to the decision at hand. Different choices will produce different results.

The choice of how to conduct the analysis should be based on four critical principles pertaining to:

- the strategic objective(s) of the ROI analysis,
- the place (and importance) of the IT investment in the overall enterprise architecture,
- the type of analysis that should be conducted (i.e., what data and methods of analysis are best suited to those objectives)
- how the ROI analysis fits in the overall decision context for IT investments.

Understanding the strategic objectives of an ROI analysis will determine how the analysis is ultimately done and used. Choosing and using the various methods of ROI analysis requires sound knowledge and judgment: knowledge about the methods and judgment about how best to apply them.

2.2.2 Perceived value of IT investments

Traditional financial and accounting measures often fail to properly quantify the business benefits of IT investments. According to Intel (2003), IT investments are growing more complex, more strategic, and larger in scope. At the same time, traditional financial and accounting measures often fail to properly quantify the business benefits of those investments. This is supported by the ROI forum (2006) stating that unlike financial returns, there may be no widely accepted metrics that can be applied in measuring the benefits of IT investment in a firm. However, IT's potential for producing positive impacts on business performance and mission results are undeniable. The difficulty that most organisations encounter here is twofold: people aren't sure what to measure and they don't know how to measure.

Some IT projects provide indirect benefits to a company, such as improving IT efficiency through optimised wide area network capacity while also delivering a new IT business capability to employees at a reduced cost. Other projects deliver direct benefits to a company by improving throughput, enhancing productivity, and increasing revenues. These projects deliver business value to the corporation but have no direct impact on the IT infrastructure.

Research conducted indicated various reasons for companies to invest in IT. Sigala (2003) noted that many organisations have turned to information and communication technologies as a way to cope with turbulent environments. Hu and Plant (2001) postulated the attempt to secure a sustainable competitive advantage as the driving force behind the large-scale investments in information technology (IT) over the last three decades. This was supported by Demirhan, Jacob and Raghunathan (2005) that investments in information technology have become crucial for firms to improve the quality of their products and services. It is clear that researchers and business managers consider information technology investment as an enabler for improved organisational efficiency and competitiveness (Kohli & Devaraj, 2003). According to a study by the Computer Science Corporation (2003) the motivation for IT investment is driven by

- Increase efficiency
- Increase productivity
- Transaction efficiency
- Increase trade sales
- Cut purchase costs

Finally, decision-makers make IT project selection decisions based upon the perceived value of the investment in part due to the difficulties and complexity of calculating the exact pay-offs of investments in IT.

2.3 Sampling

Another aspect that came under scrutiny during the earlier studies was the issue of sample size and the variables taken into account for the analysis of the data. In explaining the productivity paradox Brynjolfsson (1993) noted that measurement errors contributed to this phenomena. There were obvious problems in measuring and comparing IT investments owing to rapid price and quality changes; and economic statistics generally fail to measure qualitative improvements in the output of service industries (Gillin, 1994). Simple bi-variate correlations between aggregate productivity and aggregate IT capital stock did not take into account the impact of all variables which also affect productivity. They were therefore likely to measure spurious effects (Lehr & Lichtemberg, 1999) as cited by Brynjolfsson (1998)

Brynjolfsson (1998) noted that in the early 1990s new data became available which allowed a re-examination of some of the previous results on IT productivity. These data, for the first time, enabled researchers to look at the IT investment behaviour and productivity of large numbers of firms rather than focusing on higher level aggregates such as manufacturing industries or the whole economy. This micro-level approach had a number of advantages. While there is only one U.S. economy and only a few dozen manufacturing industries, these data allowed analyses to be conducted on hundreds of firms over several years. The increase in sample size enabled much more precise estimates of IT's contributions. Firm level data also enables the measurement of at least some of the intangible value that was being created by computers even if this value could not be directly observed. This was supported by Oliner and Sichel (1994, 2000); Lehr and Lichtemberg (1999) and Brynjolfsson and Hitt (1996) as noted by Brynjolfsson (1998).

2.4 Summary

This chapter explored the foundation of the study. Devaraj and Kohli (2002) postulate that companies IT budgets are increasingly being squeezed and

hacked away at with the same lack of understanding as they were senselessly and wildly increased in the late 1990. The question is why is this happening? Devaraj and Kohli (2003) argued that a lack in demonstrating the justification of technology, companies will continue to spend their IT budgets on faith not fact.

In large corporations information technology cuts across various departments, whether operational, administrative or supporting functions. A change in one of the information technology fields could most likely force changes in software platforms, database administration, network configuration and training for the new users as well as first line and maintenance support team.

The next chapter deals with the productivity paradox and the different relationships that exist between IT investment and productivity and will discuss the different actions and reactions of IT investment.

CHAPTER 3: LITERATURE REVIEW

3.1 Introduction

When speaking to any financial manager in both small and large organisation it is apparent that information technology has become a significant component of new capital investment. Be it installing of new desktop computers, printers, and software or incorporating enterprise resource planning (ERP) systems. Brynjolfsson and Hitt (1998) noted that during the 1990's an important question has been debated for almost a decade namely whether computers contribute to productivity growth. Research conducted by Steven Roach, as cited by Brynjolfsson and Hitt (1998), and published in 1987, found that the amount of computing power per white-collar worker in the United States service industry was growing dramatically over the 1970s and 1980s, yet the measured productivity of this sector was flat. This drew the attention to the so-called 'Productivity Paradox'.

The 'Productivity Paradox' created an increased awareness of the issue that surround the questions: What value does information technology add to an organisation (Hu & Plant, 2001). Since then numerous studies have been conducted, investigating the relationship between IT investment and firm performance.

In order to provide a structural layout of the chapter, section 3.2 provides a brief review of the 'productivity paradox' and the most recent standings of researchers towards this issue. Subsequent sections focus on the particular findings of researchers towards investigating the relationship between IT investment and firm performance. From these, various research questions and hypotheses emerge, which form the foundation of this research study.

3.2 The productivity paradox

The 'productivity paradox' phrase was coined when large investments in information technology (IT) apparently failed to produce significant increases in productivity on two levels. The first was at the industry or economy-wide level and the second was observed at company level (Lim, Richardson & Roberts, 2004).

Ryan (1999) asked the question do IT investments contribute to productivity growth. He noted that early research into the subject had pointed out a paradox that despite the spending of large amounts by firms during the 1990s, the productivity benefits were patchy. Early research tended to focus on the services sector, where IT spending in the 1980s generated minimal annual growth in productivity. IT spending by firms in the 1980s amounted to about one percent of revenues, a figure insufficiently large to materially impact productivity. At the centre of the paradox is the fact that productivity appeared to start slowing in the early 1970s, coinciding with the oil crises and, surprisingly, the widespread use of IT.

Attention was first drawn to the productivity paradox in 1987 by Steven Roach, who demonstrated that while the amount of computing power per white collar worker in the services sector had grown dramatically over the 1970s and 1980s, measured productivity of the sector remained flat (Ryan, 1999). Researchers conducted various studies and searched for a link between productivity growth and computer investment in manufacturing industries. From an economy-wide level perspective, the conventional wisdom was by the late 1980s that IT was not contributing significantly to productivity (Brynjolfsson & Hitt, 1998). Lim, Richardson and Roberts (2004) noted that this view was also supported by findings from researchers such as Landauer (1995), Loveman (1994), Mahmood (1993), Weill (1992), Roach (1987) and Solow (1987). Brynjolfsson and Hitt (1998) remarked that a few studies did find positive effects on intermediate factors such as cost efficiency or market share, but it was difficult to tie these benefits to the bottom line. While early research found little evidence of a relationship between IT and productivity,

there was also little evidence that computers were unproductive, argued Brynjolfsson and Hitt (1998). Most productivity measures are oriented around numbers. Such measures of productivity are severely limiting and not the sole reason for purchasing IT. Proof of this is the fact that most managers rate customer service and quality above cost savings as the prime motivation for IT investment. Productivity growth, argued Brynjolfsson and Hitt (1998), does not come from working harder, as this increases labour input, but rather from working smarter. In effect this means adopting new technologies and techniques for production. Ryan (1999) postulated that these early research into the subject of IT and productivity was skewed by the use of economy-wide data, and the use of flawed data for several services sectors, making it appear that computers had done little to boost productivity. Earlier research conducted in the 1990's which focussed on the company- or firm-level, also lacked evidence and supported the productivity paradox as there was a failure of IT to produce significant increases in productivity despite large IT costs incurred by organisations when they adopt IT. Research conducted by Strassman (2004) found that there was no correlation between expenditure for information technologies and any know measures for profitability (Lim, Richardson & Roberts, 2004).

However, more recent studies conducted in 2000's showed that there are positive payoffs from IT and have changed their position from doubts about payoffs to when and why there are payoffs. Results of these later IT investment studies showed a positive correlation between IT investment and firm performance (Lim, Richardson & Roberts, 2004).

Productivity is a simple concept. It is the amount of output produced per unit of input. While it is easy to define, it is notoriously difficult to measure, especially in the modern economy (Brynjolfsson & Hitt, 1998). In particular, there are two aspects of productivity that have increasingly defied precise measurement: output and input. Properly measured, output should include not just the number of widgets coming out of a factory, or the lines of code produced by a programming team, but rather the value created for consumers. In today's economy, value depends increasingly on product

quality, timeliness, customisation, convenience, variety and other intangibles. Similarly, a proper measure of inputs includes not only labour hours, but also the quantity and quality of capital equipment used, materials and other resources consumed, worker training and education, even the amount of 'organisational capital' required, such as supplier relationship cultivated and investments in new business processes.

3.3 The relationship between IT investment and firm performance

"Better information technology (IT) makes a quantifiable, positive difference in business performance." That was the core finding of a research study from Keystone Strategy, Inc. (2006). This section will explore the literature regarding IT investment and a possible lagged effect; IT as a catalyst in an organisation; and the non-relationship between IT investment and ROI.

3.3.1 IT investment has a lagged effect

Mann and Mahmood (2000) noted that some studies of relationships between investment in IT and organisational performance and productivity (Alpar & Kim, 1990; Brynjolfsson, 1993; Brynjolfsson & Hitt, 1996; Mahmood & Mann, 1993; Mitra & Chaya, 1996; Rai, Patnayakuni; & Patnayakuni, 1997) have reported positive and significant effects of such investment. Some researchers question these results on the grounds that the studies involved examination of primarily cross-sectional data. This criticism stems at least in part from the premise that the benefits of IT investment can be realised only over longer periods of time. It is possible that in many instances IT has the potential to provide important benefits within the same year the investment is made. Research reflecting relationships between IT investment and organisational performance and productivity might be more convincing if it were based on IT investment in both current and earlier periods. Although some researchers (Brynjolfsson, 1993; Loveman, 1994; Osterman, 1986) have speculated on the lagged effects of IT investment, there have so far been no empirical studies, with the exception of one reported in a conference

(Mahmood, Mann, Dubrow & Skidmore, 1998), that have demonstrated a relationship between such investment and organisational performance and productivity in subsequent periods.

Another reason for disagreement among researchers involves the argument that correlations reflecting relationships between IT investment and organisational performance and productivity do not necessarily imply causation, particularly if the correlations are based on data from the same year only (Mitra & Chaya, 1996). It has also been emphasised that causality cannot be established by using conventional statistical techniques. Mahmood and Mann (2000) also encouraged researchers to apply multivariate and non-parametric methods, as opposed to more commonly used methods such as correlation and regression analyses, to enable them to infer causality, if present, between IT investment and organisational performance and productivity.

It has been argued that traditional IT investment-performance analyses have not been very successful in the past because of their over reliance on financial data. Some researchers (Brynjolfsson & Hitt, 1996) have called for additional research to identify the hidden costs and benefits that are typically not included in a traditional analysis of IT investment relationships with organisational performance and productivity.

According to Brynjolfsson and Yang (1999) another explanation for the paradox is that the benefits from information technology can take several years to appear on the bottom line. The idea that new technologies may have a delayed impact is a common one in business. A survey of executives suggested that many expected it to take as long as five years for information technology investments to pay off (Nolan & Norton, 1988). This accords with an econometric study by Brynjolfsson (1991) which found lags of two to four years before the strongest organisational impacts of information technology were felt. Loveman (1994) also found slightly higher, albeit still very low, productivity when small lags were introduced.

Goh and Kauffman (2005) noted that the existence of lags has some basis in theory. They stated that returns from IT investments are not instantaneous and therefore cannot be measured based on a direct relationship. They also cited Curley and Pyburn, (1982) and Scherer (1980) that postulated the unusual complexity and novelty of IT may result that firms and individual users require some experience before becoming proficient. According to dynamic models of learning-by-using, the optimal investment strategy sets short term marginal costs greater than short-term marginal benefits. This allows the firm to ride the learning curve and reap benefits analogous to economies of scale. If only short-term costs and benefits are measured, then the investment might appear inefficient. Viewed in this framework, there is nothing irrational about the experimentation phase firms are said to experience in which rigorous cost or benefit analysis is not undertaken. Future information technology investments tend to be large relative to current investments, therefore the learning effect could be quite substantial. A similar pattern of costs and benefits is predicted by an emerging literature that treats investments in information technology as options, with short term costs, but with the potential for long-term benefits (Kambil, 1991; Dixit & Pindyck, 1995). Goh and Kauffman (2005) also cited Bharadway, Bharadway and Konsynski (1999), which postulated that investments in IT systems might take years to add value to a firm and are more likely to be reflected in the future profit streams of an organisation.

Goh and Kauffman (2005) argued that returns on IT investment occur in three key phases for value: dormancy, triggering and transformation. Phase 1, value dormancy, occurs after an IT investment has been made by the firm, the associated value flows take time to appear. Their timing will be influenced by technology, people and processes (a set of firm activities) of the organisation. This may come from existing firm structures and routines. For value flows to occur within the firm in Phase 2, a primary set of value triggers needs to be in place. This involves the triggering of value flows that result in changes in organisational routines and structures that permit the flow of IT value. In this phase, firms have to focus on setting off a series of timely value triggers. For

effective value creation with constraining organisational structures and routines, strong catalysts are necessary to support the changes. These catalysts stem from the technology, people and processes within the organisation. After the current impediments are overcome, the value creation process will undergo a period of extensive change in Phase 3: value transformation. In each phase, technology, people (stakeholders of the firm) and firm processes shape the outcome and impact the value flows.

Brynjolfsson and Hitt (1996) as cited by Goh and Kauffman (2005), examined the productivity paradox of IT, noting that returns to IT investments were inconsistent over time, with a lag between initial investment and final payoff. Similarly Brynjolfsson and Hitt (1996) found that an econometric analysis of firm-level IT returns showed that long-term returns were two to eight times greater than short term returns. This view is supported by Devaraj and Kohli (2000). They argued that it is important to understand the factors and circumstances that influence IT value latency and result in differential lag lengths. When managers understand how IT investments reach their full potential value, they will be prepared to anticipate and respond to changes that impact projects. Having a theory based or empirical analysis-based understanding of the value trajectory over time for different kinds of IT investments will lead to appropriate managerial expectations for the benefits the firm can obtain. This will also enable senior managers to track the progress of IT returns, and help overcome myopic views about IT project investment opportunities. The results from a study conducted in 2003 by the Computer Science Corporation (CSC) also indicated that the expected paybacks on IT projects typically are one to two years trending to shorter payback periods.

The relationship between IT investment and firm performance considering the information intensity of the industry is explored using a distributed lag model. Findings indicate both a positive effect and a positive lag effect of IT investment. The effects of IT investment in the high information-intensive industry are significantly larger than in the low information-intensive industry.

Furthermore, a lagged effect of IT investment is larger than an immediate effect, regardless of the information intensity of the industry (Lee & Kim, 2006)

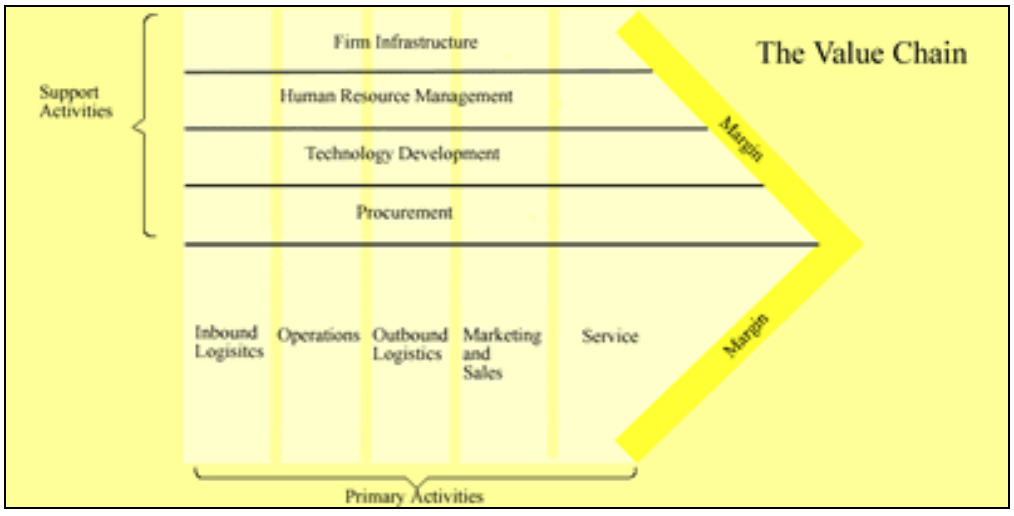
Before a new tool can be fully integrated and used to its full abilities, the users need to be given the corresponding training in order to accept the new technology. As the users gain the adequate experience, then investors would be able to draw conclusions whether the investment had the wanted effect.

3.3.2 IT acts as a catalyst in an organisation

The case literature of the 1980s and 90s attempted to show that IT provided competitive advantages to firms by adding value across all aspects of the value chain, improving operational performance, reducing costs, increasing decision quality and enhancing service innovation and differentiation. This view was supported by Applegate (1996); Porter and Millar (1985); as cited by Hu and Plant (2001).

Porter (1985) introduced a generic value chain model that comprises a sequence of activities found to be common to a wide range of firms. He identified primary and support activities as shown in the following figure:

Figure 3.1: Porter's generic value chain (Porter, 1985)



According to this figure (3.1) Information Technology is only regarded as an activity in a supportive role to the primary activities, in order to create value in a company. A company's margin or profit depends on its effectiveness in performing these activities efficiently. It is in these activities that a firm has the opportunity to generate superior value. The value chain model is a useful analysis tool for defining a company's core competencies and the activities in which it can pursue a competitive advantage.

According to Brynjolfsson and Hitt (1998) the success of a business depends on its ability to deliver more real value for consumers without using more labour, capital or other inputs. This is achieved by productivity growth. Productivity growth comes from working smarter by means of adopting new technologies and new techniques for production. The introduction of IT in organisations has had mixed results in the productivity output. There have been amazing success stories but on the other hand, there is also of stories about cost overruns, abandoned systems investments and other IT failures. The question remains if IT acts as a positive or negative catalyst in organisations.

In their study Brynjolfsson and Hitt (1998) found that a positive consensus was beginning to emerge regarding the catalyst effect of IT. This finding was supported by Dewan and Min (1997). An even more important finding was that while the average returns to IT investment were solidly positive there was huge variation across organisations; some have spent vast sums on IT with little benefit, while others have spent similar amounts with tremendous success. The greatest benefits of IT appear to be realised when IT investment was coupled with other complementary investments; new strategies, new business processes and new organisations. These complementary investments all appeared to be important in realising the maximum benefit of IT. These changes are not easy since many organisations would require a time consuming period of reengineering, restructuring and organisational redesign in order to best utilise their IT investments. The investments in change will position companies to reap the benefits of continued technological progress in the IT industry.

The above can be supported by Ross, Beath and Goodhue (1996 as cited by Hu & Plant, 2001) which suggested that sustained competitive advantages can be achieved through building and leveraging key IT assets such as human resources, reusable technology and partnership between IT and business management. The underlying theory is that these operational and strategic improvements as a result of effective use of IT should lead to corresponding improvements in productivity, revenue, and profits for those firms which consistently make higher investment in IT than their competitors. In the case of high-tech companies, IT is often the product or service that directly contributes to revenue and profit. Johannessen, Olaisen and Olsen (1999) cited Quinn (1996), also argued that although not reflected in macroeconomics measures of productivity or financial measures of financial performance, there is little doubt that IT has improved performance enormously.

3.3.3 There is no relationship between IT investment and ROI

Over the past years numerous research studies had been conducted to find a relationship between IT investment and the value it has for organisations. The relationship between IT and productivity has been extensively debated over the last three decades. In the 1980s and 1990s, empirical research generally did not find relevant productivity improvements associated with IT investments (Strassman, 1990; Loveman, 1988; Franke, 1987). The productivity paradox concept then arose when Solow (1987) remarked that “You can see the computers everywhere but in the productivity statistics”. Rei (2004) noted that it can be argued that productivity growth has slowed as investments in IT have grown. For many economists, this is proof that information technology does not affect productivity. However, the available evidence is mixed and does not solve the paradox. Brynjolfsson and Yang (1996) reviewed numerous articles and found little empirical evidence supporting the idea that IT investment has contributed to increases in output and productivity growth. Gera, Gu and Lee (1999) came to the same conclusion after an extensive literature review. Loveman (1994) concluded in his study that IT investment

provided negligible benefits. Although computing power has increased exponentially in the last three decades, productivity in firms, especially in the service sector, has stagnated (Brynjolfsson, 1993).

Dasgupta, Sarkis and Talluri (1999) noted that a number of early studies did not document a significant impact of information technology spending and firm productivity or performance, giving credibility to the term: "productivity paradox." Roach (1991) in a study of information workers from 1970 to 1986 found that computers had limited effect on the productivity of workers. In fact, some studies found a negative impact of information technology investment on productivity (Franke, 1987). They also cited Barua, Kriebel and Mukhopadhyay (1991) that investigated the effect of information technology spending on intermediate measures like capacity utilisation, inventory turnover, quality, relative price and new product introduction. They found that spending was related to three out of the five measures, but these did not have a significant effect on overall performance measures for the firms. Morrison and Brendt (1990), using government reported data, found that information technology provided only marginal returns, and concluded that there was a general over-investment in information technology.

Some studies have considered information systems spending and its effect on firm productivity in the service sector. In the banking sector a major share of information technology investment has been in the form of automated teller machines. In a study of banks, Banker, Kauffman, and Morey (1990) found that there is no significant relationship between the number of ATM owned by a bank and the number of local demand deposits and savings. These findings have extended to service functions within an organisation (Dasgupta, Sarkis and Talluri, 1999).

Using the Granger causality models and three samples of firm level financial data, Hu and Plant (2001) found no statistical evidence that IT investments have caused the improvement of financial performance of the firms in the samples. Rei (2004) compiled a summary of the studies on the IT productivity

relationship and found that Loveman (1988), Strassman (1990) and Harris and Katz (1991) found no or weak relationships between IT investment and productivity. Loveman (1994) in his research of 60 strategic business units found that the contribution of information technology capital to output was approximately zero for almost every sub-sample considered (Dasgupta, Sarkis and Talluri, 1999).

Strassman (2004), a leading figure in research regarding IT investment also stated that according to his knowledge nobody has been able to demonstrate that there is positive correlation between money spent on IT and sustainable profits. His research found that companies spending more money on information technology, including a higher ratio of information technology (costs) to labour costs, don't necessarily have better financial performance. This suggests that investments in information technology have no discernible impact on financial performance.

3.4 Difficulty in measuring the value of IT and ROI

Understanding, measuring and monitoring the benefits delivered by IT is becoming vital to successfully exploiting business technology. Measuring the value of an investment is an inextricable part of business planning. This was sustained by Lee (2004) noting that because of increasing competition and limited capital budgets, firms need to carefully assess every information technology opportunity to ensure that their resources are spent judiciously. Conventional wisdom holds that IT has enormous potential. However, organisations continue to question the benefits of IT in conjunction with new corporate initiatives such as business process re-engineering, e-commerce, and enterprise resource planning. Despite the potential benefits derived from IT investment, traditional capital budgeting models have failed to estimate true IT values due to their inability to measure complex interactions between IT and organisational performance.

Despite significant discussions in both the managerial and academic literature concerning the importance of evaluating the payoffs of IT investments, there has been little guidance on how to design or implement an appropriate IT performance evaluation system, i.e. how to identify and document the contribution of information technology to high-performance organisations. On the one hand there is a shortage of relevant metrics. On the other, there is an absence of a proper methodology to evaluate the payoffs of IT investments (Epstein & Rejc, 2005). They report that in a survey published in 2004 (McKinsey on IT), more than two thirds of CIO's reported they had no process for auditing the performance of their IT projects. Results also showed that non-IT executives were less aware of the programs to measure IT success and the return on investment effect of technology investment was unclear. This lack of understanding is supported in the finding that IT organisations and the business units that act as their customers should be able to demonstrate confidently, and continually the value of their investments over time. The uncomfortable fact remains that most companies have done an abysmal job of determining accurately the economic, strategic and operational returns on their IT investment (Maynard, 2006).

Johannessen, Olaisen and Olsen (1999) noted that although they observed a general optimism, in society as a whole, concerning IT's potential for creating sustainable competitive advantages, they had some concern about the lack of empirical support for the positive economic impact of IT on businesses.

3.5 Models and methods proposed to measure and track IT value

Today, financial managers and other decision-makers increasingly want the IT requests to be framed in a ROI or shareholder value format so that they can be effectively compared with alternative potential company investments (Epstein & Rejc, 2005). Typical large IT investments, e-commerce investments, and very large ERP system implementations thus all face the same challenges of demonstrating the value of the investments, and historical difficulties in estimating both revenues and total costs. Despite significant discussions in both the managerial and academic literature concerning the importance of evaluating the payoffs of IT investments, there has been little guidance on how to design or implement an appropriate IT performance evaluation system, i.e. how to identify and document the contribution of information technology to high-performance organisations. On the one hand there is a shortage of relevant metrics. On the other, there is an absence of a proper methodology to evaluate the payoffs of IT investments. Even approaches such as the Balanced Scorecard and shareholder value analysis, which do provide frameworks for analysis and management is considered insufficient per se (Epstein & Rejc, 2005). Financial statements have lost considerable meaning as the source of wealth creation in the global economy and have changed over time. A new set of metrics must be formulated and agreed on (Grasenick & Low, 2004).

Measurement instruments have been developed during the last decade with the purpose of reporting the contribution of human competencies, knowledge and skills to a firm's value and to foster their further expansion. Correlation between intangibles and other drivers of value show clear empirical evidence of their importance; it has been shown, however, that their interaction cannot be explained easily within a consistent theoretical framework. Grasenick & Low, 2004 noted that the most well-known representatives are the balanced scorecard (Kaplan & Norton, 1996), the intangible asset monitor (Sveiby, 1997), the intellectual capital approach (Edvinsson & Malone, 1997) and the IC-index (Roos *et al*., 1997), the performance prism (Neely *et al*, 2003),

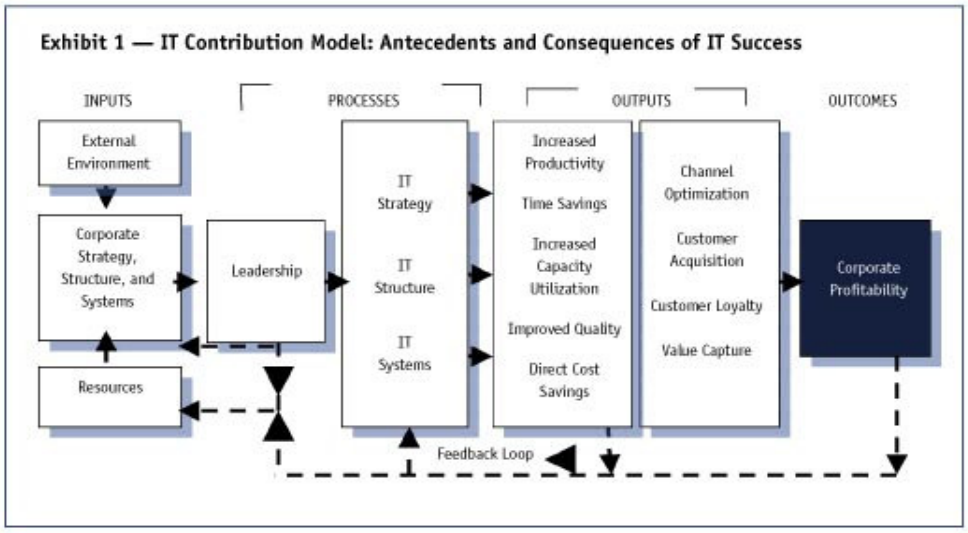
MERITUM guidelines (Canibano *et al*, 2002), Danish guidelines (Mouritsen *et al*, 2003a).

Companies try to identify, measure and manage primarily those intangibles they have assessed as the most important for their long-term value creation. However, the cause effect relation is not easy to establish and to demonstrate to the satisfaction of constituencies that must be convinced. At this stage in the evolution of the field it is the perception of the firm and not a generally accepted fact that establishes value at a particular level (Grasenick & Low, 2004).

3.5.1 IT Contribution Model

Epstein and Rejc (2005) developed a model for evaluating performance in information technology in order for management to better justify and evaluate IT initiatives. The IT Contribution Model for evaluating performance in information technology is a general model of key factors that helps organisations identify and measure the costs and benefits of IT and properly assess the payoffs of investments in IT. They suggest that the identification and measurement of the impacts of IT investments starts with a careful examination of the critical factors for corporate success in IT integration. IT success ultimately must be measured by its contribution to overall organisational success. The IT Contribution Model can be applied equally effectively to both for-profit and non-profit organisations. The following model shows the inputs, processes, outputs and outcomes of IT contribution in an organisation.

Figure 3.2: The IT Contribution Model (Epstein & Rejc, 2005)



The guideline for this model includes the following:

- It describes the key factors for organisational success in IT integration that relate to the critical inputs and processes that lead to success in IT outputs and ultimately to overall organisational success (outcome).
- It outlines the specific drivers of IT success based on inputs, processes, outputs, and outcomes, and identifies the causal relationships between the drivers.
- It provides the specific measures of IT performance to track performance of IT initiatives along the four dimensions outlined in the IT model above. The metrics can be used for both IT project justifications prior to implementation (planning) as well as for evaluation after completion (performance measurement).
- Since many organisations have little experience assigning monetary values to IT outputs and the measurement of IT payoffs, the guideline provides examples of how to assign monetary values to non-financial IT outputs (benefits).

The guideline also includes a detailed scheme of how to calculate ROI. An organisation's IT success is dependent on various inputs which include its existing corporate strategy, structure, and systems that provide both opportunities and constraints on IT initiatives. These, along with available resources and the external environment, are critical inputs that affect choices in the formulation and implementation of IT strategies. Other factors, such as leadership and IT strategy, IT structure, and IT systems or processes also significantly impact the performance and success of IT initiatives.

Both the inputs and processes affect various IT outputs that can be classified as either internal output such as improvement in productivity, time savings, increased use of capacities, improved quality, and overall cost reduction, as well as external outputs such as channel optimisation, customer acquisition, satisfaction, and loyalty, and overall value capture.

If the IT strategy formulation and implementation is successful, these outputs should ultimately be realized in improved overall corporate profitability (outcome). Based on the IT Contribution Model, organisations need to determine company specific IT performance objectives relating to relevant inputs, processes, internal and external outputs, as well as outcomes of IT activities.

3.5.2 The Balanced Scorecard

The balanced scorecard developed by Kaplan and Norton (1992, 1993) describes the strategy and strategic hypotheses using a set of explicit and testable cause-and-effect relationships.

The balanced scorecard concept, developed in the early 1990s, recognises the incompleteness of many business measurement processes – too often totally reliant on financial measures (Sanger, 1998). Financial measures are useful but they tend to measure the past and they tend to measure the easily-measurable. They are thus unbalanced measures taking a particular view of a situation. They also often tell us what has happened but fail to explain why

it has happened. They may suggest where things are going wrong, but again often fail to highlight where things are going well. To analyse causes, it may require managers to sift through significant amounts of data. This inevitably means that some critical issues will not be identified, and may mean that by the time causes are identified, it is too late to make changes before the next measurement and reporting cycle. This suggests that a measurement regime, to be really effective, should include predictors of future behaviour and performance, as well as offering comments on the past. Thus the measurement regime has to identify the drivers of performance in any situation. It also suggests that a measurement regime should include effective presentation of results as a key component; data should be presented in a simple, consistent form which allows readers to focus on the important issues. More data is not necessarily better. The data should highlight issues and help in assessing priorities. The balanced scorecard attempts to overcome the deficiencies of existing measurement systems – it is used to measure performance and develop strategies by analyzing results across a range of activities. At the very heart of the balanced scorecard method is the belief that organisational success can best be achieved and measured when viewed objectively from four perspectives:

(1) *Financial.* How will we look to our stake holders?
(2) *Customer*. How must we look to our customers?
(3) *Internal.* What internal processes must we excel at?
(4) *Innovation*. How can the organisation learn and improve?

This well-rounded assessment provides management with a balanced view of the business. Epstein and Rejc (2005) noted that an IT performance and measurement system must focus on the causal relationship and linkages within the organisation and the actions managers can take to improve both customer and corporate profitability and drive increase value. A company should determine the key drivers of IT success and the causal relationships among them and develop numerous performance measures to track IT performance. They have developed an IT balanced scorecard using the same four perspectives that was originally specified by Kaplan and Norton (1996).

An organization's IT success is dependent on various IT learning and growth related elements, such as appropriate resources (capital and people), suitable corporate systems (training, information, performance measurement and incentive systems, organizational culture and climate), and behavioural effects. IT learning and growth affects IT internal processes, such as standardization; integration and consolidation; security; and overall quality of IT processes, products, and services. Both the IT learning and growth and internal processes have an impact on customer satisfaction. Because both internal and external customers play a critical role in the IT function, the customer perspective was divided into internal and external customers. Internal customers' satisfaction reflects in their increased productivity, creativity, and quality of work. External customers' satisfaction, on the other hand, will reflect in higher loyalty, new customer acquisitions, and greater sales. From the financial perspective, both customer dimensions lead to either higher revenue growth or cost reduction (Epstein and Rejc, 2005a).

Epstein and Rejc (2005a) also argued that a careful and clear articulation of the most influential drivers of IT success helps managers understand the causal relationships leading from the learning and growth perspective to the internal processes and then flowing to the desired customer outputs and financial results. Causal relationships among drivers within each of the four dimensions as well as among drivers in different dimensions are based on hypothetical assumptions of causes and effects, i.e., leading and lagging elements. As such, they need to be continuously tested and revised. All four perspectives connect in a chain of cause and effect: IT learning and growth improve internal business processes, and internal business processes improve customer satisfaction, both internal and external, which in turn leads to improved financial performance. This is a continuum where one category of drivers and measures drives performance in the next. These drivers and subsequent measures should reinforce each other so that all contribute to increased corporate financial performance. The financial perspective relating to the outcomes of the IT initiatives helps managers keep score in the traditional sense.

The Balanced Scorecard aims at the improvement of organisations' processes and economic performance, but by incorporating both financial and non-financial aspects, it can be seen as an open-structured management instrument that provides a high potential concerning the management of, for example, corporate sustainability.

3.5.3 Beyond Budgeting

Fraser, Hope and Bunce (2003) postulated that working with budgets, as practiced in most corporations, should be abolished. This is a radical proposition, but it is merely a step in a long running battle to change organisations from centralised hierarchies towards devolved networks. Firms have invested huge sums in quality programs, IT networks, process reengineering, and a range of management tools including VA, balanced scorecards, and activity accounting. They are unable to realise the new ideas, because the budget, and the command and control culture it supports, remains predominant. Beyond Budgeting (BB) is an alternative that is more adaptive and devolved. It replaces the budgeting model with a more adaptive and devolved alternative. It defines a set of principles that guides leaders towards a new management model, which is lean, adaptive and ethical.

Beyond Budgeting is not a process. It is a management model based on two sets of principles namely the six principles of managing with adaptive management processes, and the six devolution-based principles. These 12 beyond-budgeting principles include (Hope & Fraser, 2003; De Waal *et al*., 2004):

Creating a flexible organisational structure (principles 1 through 6):

1. A self-governance framework
2. Empowered managers
3. Accountability for dynamic outcomes
4. Network organisations
5. Market coordination
6. Supportive leadership

Designing an adaptive management process (principles 7 through 12):

7. Relative targets

8. Continuous strategy-setting

9. Anticipatory systems

10. Resources on demand

11. Fast, distributed information

12. Relative team rewards

Fraser and De Waal (2001) noted that in the private sector, managers are forced to consider current and future opportunities and threats, particularly where rolling monthly forecasts of financial performance operate together with a focus on other non-financial value drivers. In essence, the 'beyond budgeting' model entails devolved managerial responsibility where power and responsibility go hand in hand. The view held by proponents of the beyond budgeting model is that the following benefits may accrue as a result of its successful application by management:

- It creates and fosters a performance climate based on competitive success. Goals are agreed via reference to external benchmarks as opposed to internally-negotiated fixed targets. Managerial focus shifts from beating other managers for a slice of resources to beating the competition.
- It motivates people by giving those challenges, responsibilities and clear values as guidelines. Rewards are team-based, in recognition of the fact that no single person can act alone to achieve goals.
- It devolves performance responsibilities to operational management who are closer to the action. This uses the 'know-how' of individuals and teams interfacing with the customer, which in turn enables a far more rapid adaptation to changing market needs.
- It empowers operational managers to act by removing resource constraints. Key ratios are set, rather than detailed line-by-line budgets. For example, gearing and liquidity ratios may be used to show there is enough cash in the bank to meet liabilities. Local access to resources is thus based on agreed parameters rather than line-by-

line budget authorisations. This is aimed at speeding up the response to environmental threats and enabling quick exploitation of new opportunities.

- It establishes customer-orientated teams that are accountable for profitable customer outcomes. These teams agree resource and service-level requirements with service departments via the establishment of service level agreements.
- It creates transparent and open information systems throughout the organisation, which should provide fast, open and distributed information to facilitate control at all levels. The IT system is crucial in flexing the key performance indicators as part of the rolling forecast process.

The Beyond Budgeting model enables a more decentralised way of managing. In place of the traditional hierarchy and centralised leadership, it enables decision-making and performance accountability to be devolved to line managers and creates a self-managed working environment and a culture of personal responsibility. This causes increased motivation, higher productivity and better customer service. Individually these two main features can produce significant benefits but in combination they can help to realise a leadership vision that until now was strong on vision, but was weak on delivery because BB is a coherent model in which all of its components work in harmony, it can produce outstanding and sustained success. This success is driven by four direct value drivers: innovative strategies, low costs, loyal and profitable customers, and ethical reporting. However, these drivers will be ineffective unless front line people have the scope, knowledge and power to deliver. The result is an organisation that is lean, adaptive and ethical and that has the potential to remain at the top of its peer group league table.

There are many possibilities, on the scale of traditional budgeting to beyond budgeting, to modernise the budgeting process. However, the beyond-budgeting model deserves serious consideration because it enables an organisation to look with a fresh view at its budgeting process, other planning processes, and organisational structure. Each organisation should at least

explore the benefits of introducing one or more beyond-budgeting principles. Research has shown that the more beyond-budgeting principles an organisation implements, the better it performs (Fraser & De Waal, 2001).

The Chartered Institute of Management Accountants (CIMA, 2004) noted that throughout the late 1980s and 1990s there have been a growing number of concerns raised about traditional accounting measures. These criticisms are primarily concerned with the scope for subjectivity that even the most comprehensive accounting standards allow. A number of consultants, such as Rappaport (1986) and Stewart (1991), recognised these problems. As a result, they turned to the concept of shareholder value and how this can be created and sustained. This has, in turn, led to the development of a number of "value metrics", the most significant of which are:

- shareholder value analysis (SVA)
- economic profit (EP) and economic value added (EVA)
- cash flow return on investment (CFROI)
- total business returns (TBR)

Each of these types of metrics is advocated by a number of consultants and has been adopted by companies in the UK and elsewhere. It is argued that these metrics can be used for numerous purposes, including valuation, strategy, evaluation and the monitoring of performance. There are significant differences between the different value metrics but in each case it is agreed that the primary objective of a company should be to maximise shareholder wealth. Therefore, each of the metrics attempts to measure value creation for shareholders.

3.5.4 Shareholder Value Analysis

The shareholder value analysis (SVA) approach was developed by Alfred Rappaport in the 1980s. It can be used to estimate the value of the shareholders' stake in a company or business unit, and can also be used as the basis for formulating and evaluating strategic decisions. The value of the operations of a business is determined by discounting expected future

operating *free cash flows* at an appropriate cost of capital. In order to find shareholder value, the value of marketable securities and other investments must be added to, and the value of debt must be subtracted from, the business valuation. Free cash flow reflects the cash flow from the operations of a business for a period, id est. before taking into account any financing-related cash flows, such as those relating to share or debt issues, dividend and interest payments, etcetera.

3.6 Summary

The earlier-mentioned studies by Brynjollfsson (1993, 1994); and Strassmann (1990) were conducted in search of a relationship between IT and investments, and revealed several problems that were still being experienced in organisations regardless of what had been achieved. These researchers highlighted that although managers make investment decisions, they tend to play a passive role in ensuring that such systems are used effectively and efficiently. Many people in organisations embraced IT, and some suffered major psychological and physical challenges, such as the information overload. The inability of managers to document any contribution IT has made over the years is also human centric in nature. The researchers found that there were lags between costs and benefit, showing poor short-term results. This is seen between the time of learning and development among workers, and between the new technology or other business processes and the changes that are inevitable in organisations, which take into account the benefits and return on investments in IT that do not show immediately. These systems still crash and lead to a loss of valuable information and knowledge in organisations. Managers are also affected by the many difficulties in quantifying the benefits of IT, e.g. the difficulties in finding appropriate measurement instruments. This brings about hitches to the benefits and rewards if work and incentives are not appropriately adjusted. The result is that IT might increase organisational slack instead of output or profits. In some instances, the rewards are directly immeasurable. The truth is there are

no comprehensive models to measure the changes IT brings. In addition, investigations on IT and productivity have not been at all satisfactory, which raises frustration and misunderstanding of the measures and methods commonly used to assess productivity in organisations and the industries.

CHAPTER 4: PROBLEM STATEMENT AND HYPOTHESES

4.1 Introduction

In the previous chapter a detailed literature review was conducted. The relationships between IT investment and productivity were discussed. The different models and methods to measure and track IT value were evaluated. In this chapter the problem statement will be highlighted. In previous studies, Hu and Plant (2001) argued that the promise of increased advantage was the driving force behind large-scale investment in IT since the 1970's. Current debate continues amongst managers and academics with reference to the measurable benefits of IT investment. Return on Investment (ROI) and other performance measures in academic literature, indicates conflicting empirical findings. The strategic importance of IT investment and the importance of IT investment decisions by business managers will be emphasised.

4.2 Problem statement

Earlier studies revealed that there existed no evidence of a relationship between IT spend and the financial performance of a firm. More recent studies did reveal significant relationships but in general studies have found mixed results.

Studies that have found relationships indicated that a lagged effect exist between IT investment and the financial performance of a firm. Another group of researchers also noted the indirect value of IT saying that it act as a catalyst.

The reasons for the mixed results were contributed to data reliability, analysis methods and the lack of proper ways to measure the effect of IT investment.

The South African Post Office (SAPO), as with other organisation, also considers the return on their investments. With their strategic plan set out to have an operating profit of one billion rand, they are faced with evaluating the value of their IT spend.

Given the above the following two primary research questions were formulated for this study:

- Does a relationship exist between IT expenditure and the financial performance of a firm?
- What is the perceived value of IT investment in a firm?

4.2.1 Relationship between IT expenditure and the financial performance of a firm

The literature indicated that studies have found in various cases a positive lagged effect. The following hypothesis was therefore formulated.

Hypothesis 1: There is a positive lag effect of IT expenditure on the financial performance of the firm.

4.2.2 Perceived value of IT investment in a firm

From the literature (Johannessen, Olaisen & Olsen, 1999) the indirect value of IT relate to areas such as:

- increased effectiveness
- ease the work
- develop new ways to manage the company
- increase customer service quality
- increase internal connectance
- planning
- decrease costs
- differentiate service
- improve internal communication

- improve external communication
- change existing work processes
- increase access to market information
- contribute to employees access to common information foundation

The Computer Sciences Corporation (2003) also noted that IT investment have an indirect influence following aspects of a firm:

- way to reduce costs
- supports needs of business
- aligned to business strategy
- good job in meeting customer requirements
- plays integral role in customer requirements
- important part of business
- tactical aspect of business
- ability to increase sales
- competitive advantage
- IT is a core competency

In light of the literature, the following hypothesis was therefore formulated.

Hypothesis 2: IT is perceived by line-management to have indirect value on the performance of the firm.

4.3 Summary

Regardless of theoretical arguments and professional belief in favour of a positive relation between investment in IT and firm performance, empirical evidence on this relation has been inconclusive and has arrived at multifaceted conclusions that have sometimes been conflicting (Lee & Bose, 2002). Beyond theory development, numerous attempts have been made to relate IS/IT expenditures, computational intensity, MIS budget, or other particular strategies to firm performance (Guerreiro & Serrano, 2006).

Several empirical studies and ample anecdotal evidence indicate that companies that spend more on IT are not rewarded with superior financial performance (Stratopoulos & Dehning 2000). Stratopoulos and Dehning (2000) report empirical evidence that suggests the financial performance of a firm is more related to the way IT assets are managed than the level of organisational spending on new technology, and thus, adding further dimensions to the productivity paradox.

CHAPTER 5: RESEARCH DESIGN AND ANALYSIS

5.1 Introduction

Chapters 2 and 3 served to provide a framework for the study. In chapter 4 the research problem was stated. Chapter 5 gives an exposition of how the study was conducted. More specifically the areas of research design, sample design, data gathering and data analysis are dealt with, which were chosen according to the study's research objectives.

5.2 Research design

The research design is the series of steps to be carried out in order to answer the research objectives (McDaniel & Gates, 2001). The study followed an exploratory case study approach. In addressing the primary research objective, statistical techniques were employed to determine the relationship between IT expenditure and the financial performance of the firm. The secondary research objective was addressed using survey research to explore the perceived value of IT investment amongst a sample of management within SAPO.

5.3 Sample

In addressing the primary research objective, monthly financial data was obtained from SAPO for the period April 2002 to March 2006, giving 48 data points in total. Audited financial figures were provided for four variables, namely:

- Operating Revenue
- Operating Expenses
- Net Profit

- IT Operating Expenses

The net profit of the SAPO was chosen as indicator variable for the financial performance of the firm, whereas IT operating expenditure would serve as proxy for IT expenditure of the firm. Annexure A shows the financial data for the four mentioned variables.

The secondary research objective explored perceptions. A non-probability purposive approach was used to gather data from a quota specified sample of 50 managers at SAPO across the five main operational and support departments. Respondents were selected based on their perceived knowledge and insight into IT investment within the firm and intended outcomes. Quotas were also specified to obtain a representation of managers across the noted departments given research budget and time constraints, restricting gathering data from all employees.

The sample details (n = 50) are summarised below:

Gender:	Male	54%
	Female:	46%
Age:	18 - 24 yrs	4%
	25 - 34 yrs	30%
	35 - 49 yrs	58%
	50 - 59 yrs	8%
Employee level:	General Staff/ Administrative	28%
	Supervisory/ Junior Management	16%
	Middle Management	30%
	Senior Management	12%
	General Management	4%
	Executive Summary	10%
Department:	Finance	20%

Human Resources	20%
Operations	20%
Information Technology	20%
Support Services	20%

5.4 Survey instrument

A semi-structured self-administering questionnaire was used as data gathering instrument (refer to Annexure A). The questionnaire consisted of a number of questions being categorical and was grouped into two sections. Section A dealt with respondent's demographic characteristics and gathered the following information from respondents:

- Gender
- Age
- Employee level
- Department

Section B dealt with respondent's perspectives on IT and consisted of the following questions and statements:

- What is the predominant view of Information Technology by senior management?
- How would you characterise your organisation's use of Information Technology?
- How do you rate the effectiveness of your IT organisation?
- IT provides our company the ability to increase sales
- IT provides a way for our company to reduce costs
- IT gives our company competitive advantage
- IT supports and is aligned to business strategy
- IT is an important component of our business strategy
- IT is a tactical aspect of our business
- IT is a core competence in our company
- IT supports the needs of the business

- IT plays an integral role in meeting customer requirements
- IT does a good job in meeting customer requirements
- What do you believe are the risks or issues that would make you hesitate in investing in IT?

Respondents were asked to rate the statements using a 5-point Likert scale where 1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; and 5 = Strongly agree.

A copy of the questionnaire used is provided in Annexure C of this report.

5.5 Data analysis

The analysis of financial data from SAPO to determine the relationship between IT expenditure and the financial performance of the firm involved both regression and time series analysis. Data was exported to a statistical software package, namely SPSS for Windows. With the assistance of a statistician, regression analysis was performed to investigate the linear relationship between operating and IT expenditure and operating revenue and profit/loss. The analysis however did not include investigating the possible time effect of IT expenditure on revenue, as hypothesised by a number of authors (Brynjolfsson & Hitt, 1998; Lee & Kim, 2006), but merely to investigate if any relationship could be detected irrespective of time-dependence. In order to investigate a possible lagged effect, time series analysis was utilised. The cross-correlation function (CCF) in SPSS's Time Series module was used. This CCF shows the correlation between two series of data at the same time and also with each series leading by one or more lags (SPSS Inc, 1994). Cross-Correlation procedures should only be used on data series that are stationary. A series is stationary if its mean and variance stay about the same over the length of the series. Visual inspection of the financial data used in the analysis revealed that the data needed to be made stationary before the

CCF could be used. Differencing was used to make the series stationary. Refer to Annexure B for CCF results.

The second part of the study involved survey research. Completed questionnaires obtained from respondents were captured first in Excel and validated using various control checks that ensure that no data capturing errors were evident. The data were henceforth exported to SPSS for Windows.

The next step involved the analysis of the survey data. Churchill (1979) stated that the purpose of analysis is to obtain meaning from the collected data.

Hussey and Hussey (1997) noted that most statistical literature commonly draws a distinction between exploratory data analysis and descriptive statistics, which is used to summarise or display quantitative data, and confirmatory data analysis or inferential statistics, which involves using quantitative data collected from a sample to draw conclusions about a complete population. In this study, the focus fell primarily on exploratory data analysis, and involved the construction of one-dimensional frequency tables (refer to Annexure D). This provided a base for summarising and presenting of data, which enabled patterns and relationships to be discovered which were not apparent in the raw data.

5.6 Limitations of the study

The research aimed to determine the relationship between IT investment and the financial performance of a firm and to explore the perceived value of IT investment in SAPO. The scope of this study was limited to the South African Post Office and only included data from this company.

5.7 Summary

This study followed an exploratory case study approach. Data were obtained from two sources, namely financial company records as well survey data. In addressing the primary research objective, monthly financial data was obtained from SAPO for the period April 2002 to March 2006. The secondary research objective explored perceptions. A non-probability purposive approach was used to gather data from a quota specified sample of 50 managers at SAPO across the five main operational and support departments. A semi-structured questionnaire was used as data gathering instrument. The data was analysed using various basic and advanced statistical analysis techniques.

The results of the analysis are depicted in Chapter 6.

CHAPTER 6: RESULTS

6.1 Introduction

A review of literature revealed that more recent studies found significant relationships between IT expenditure and the financial performance of a firm (Guerreiro & Serrano, 2006; Al-Mudimigh, 2001 & Shin 2001). In general, however, studies have found mixed results.

Studies that have found relationships indicated that a lagged effect exist between IT expenditure and the financial performance of a firm. Another group of researchers also noted the indirect value of IT saying that it act as a catalyst.

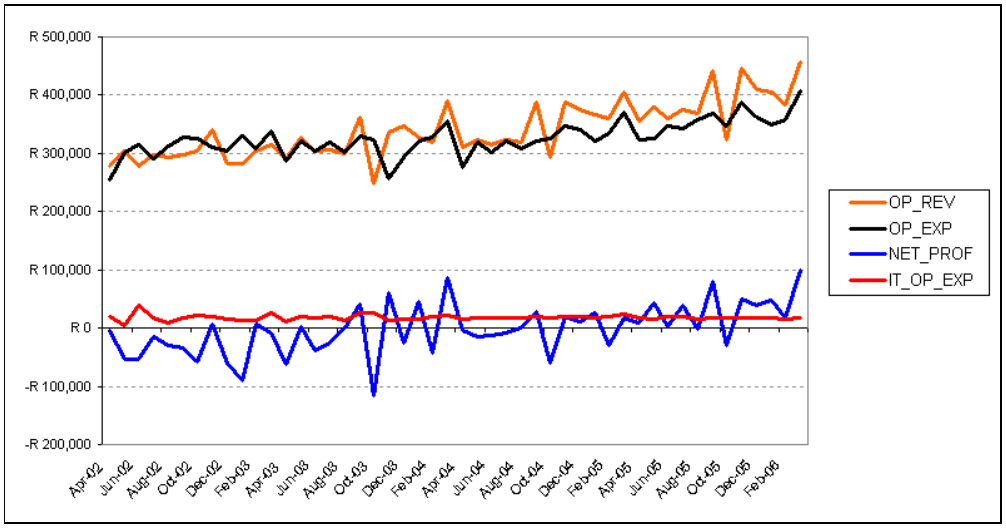
This chapter depicts the results from the analysis of data collected from the field. It addresses two main hypotheses namely:

Hypothesis 1: There is a positive lag effect of IT expenditure on the financial performance of the firm.
Hypothesis 2: IT is perceived by line-management to have indirect value on the performance of the firm.

6.2 The relationship between IT expenditure and financial performance

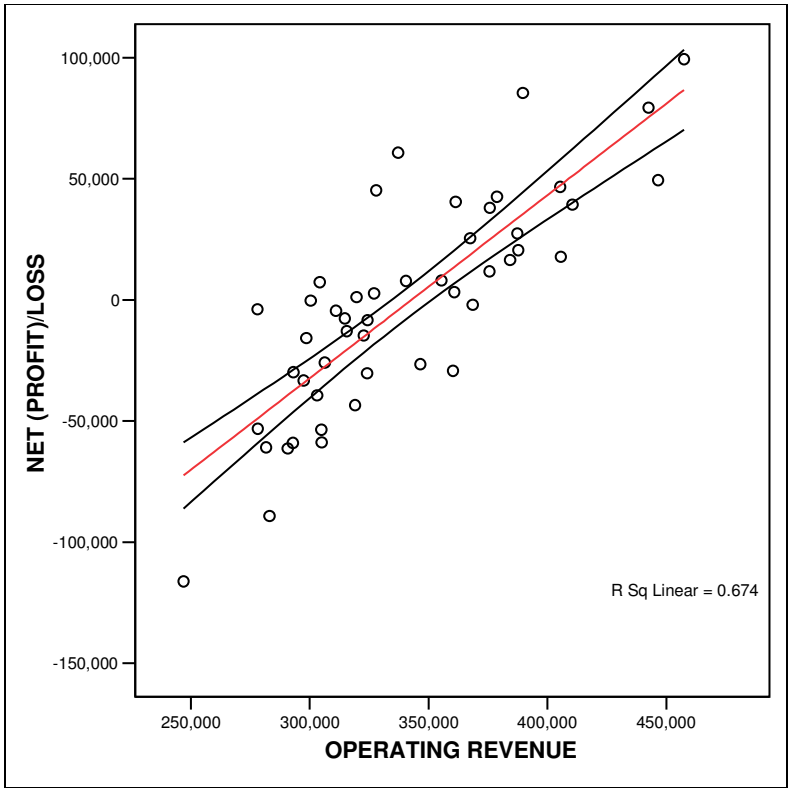
Figure 6.1 shows the operating revenue, operating expenditure, IT expenditure and net profit for the South African Post Office over the period April 2002 to March 2006. From the figure it is evident that operating revenue, net profit and operating expenditure showed positive trends over the period, suggesting that operating expenditure resulted in positive returns of revenue. IT operating expenditure however remained stable over the period, showing neither a downward nor upward trend.

Figure 6.1: Selective financial results for SAPO April 2002 to March 2006



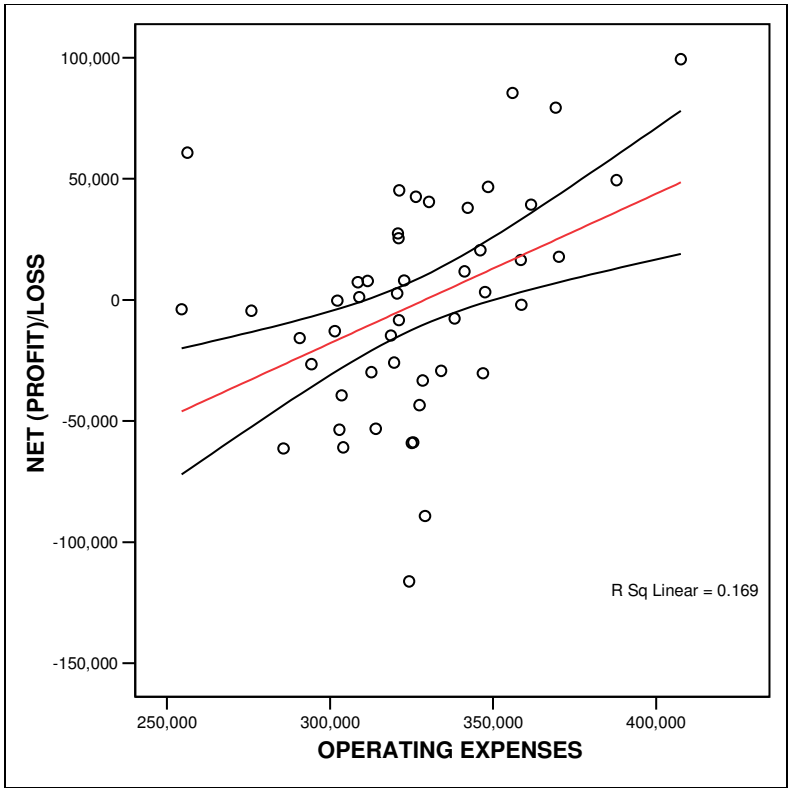
A plot of net profit by operating revenue confirms a positive relationship between the two variables. This is shown in figure 6.2 and in line with the deduction made from figure 6.1. The R-square value of 0.674 shows that the fitted regression line, which signifies the positive relationship, explains 67% of the total variation in the data.

Figure 6.2: Relationship between net profit and operating revenue



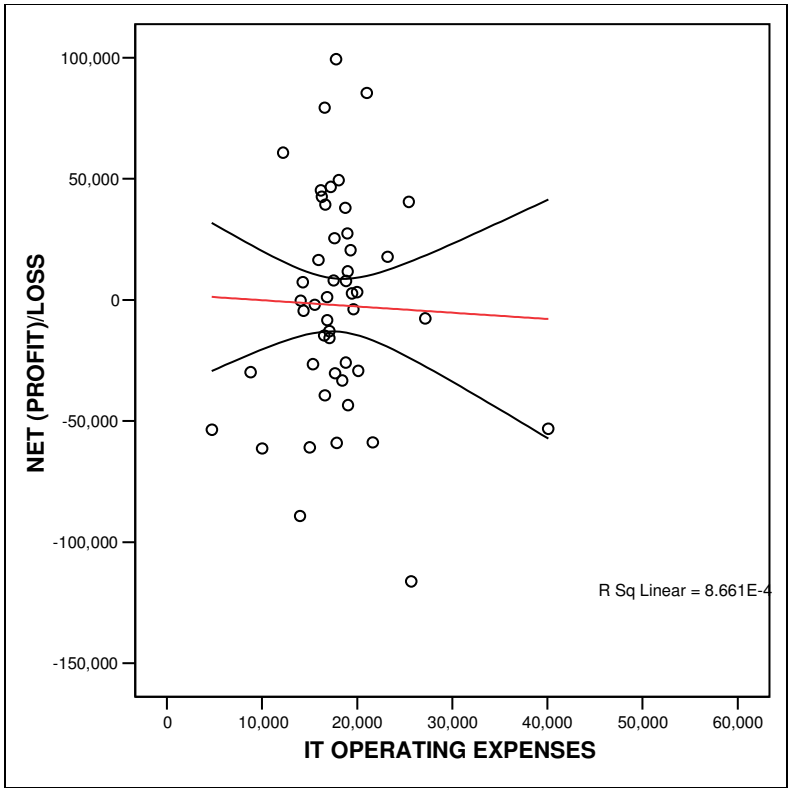
Further results show that net profit is also positively associated with operating expenses. The R-square value of 0.169 however suggests a less strong positive relationship. Refer to figure 6.3 for the results.

Figure 6.3: Relationship between net profit and operating expenditure



The final regression analysis focused on investigating the relationship between net profit and IT expenditure. The results, as shown in figure 6.4, show that no significant linear relationship between the two variables exists.

Figure 6.4: Relationship between net profit and IT operating expenditure

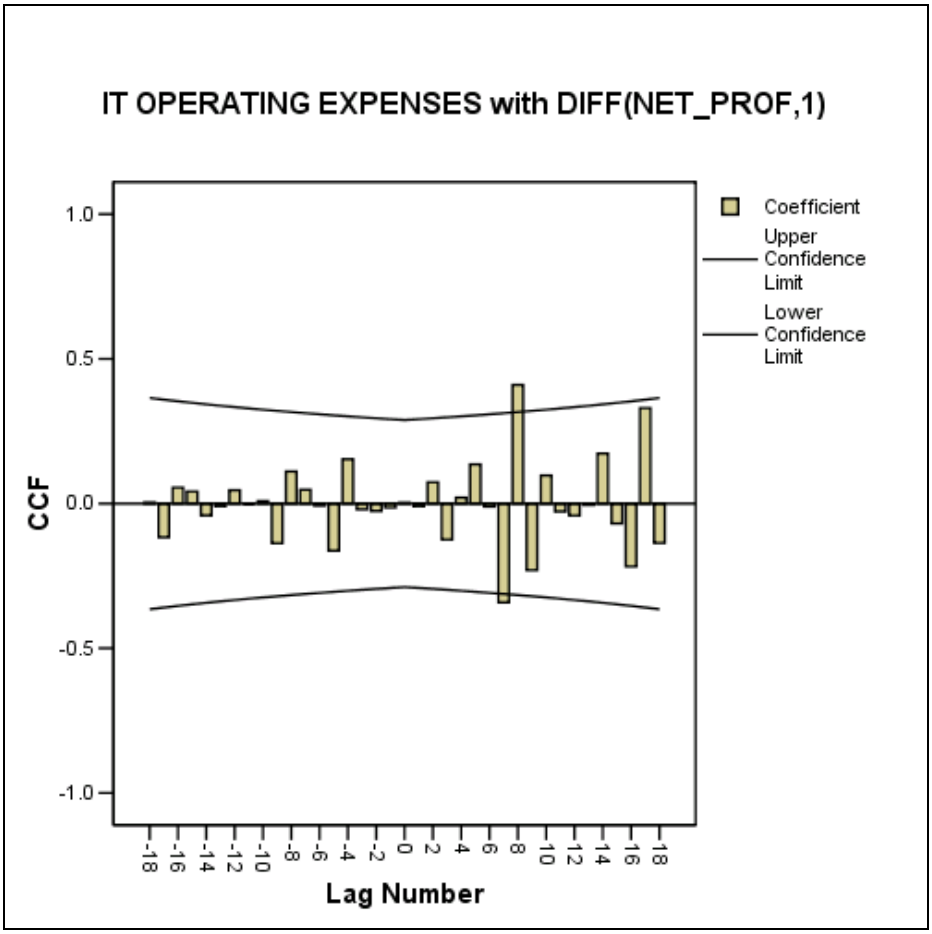


The second part of the analysis focused on determining if IT expenditure had a lagged effect on the financial performance of the firm. The results of the cross-correlation function between net profit and IT operating expenditure are shown in figure 6.5.

As shown in the figure, most of the correlations are small. There is a significant positive correlation evident of 0.410 at lag 8. A positive lag suggests that first series, namely IT expenditure leads the second series net profit. The correlation also suggests that increases in IT expenditure are associated with increases in net profit.

The results therefore accept the hypothesis stated earlier, namely that IT expenditure has a lagged effect on the financial performance of the firm. It is however of importance to note that the relationship, although significant, is considered mediocre.

Figure 6.5: Cross-correlation between net profit and IT operating expenditure



6.3 Perceived value of IT investment

The second part of the study considered the hypothesis that investment in IT is perceived to have an indirect value in the firm. In general, respondents viewed IT as a strategic and tactical component and regarded it as a necessary business expense that produced a return on investment. However, although the majority of respondents (60%) felt IT to be effective, a significant proportion were not convinced that IT is able to increase sales or meet customer requirements. IT is also not providing the SAPO a way to reduce cost.

Figure 6.6 shows that respondents perceived IT to be regarded as a necessary business expense by senior management (46%). Respondents also felt that senior management regards IT as a strategic asset (26%) and a return-producing investment (18%). Only a small percentage of the sample (10%) felt that senior management perceived IT to be a non-value adding cost.

Figure 6.6: Predominant view of IT by senior management (n = 50)

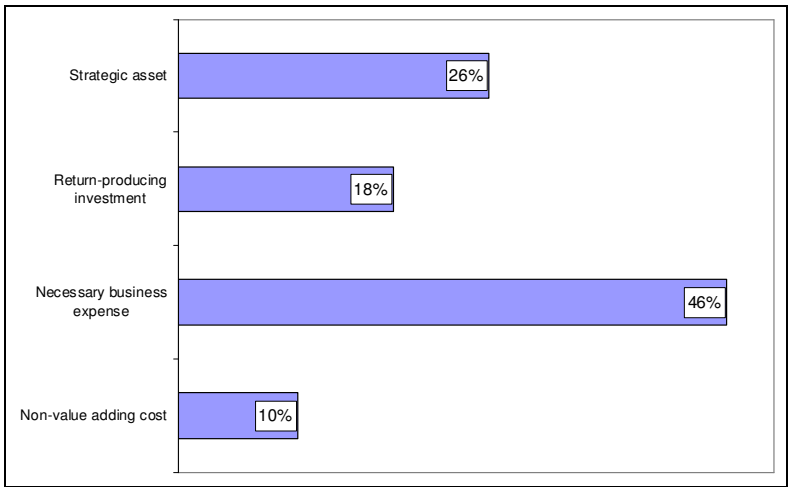


Figure 6.7 show that the SAPO is perceived to stay current on technology, but without getting too far ahead of competition (32%). SAPO thus takes a conservative approach (28%) to IT investment where it is seen as critical and essential (28%).

Figure 6.7: Use of IT within SAPO (n = 50)

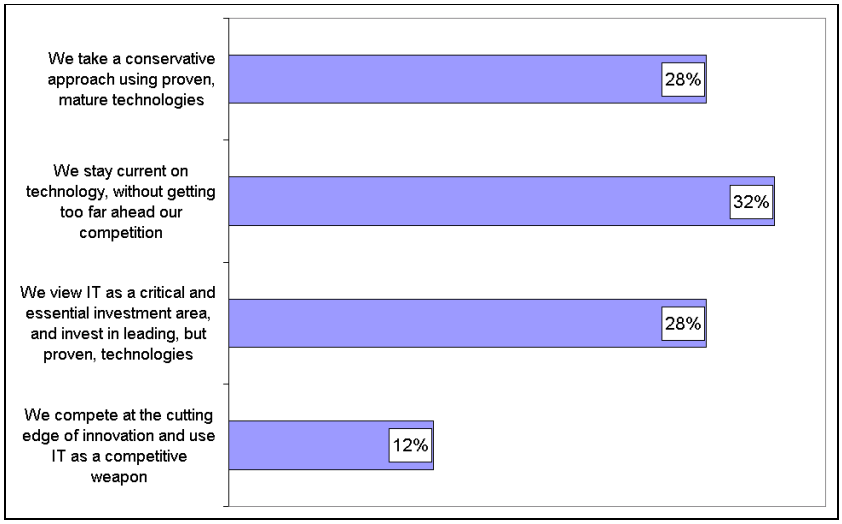
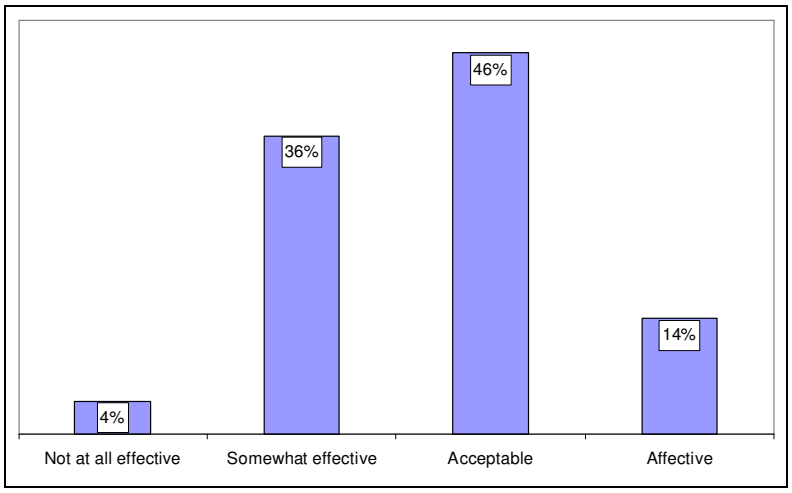


Figure 6.8 show that IT's effectiveness is perceived by 46% to be acceptable, while 14% noted IT to be effective. Four out of 10 respondents (4% and 36% respectively), however, indicated IT in SAPO to be not effective at all or only effective to a limited extent.

Figure 6.8: Effectiveness of IT (n = 50)



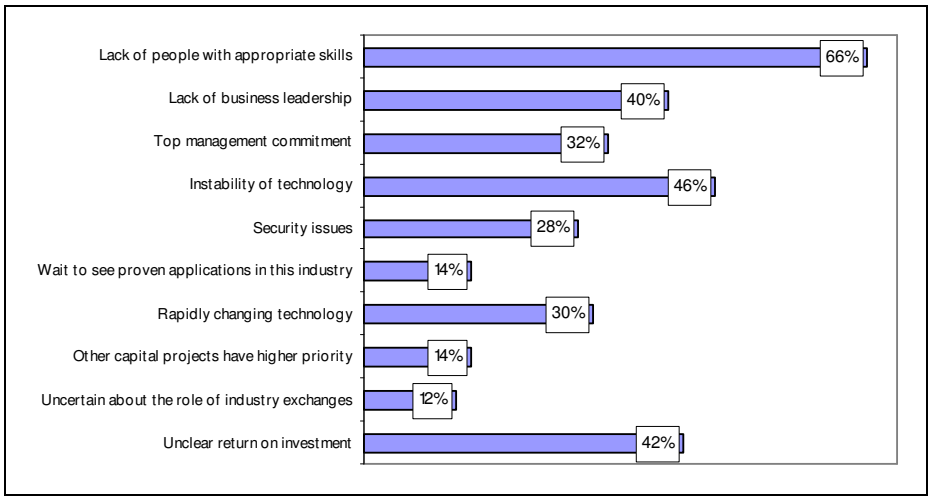
Although IT is perceived by most respondents (Table 6.1) to be an important (80%) and tactical component (72%) of SAPO's business strategy, a significant proportion of respondents doubted the perceived value of IT with regard to providing SAPO with the ability to increase sales, reduce cost and meet customer demands.

Table 6.1: Agreement with statements about the perceived value of IT

Statement	% agreement
IT is an important component of our business strategy	80%
IT is a tactical aspect of our business	72%
IT supports the needs of the business	54%
IT provides our company the ability to increase sales	50%
IT provides a way for our company to reduce costs	46%
IT gives our company competitive advantage	46%
IT does a good job in meeting customer requirements	44%
IT supports and is aligned to business strategy	42%
IT is a core competence in our company	40%
IT plays an integral role in meeting customer requirements	10%

Considering the risks of IT investments, figure 6.9 show that the respondents mentioned lack of skilled people (66%), the instability of technology (46%) and unclear return on investment (42%) as the primary hampering factors.

Figure 6.9: Risks in IT investments (n = 50)



Given the research results, the hypothesis is accepted. It is considered by the majority of respondents to have indirect value to the business, in particular being effective, tactical and supporting the needs of the business.

6.4 Summary

This chapter depicted the results that were obtained from the analysis of the financial and survey data. The first part of the chapter considered the results relating to testing if there is a positive lag effect of IT investment on the financial performance of the firm. The second part of the chapter considered the value of IT as perceived by SAPO line en top management.

Chapter 7 provides a discussion of the results and drawing of conclusions.

CHAPTER 7: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

When computers were first introduced to organisations, they carried lots of promise for the immediate achievement of results. This led to increased investment by organisations in Information Technology (IT), primarily because of the belief that IT has a significant impact on organisational performance, achieving higher returns, and improving their economic performance.

Success stories give impressive examples of the effects of investment in IT on a firm's performance and competitive advantage, and therefore, become one of the key areas in organisational investment strategies. However, despite the continuous heavy investment that takes place within companies towards IT, a review of the literature suggests that the enthusiasm for IT has in some instances been overtaken by a sense of pragmatism. This has also been brought about from several empirical studies, which have failed to find any positive relationships between the extensive investment in IT and organisational efficiency, performance and success (Guerreiro & Serrano, 2006; Goh & Kauffman, 2005; Love & Zahir, 2004).

Serafeimidis and Smithson already noted in 2000 that management increasingly seek more concrete evidence of the business and the real value of their often extensive IT investments.

At firm, industry and economy level there is contradictory evidence on whether IT expenditure has resulted in business value. Although it is important that a firm should invest in IT and the competitive advantages from superior IT investments be widely recognised (Brynjolfsson & Hitt, 1998), some research (Harris & Katz, 1989) has shown that it is unlikely that higher expenditures on IT alone will ensure a firm's superior performance and actual returns received on IT investments vary widely (Brynjolfsson & Hitt, 1998). IT investments may not automatically improve financial performance; instead, it is one essential

tool, but needs to be coupled with organisational factors such as business strategies to be truly effective (Shin, 2001).

7.2 Outcome of results of hypotheses

7.2.1 Relationship between IT expenditure and financial performance

The first hypothesis aimed to investigate if a positive lag effect exists between IT expenditure and the financial performance of the firm.

In the case of the South African Post Office (SAPO), it was found that a significant positive relationship existed between IT expenditure and net profit at a lag of around 6 to 8 months. This suggests that IT expenditure is having a delayed positive effect of around 6 month on the financial performance of the SAPO. In the light of this finding, the hypothesis is accepted.

In accepting the hypothesis it is also important to keep in mind the extent of the relationship. Although the statistical relationship was significant, the relationship was considered to be mediocre, suggesting that IT is not the only contributor to the financial performance of a firm but is also driven by other factors, jointly working towards driving performance.

7.2.2 Perceived value of IT investment

The second hypothesis considered if IT is perceived by line-management in SAPO to have indirect value on the performance of the firm.

Given the research results, the hypothesis is accepted. It is considered by the majority of respondents to have indirect value to the business, in particular being effective, tactical and supporting the needs of the business**.** The survey did, however, reveal that although the majority of respondents (60%) felt IT to be effective, a significant proportion were not convinced that IT is able to increase sales, meet customer requirements or reduce cost. IT is also not perceived to be effective by all.

7.3 Conclusions

From the literature it is apparent that there are probably as many different viewpoints and findings to whether investing in IT is good or not.

The findings of this study related with findings reported by other researchers on the positive relationship between investment in IT and organisational performance (Mahmood, Mann, Dubrow & Skidmore, 1998. Rai, Patnayakuni; & Patnayakuni, 1997. Mitra & Chaya, 1996. Brynjolfsson & Hitt, 1996. Mahmood & Mann, 1993. Brynjolfsson, 1993. Alpar & Kim, 1990). The literature did, however, reveal that some researchers question these results on the grounds that the studies involved examination of primarily cross-sectional data. This criticism stems at least in part from the premise that the benefits of IT investment can be realised only over longer periods of time. It is possible that in many instances IT has the potential to provide important benefits within the same year the investment is made, as was found in the case of the SAPO. These benefits is not necessarily restricted to a single year and the total ripple effects are difficult to measure as IT investments do not occur in single events, but rather on a continuous basis.

Another important conclusion that is made is that IT provides competitive advantages to firms by adding value across all aspects of the value chain, improving operational performance, reducing costs, increasing decision quality and enhancing service innovation and differentiation.

According to Porter's Value Chain, Information Technology functions in a supportive role to the primary activities, in order to create value in a company. A company's margin or profit depends on its effectiveness in performing these activities efficiently. It is in these activities that a firm has the opportunity to generate superior value. The greatest benefits of IT appear to be realised when IT investment was coupled with other complementary investments; new strategies, new business processes and new organisations. This furthermore supported by Ross, Beath and Goodhue (1996 as cited by Hu & Plant, 2001) which suggested that sustained competitive advantages can be achieved

through building and leveraging key IT assets such as human resources, reusable technology and partnership between IT and business management. The underlying theory is that these operational and strategic improvements as a result of effective use of IT should lead to corresponding improvements in productivity, revenue, and profits for those firms which consistently make higher investment in IT than their competitors. In the case of high-tech companies, IT is often the product or service that directly contributes to revenue and profit.

7.4 Recommendations

In the light of the above, it is recommended that the value of IT, both on a financial basis and perceived basis, be measured on an ongoing basis. It should be incorporated into review reports such as the Balanced Scorecard, to ensure that cognisance is taken of expenditure and that real effort should be made to evaluate its effect on the business.

ARTICLE

Return on Investment in Information Technology in the South African Post Office.

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Return on Investment in Information Technology in the South African Post Office.

Abstract

The South African Post Office is investing large amounts of money in IT. Organisations were encouraged by the notion that investing in IT correlates with higher returns and the delivery of expected results by replacing the human component in organisations. The employment of IT within business has often resulted in the replacement of old problems with new and the expected business benefits of IT not realised. This study explored the return on IT investment in the South African Post Office and aimed to determine the relationship between IT expenditure and the financial performance of a firm. Results indicated that a significant positive relationship existed between IT expenditure and net profit at a lag of around 6 to 8 months. This suggests that IT expenditure is having a delayed positive effect of around 6 month on the financial performance of the SAPO. The findings of this study related with findings reported by other researchers on the positive relationship between investment in IT and organisational performance.

The findings suggested that IT is considered a strategic and tactical component within SAPO and therefore a necessary business expense. It is also perceived by the majority to be efficient. However, the findings also suggested that respondents were not convinced that IT is able to increase sales, reduce cost or meet customer requirements.

In the light of the above, it is recommended that the value of IT, both on a financial basis and perceived basis, be measured regularly. It should be incorporated into review reports such as the Balanced Scorecard, to ensure that personnel and management takes cognisance of IT expenditure and that real effort should be made to evaluate its effect on the business at all levels.

Introduction and theoretical background

The South African Post Office with turnover of more than four billion rand and assets worth more than three billion recorded their first operating profit during the 2003/4 financial year (SAPO, 2004). Since then, their operation profit has increased marginally during 2004/5 and 2005/6. SAPO, as with every other high ranking organisation in South Africa has undergone a process of reform in the past few years. It has readdressed the historical operational and service imbalances, while improving the scope, scale and quality of service. It had significantly reduced and ultimately eliminated cost and service inefficiencies and repositioned the postal service to benefit from the growth in the overall communications world-wide. This was done by also investing in information technology to meet the challenges of the economy and their customers.

The use of Information Technology (IT) has since the beginning been targeted for evaluation whether it pays off or not. The research entered a new phase in the 1980s. This was mainly initiated with a statement from Solow (1987) as cited by Loveman (1994), that IT investments were not giving a return to its investors. This sparked further research and many jumped on the new hot topic. Many researchers were following different approaches to investigate and research around this area, some agreeing to what Solow stated (Loveman 1994), and some not (Brynjolfsson, 1993; Brynjolfsson & Hitt 1996, 1998 & 2003). These different views are supported by Kohli and Devaraj (2003) that noted in their study that payoff from IT has generated interest and debate from both academics and practitioners. Various studies have found mixed results when having investigated the relationship between investment in IT and firm performance (Goh & Kauffman, 2005). From the many empirical studies, there are probably as many different viewpoints and findings to whether investing in IT is good or not. The one thing most researchers agree with is that the outcomes of investments in IT are difficult to measure.

Today's economic climate has forced the control of IT investments into becoming a necessary and vital part of business behaviour. IT managers are

no longer able to approve large expenditure without a strong commercial business case showing a high return on investment (ROI). Another factor driving a commercial focus amongst IT managers are statistics that show that a very high percentage of IT projects fail to deliver a ROI over an acceptable time frame. The business environment is now dominated by prudent investment decisions and recessionary attitudes. It is common practice that organisations firstly consider the returns or value outcomes before making any IT investments.

Guerreiro and Serrano, (2006) noted that firms invest in IT in order to improve their economic performance and increase their net worth. IT is often designed to support and improve medium to long-term business, based on a variety of corporate goals. The employment of IT within business has often resulted in the replacement of old problems with new and the expected business benefits of IT not realised. Despite increasing expenditure on IT, productivity has not increased and this has given rise to a productivity paradox (Love & Zahir, 2004).

The 'productivity paradox' phrase was coined when large investments in information technology (IT) apparently failed to produce significant increases in productivity on two levels. The first was at the industry or economy-wide level and the second was observed at company level (Lim, Richardson & Roberts, 2004). Ryan (1999) noted that early research into the subject had pointed out a paradox that despite the spending of large amounts by firms during the 1990s, the productivity benefits were patchy. Early research tended to focus on the services sector, where IT spending in the 1980s generated minimal annual growth in productivity. At the centre of the paradox is the fact that productivity appeared to start slowing in the early 1970s, coinciding with the oil crises and, surprisingly, the widespread use of IT. Attention was first drawn to the productivity paradox in 1987 by Steven Roach, who demonstrated that while the amount of computing power per white collar worker in the services sector had grown dramatically over the 1970s and 1980s, measured productivity of the sector remained flat (Ryan, 1999). Researcher conducted various studies and searched for a link between

productivity growth and computer investment in manufacturing industries. From an economy-wide level perspective, the conventional wisdom was by the late 1980s that IT was not contributing significantly to productivity (Brynjolfsson & Hitt, 1998). Brynjolfsson and Hitt (1998) remarked that a few studies did find positive effects on intermediate factors such as cost efficiency or market share, but it was difficult to tie these benefits to the bottom line. While early research found little evidence of a relationship between IT and productivity, there was also little evidence that computers were unproductive

Most productivity measures are oriented around numbers. Such measures of productivity are severely limiting and not the sole reason for purchasing IT. Proof of this is the fact that most managers rate customer service and quality above cost savings as the prime motivation for IT investment. Ryan (1999) postulated that early research into the subject of IT and productivity was skewed by the use of economy-wide data, and the use of flawed data for several services sectors, making it appear that computers had done little to boost productivity. Earlier research conducted in the 1990's which focussed on the company- or firm-level, also lacked evidence and supported the productivity paradox as there was a failure of IT to produce significant increases in productivity despite large IT costs incurred by organisations when they adopt IT. Research conducted by Strassman (2004) found that there was no correlation between expenditure for information technologies and any known measures for profitability (Lim, Richardson & Roberts, 2004). More recent studies conducted in 2000's showed that there were positive payoffs from IT and have changed their position from doubts about payoffs to when and why there are payoffs. Results of these later IT investment studies showed a positive correlation between IT investment and firm performance (Lim, Richardson & Roberts, 2004).

Research reflecting relationships between IT investment and organisational performance and productivity might be more convincing if it were based on IT investment in both current and earlier periods. Although some researchers (Brynjolfsson, 1993; Loveman, 1994; Osterman, 1986) have speculated on the lagged effects of IT investment, there have so far been no empirical

studies, with the exception of one reported in a conference (Mahmood, Mann, Dubrow & Skidmore, 1998), that have demonstrated a relationship between such investment and organisational performance and productivity in subsequent periods. It has also been argued that traditional IT investment-performance analyses have not been very successful in the past because of their over reliance on financial data. Some researchers (Brynjolfsson & Hitt, 1996) have called for additional research to identify the hidden costs and benefits that are typically not included in a traditional analysis of IT investment relationships with organisational performance and productivity.

According to Brynjolfsson and Yang (1999) another explanation for the paradox is that the benefits from information technology can take several years to appear on the bottom line. The idea that new technologies may have a delayed impact is a common one in business. A survey of executives suggested that many expected it to take as long as five years for information technology investments to pay off (Nolan & Norton, 1988). This accords with an econometric study by Brynjolfsson (1991) which found lags of two to four years before the strongest organisational impacts of information technology were felt. Loveman (1994) also found slightly higher, albeit still very low, productivity when small lags were introduced.

Goh and Kauffman (2005) argued that returns on IT investment occur in three key phases for value: dormancy, triggering and transformation. Phase 1, value dormancy, occurs after an IT investment has been made by the firm, the associated value flows take time to appear. Their timing will be influenced by technology, people and processes (a set of firm activities) of the organisation. This may come from existing firm structures and routines. For value flows to occur within the firm in Phase 2, a primary set of value triggers needs to be in place. This involves the triggering of value flows that result in changes in organisational routines and structures that permit the flow of IT value. In this phase, firms have to focus on setting off a series of timely value triggers. For effective value creation with constraining organisational structures and routines, strong catalysts are necessary to support the changes. These catalysts stem from the technology, people and processes within the

organisation. After the current impediments are overcome, the value creation process will undergo a period of extensive change in Phase 3: value transformation. In each phase, technology, people (stakeholders of the firm) and firm processes shape the outcome and impact the value flows.

Brynjolfsson and Hitt (1996) noted that returns to IT investments were inconsistent over time, with a lag between initial investment and final payoff. Brynjolfsson and Hitt (1996) also found that an econometric analysis of firm-level IT returns showed that long-term returns were two to eight times greater than short term returns. Devaraj and Kohli (2000) argued that it is important to understand the factors and circumstances that influence IT value latency and result in differential lag lengths. When managers understand how IT investments reach their full potential value, they will be prepared to anticipate and respond to changes that impact projects. Having a theory based or empirical analysis-based understanding of the value trajectory over time for different kinds of IT investments will lead to appropriate managerial expectations for the benefits the firm can obtain. This will also enable senior managers to track the progress of IT returns, and help overcome myopic views about IT project investment opportunities.

There has also been studies that implied that there is no relationship between IT investment and ROI (Strassman, 1990; Loveman, 1988; Franke, 1987). The productivity paradox concept then arose when Solow (1987) remarked that “You can see the computers everywhere but in the productivity statistics”. Rei (2004) noted that it can be argued that productivity growth has slowed as investments in IT have grown. For many economists, this is proof that information technology does not affect productivity. However, the available evidence is mixed and does not solve the paradox. Brynjolfsson and Yang (1996) reviewed numerous articles and found little empirical evidence supporting the idea that IT investment has contributed to increases in output and productivity growth. Strassman (2004), a leading figure in research regarding IT investment also stated that according to his knowledge nobody has been able to demonstrate that there is positive correlation between money spent on IT and sustainable profits. His research found that

companies spending more money on information technology, including a higher ratio of information technology (costs) to labour costs, don't necessarily have better financial performance. This suggests that investments in information technology have no discernible impact on financial performance.

Brynjollfsson (1993; 1994); and Strassmann (1990) revealed in their studies, the reasons why organisations invested in IT namely a need to create wealth; the idea to improve output levels in production; in order to benefit by producing quality products; to improve service delivery; to control communication activities; and with the expectation to achieve customer satisfaction. Organisations also expected IT would assist in the production of products with a high level of speed and responsiveness. Firms expected to benefit from IT by improving efficiency through gaining competitive advantage over their competitors and increasing profits in organisations. They aimed to improve the quality of life of the information worker by enabling them to share information and knowledge and that IT would improve workers' performance. They also thought IT would enable workers to manage their work effortlessly by saving time. Managers invested in IT with expectations that it would facilitate their decision making processes.

Organisational expectations are being met through the changes that IT brings towards improving organisational processes, and the way workers fulfil their daily tasks. Information technology enables knowledge sharing, collaboration, and supports management processes. IT allows for communication on projects at any time and any place. New and emerging technology helps in preserving the knowledge and information generated in organisations, and delivers expected results although there are still some challenges or pitfalls with such tools.

Measuring the value of an investment is an inextricable part of business planning. A Return on Investment (ROI) calculation is only a small part of the total value of an investment. Understanding, measuring and monitoring the benefits delivered by IT is becoming vital to successfully exploiting business technology. Organisations continue to question the benefits of IT in

conjunction with new corporate initiatives such as business process re-engineering, e-commerce, and enterprise resource planning. Despite the potential benefits derived from IT investment, traditional capital budgeting models have failed to estimate true IT values due to their inability to measure complex interactions between IT and organisational performance.

Despite significant discussions in both the managerial and academic literature concerning the importance of evaluating the payoffs of IT investments, there has been little guidance on how to design or implement an appropriate IT performance evaluation system. Epstein and Rejc (2005) noted that there is a shortage of relevant metrics and an absence of a proper methodology to evaluate the payoffs of IT investments. They report that in a survey published in 2004 (McKinsey on IT), more than two thirds of CIO's reported they had no process for auditing the performance of their IT projects. Results also showed that non-IT executives were less aware of the programs to measure IT success and the return on investment effect of technology investment was unclear. The uncomfortable fact remains that most companies have done an abysmal job of determining accurately the economic, strategic and operational returns on their IT investment (Maynard, 2006).

The earlier-mentioned studies by Brynjollfsson (1993, 1994); and Strassmann (1990) were conducted in search of a relationship between IT and investments, and revealed several problems that were still being experienced in organisations regardless of what had been achieved. These researchers highlighted that although managers make investment decisions, they tend to play a passive role in ensuring that such systems are used effectively and efficiently. Many people in organisations embraced IT, and some suffered major psychological and physical challenges, such as the information overload. The inability of managers to document any contribution IT has made over the years is also human centric in nature. The researchers found that there were lags between costs and benefit, showing poor short-term results. This is seen between the time of learning and development among workers, and between the new technology or other business processes and the changes that are inevitable in organisations, which take into account the

benefits and return on investments in IT that do not show immediately. These systems still crash and lead to a loss of valuable information and knowledge in organisations. Managers are also affected by the many difficulties in quantifying the benefits of IT, e.g. the difficulties in finding appropriate measurement instruments. This brings about hitches to the benefits and rewards if work and incentives are not appropriately adjusted. The result is that IT might increase organisational slack instead of output or profits. In some instances, the rewards are directly immeasurable. The truth is there are no comprehensive models to measure the changes IT brings. In addition, investigations on IT and productivity have not been at all satisfactory, which raises frustration and misunderstanding of the measures and methods commonly used to assess productivity in organisations and the industries.

The purpose, problem statement and objectives of the study

When computers were first introduced to organisations, they carried lots of promise for the immediate achievement of results. Organisations started investing in Information Technology (IT) with an insight that this would provide a solution to all their organisational problems. Organisations were encouraged by the notion that investing in IT correlates with higher returns and the delivery of expected results by replacing the human component in organisations. Marketers continuously sell new and emerging technological solutions to organisations, thereby pressurising them to invest into IT.

For most of the past half-century, organisations have been increasing their investments in IT, primarily because of the belief that IT has a significant impact on organisational performance (Osey-Bryson & Ko, 2004). Management now seeks more concrete evidence of the business and the real value of their often extensive IT investments (Serafeimidis & Smithson, 2000). Despite massive investment in IT by both the public and private sectors, there seems to be an apparent lack of evidence concerning the impact on productivity and business performance of such investments. During the past decade a great deal of attention has focused on the impact of IT investment. However studies have frequently generated controversial or inconsistent results. Success stories give impressive examples of the effects of

investment in IT on a firm's performance and competitive advantage, and therefore, become one of the key areas in organisational investment strategies. At the same time, several empirical studies have failed to find any positive relationships between extensive use of IT and organisational efficiency, performance and success (Guerreiro & Serrano, 2006). At firm, industry and economy level there is contradictory evidence on whether IT expenditure has resulted in business value. The statistical uncertainty adds substance to a continuing business worry about how the value of IT expenditure can be measured.

Although it is important that a firm should invest in IT and the competitive advantages from superior IT investments be widely recognised (Brynjolfsson & Hitt, 1998), some research (Harris & Katz, 1989) has shown that it is unlikely that higher expenditures on IT alone will ensure a firm's superior performance and actual returns received on IT investments vary widely (Brynjolfsson & Hitt, 1998). It is opined that the greatest benefits of IT appear to be realised by organisations when IT investment is coupled with other complementary investments, such as organisational reengineering, restructuring and redesign (Lee & Bose, 2002). IT investments may not automatically improve financial performance; instead, it is one essential tool, but needs to be coupled with organisational factors such as business strategies to be truly effective (Shin, 2001).

Earlier studies revealed that there existed no evidence of a relationship between IT spend and the financial performance of a firm. More recent studies did reveal significant relationships but in general studies have found mixed results. Studies that have found relationships indicated that a lagged effect exist between IT investment and the financial performance of a firm. Another group of researchers also noted the indirect value of IT saying that it act as a catalyst. The reasons for the mixed results were contributed to data reliability, analysis methods and the lack of proper ways to measure the effect of IT investment. The South African Post Office (SAPO), as with other organisation, also considers the return on their investments. With their

strategic plan set out to have an operating profit of one billion rand by 2009/10, they are faced with evaluating the value of their IT spend.

The primary research objective of this study was to determine the relationship between IT expenditure and the financial performance of a firm. The study also explored the perceived value of IT investment in a company. Based on the case study of the South African Post Office, the research determined the relationship between IT expenditure and the perceived returns. Regardless of theoretical arguments and professional belief in favour of a positive relation between investment in IT and firm performance, empirical evidence on this relation has been inconclusive and has arrived at multifaceted conclusions that have sometimes been conflicting (Lee & Bose, 2002). Beyond theory development, numerous attempts have been made to relate IS/IT expenditures, computational intensity, MIS budget, or other particular strategies to firm performance (Guerreiro & Serrano, 2006).

Several empirical studies and ample anecdotal evidence indicate that companies that spend more on IT are not rewarded with superior financial performance (Stratopoulos & Dehning 2000). Stratopoulos and Dehning (2000) report empirical evidence that suggests the financial performance of a firm is more related to the way IT assets are managed than the level of organisational spending on new technology, and thus, adding further dimensions to the productivity paradox.

Methodology

The study followed an exploratory case study approach. In addressing the primary research objective, statistical techniques were employed to determine the relationship between IT expenditure and the financial performance of the firm. The secondary research objective was addressed using survey research to explore the perceived value of IT investment amongst a sample of management within SAPO. In addressing the primary research objective, monthly financial data was obtained from SAPO for the period April 2002 to March 2006, giving 48 data points in total. Audited financial figures were provided for four variables, namely operating revenue; operating expenses;

net profit; and IT operating expenses. The net profit of the SAPO was chosen as indicator variable for the financial performance of the firm, whereas IT operating expenditure would serve as proxy for IT expenditure of the firm. Annexure A shows the financial data for the four mentioned variables.

The secondary research objective explored perceptions. A non-probability purposive approach was used to gather data from a quota specified sample of 50 managers at SAPO across the five main operational and support departments. Respondents were selected based on their perceived knowledge and insight into IT investment within the firm and intended outcomes. Quotas were also specified to obtain a representation of managers across the noted departments given research budget and time constraints, restricting gathering data from all employees.

A semi-structured self-administering questionnaire was used as data gathering instrument. The questionnaire consisted of a number of questions being categorical and was grouped into two sections. Section A dealt with respondent's demographic characteristics and section B dealt with respondent's perspectives on IT. The analysis of financial data from SAPO to determine the relationship between IT expenditure and the financial performance of the firm involved both regression and time series analysis. Regression analysis was performed to investigate the linear relationship between operating and IT expenditure and operating revenue and profit/loss. The analysis however did not include investigating the possible time effect of IT expenditure on revenue, as hypothesised by a number of authors (Brynjolfsson & Hitt, 1998; Lee & Kim, 2006), but merely to investigate if any relationship could be detected irrespective of time-dependence. In order to investigate a possible lagged effect, time series analysis was utilised.

The next step involved the analysis of the survey data. Hussey and Hussey (1997) noted that most statistical literature commonly draws a distinction between exploratory data analysis and descriptive statistics, which is used to summarise or display quantitative data, and confirmatory data analysis or inferential statistics, which involves using quantitative data collected from a

sample to draw conclusions about a complete population. In this study, the focus fell primarily on exploratory data analysis, and involved the construction of one-dimensional frequency tables. This provided a base for summarising and presenting of data, which enabled patterns and relationships to be discovered which were not apparent in the raw data.

Interpretation of the data collected

The first hypothesis aimed to investigate if a positive lag effect exists between IT expenditure and the financial performance of the firm. In the case of the South African Post Office (SAPO), it was found that a significant positive relationship existed between IT expenditure and net profit at a lag of around 6 to 8 months. This suggests that IT expenditure is having a delayed positive effect of around 6 month on the financial performance of the SAPO. In the light of this finding, the hypothesis is accepted.

The second hypothesis considered if IT is perceived by line-management in SAPO to have indirect value on the performance of the firm. The findings suggested that IT is considered a strategic and tactical component within SAPO and therefore a necessary business expense. It is also perceived by the majority to be efficient. However, the findings also suggested that respondents were not convinced that IT is able to increase sales, reduce cost or meet customer requirements.

Summary and conclusions

From the literature it is apparent that there are probably as many different viewpoints and findings to whether investing in IT is good or not. The findings of this study related with findings reported by other researchers on the positive relationship between investment in IT and organisational performance (Mahmood, Mann, Dubrow & Skidmore, 1998. Rai, Patnayakuni; & Patnayakuni, 1997. Mitra & Chaya, 1996. Brynjolfsson & Hitt, 1996. Mahmood & Mann, 1993. Brynjolfsson, 1993. Alpar & Kim, 1990). The literature did, however, reveal that some researchers question these results on the grounds that the studies involved examination of primarily cross-sectional data. This criticism stems at least in part from the premise that the benefits of IT

investment can be realised only over longer periods of time. It is possible that in many instances IT has the potential to provide important benefits within the same year the investment is made, as was found in the case of the SAPO. These benefits is not necessarily restricted to a single year and the total ripple effects are difficult to measure as IT investments do not occur in single events, but rather on a continuous basis.

Another important conclusion that is made is that IT provides competitive advantages to firms by adding value across all aspects of the value chain, improving operational performance, reducing costs, increasing decision quality and enhancing service innovation and differentiation.

According to Porter's Value Chain, Information Technology functions in a supportive role to the primary activities, in order to create value in a company. A company's margin or profit depends on its effectiveness in performing these activities efficiently. It is in these activities that a firm has the opportunity to generate superior value. The greatest benefits of IT appear to be realised when IT investment was coupled with other complementary investments; new strategies, new business processes and new organisations. This furthermore supported by Ross, Beath and Goodhue (1996 as cited by Hu & Plant, 2001) which suggested that sustained competitive advantages can be achieved through building and leveraging key IT assets such as human resources, reusable technology and partnership between IT and business management. The underlying theory is that these operational and strategic improvements as a result of effective use of IT should lead to corresponding improvements in productivity, revenue, and profits for those firms which consistently make higher investment in IT than their competitors. In the case of high-tech companies, IT is often the product or service that directly contributes to revenue and profit.

In the light of the above, it is recommended that the value of IT, both on a financial basis and perceived basis, be measured regularly. It should be incorporated into review reports such as the Balanced Scorecard, to ensure

that personnel and management takes cognisance of IT expenditure and that real effort should be made to evaluate its effect on the business at all levels.

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ANNEXURE A: FINANCIAL DATA

MONTH	OP_REV	OP_EXP	NET_PROF	IT_OP_EXP
Apr-02	R 278,061	R 254,511	-R 3,844	R 19,613
May-02	R 304,910	R 302,885	-R 53,557	R 4,719
Jun-02	R 278,173	R 314,031	-R 53,175	R 40,081
Jul-02	R 298,598	R 290,720	-R 15,720	R 17,080
Aug-02	R 293,175	R 312,693	-R 29,843	R 8,793
Sep-02	R 297,474	R 328,427	-R 33,243	R 18,435
Oct-02	R 305,056	R 325,524	-R 58,815	R 21,639
Nov-02	R 340,504	R 311,534	R 7,833	R 18,825
Dec-02	R 281,697	R 304,049	-R 60,876	R 15,013
Jan-03	R 283,119	R 329,139	-R 89,200	R 13,988
Feb-03	R 304,267	R 308,514	R 7,325	R 14,284
Mar-03	R 314,751	R 338,164	-R 7,618	R 27,154
Apr-03	R 290,783	R 285,738	-R 61,328	R 10,000
May-03	R 327,077	R 320,566	R 2,730	R 19,453
Jun-03	R 303,147	R 303,563	-R 39,370	R 16,595
Jul-03	R 306,353	R 319,658	-R 25,865	R 18,804
Aug-03	R 300,434	R 302,234	-R 271	R 14,059
Sep-03	R 361,402	R 330,334	R 40,504	R 25,421
Oct-03	R 246,978	R 324,261	-R 116,183	R 25,683
Nov-03	R 337,206	R 256,274	R 60,818	R 12,200
Dec-03	R 346,531	R 294,295	-R 26,518	R 15,351
Jan-04	R 328,012	R 321,224	R 45,234	R 16,176
Feb-04	R 319,098	R 327,448	-R 43,432	R 19,026
Mar-04	R 389,671	R 355,975	R 85,478	R 21,004
Apr-04	R 311,099	R 275,898	-R 4,469	R 14,366
May-04	R 322,745	R 318,659	-R 14,689	R 16,535
Jun-04	R 315,566	R 301,444	-R 12,882	R 17,077
Jul-04	R 324,368	R 321,119	-R 8,325	R 16,845
Aug-04	R 319,734	R 308,951	R 1,156	R 16,834
Sep-04	R 387,278	R 320,809	R 27,476	R 18,973
Oct-04	R 292,952	R 325,064	-R 59,025	R 17,847
Nov-04	R 387,745	R 346,069	R 20,548	R 19,307
Dec-04	R 375,627	R 341,236	R 11,775	R 18,994
Jan-05	R 367,481	R 321,051	R 25,494	R 17,611
Feb-05	R 360,267	R 334,062	-R 29,264	R 20,114
Mar-05	R 405,666	R 370,159	R 17,833	R 23,195
Apr-05	R 355,476	R 322,716	R 8,057	R 17,521
May-05	R 378,739	R 326,310	R 42,591	R 16,282
Jun-05	R 360,814	R 347,554	R 3,237	R 19,991
Jul-05	R 375,755	R 342,249	R 38,049	R 18,751
Aug-05	R 368,576	R 358,670	-R 2,006	R 15,528
Sep-05	R 442,505	R 369,190	R 79,376	R 16,573
Oct-05	R 324,151	R 346,883	-R 30,283	R 17,669
Nov-05	R 446,511	R 387,863	R 49,450	R 18,063
Dec-05	R 410,516	R 361,646	R 39,337	R 16,649
Jan-06	R 405,312	R 348,470	R 46,673	R 17,219
Feb-06	R 384,280	R 358,536	R 16,513	R 15,921
Mar-06	R 457,433	R 407,576	R 99,403	R 17,777

Key

OP_REV	Operating Revenue
OP_EXP	Operating Expenses
NET_PROF	Net Profit/(Loss)
IT_OP_EXP	IT Operating Expenses

ANNEXURE B: CROSS CORRELATION FUNCTION

```
Cross Correlations:   IT_OP_EXP   IT OPERATING EXPENSES
                      NET_PR_1   DIFF(NET_PROF,1)

     Cross Stand.
Lag  Corr.   Err. -1  -.75  -.5 -.25   0   .25  .5   .75   1

-18   .004   .183               .      *      .
-17  -.116   .180               .    **⇔      .
-16   .055   .177               .      ⇔*     .
-15   .042   .174               .      ⇔*     .
-14  -.041   .171               .     *⇔      .
-13  -.009   .169               .      *      .
-12   .046   .167               .      ⇔*     .
-11   .000   .164               .      *      .
-10   .009   .162                .     *     .
 -9  -.137   .160                .  ***⇔     .
 -8   .111   .158                .     ⇔**   .
 -7   .048   .156                .     ⇔*    .
 -6  -.008   .154                .     *     .
 -5  -.163   .152                .  ***⇔     .
 -4   .153   .151                .     ⇔***  .
 -3  -.020   .149                .     *     .
 -2  -.026   .147                .    *⇔     .
 -1  -.014   .146                .     *     .
  0   .003   .144                .     *     .
  1  -.009   .146                .     *     .
  2   .074   .147                .     ⇔*    .
  3  -.124   .149                .   **⇔     .
  4   .020   .151                .     *     .
  5   .135   .152                .     ⇔***  .
  6  -.011   .154                .     *     .
  7  -.342   .156               *.*****⇔     .
  8   .410   .158                .     ⇔*****.**
  9  -.231   .160                .*****⇔     .
 10   .097   .162                .     ⇔**   .
 11  -.027   .164               .     *⇔      .
 12  -.041   .167               .     *⇔      .
 13  -.005   .169               .      *      .
 14   .173   .171               .      ⇔***   .
 15  -.069   .174               .     *⇔      .
 16  -.218   .177               .  ****⇔      .
 17   .330   .180               .      ⇔*******
 18  -.136   .183               .   ***⇔      .

Plot Symbols:      Autocorrelations *     Two Standard Error Limits .

Total cases:  48     Computable 0-order correlations:  48
```

ANNEXURE C: SURVEY QUESTIONNAIRE

QUESTIONNAIRE

THE RELATIONSHIP BETWEEN IT CAPITAL INVESTMENT AND THE FINANCIAL PERFORMANCE OF A FIRM

Dear respondent

This questionnaire aims at measuring your perceptions on **value of information technology (IT)** in your department. The completion of this questionnaire will take approximately 10 minutes. Thank you for participating in this study.

Notes to respondent

- There are no right or wrong answers
- Your honest input is appreciated
- Your responses will be treated confidentially

SECTION A: DEMOGRAPHIC INFORMATION

Please circle the appropriate code

1. Gender:	Male	1☐	
	Female	2☐	/1
2. Age:	18 - 24 years	1☐	
	25 – 34 years	2☐	
	35 – 49 years	3☐	
	50 – 59 years	4☐	
	60+ years	5☐	/2
3: Employee level:	General Staff / Administrative	1☐	
	Supervisory / Junior Management	2☐	
	Middle Management	3☐	
	Senior Management	4☐	
	General Manager	5☐	
	Executive Management	6☐	/3
4. Department:	Finance	1☐	
	Human Resources	2☐	
	Operations	3☐	
	Information Technology	4☐	
	Support Services	5☐	/4

5. What is the predominantly view of Information Technology by senior management?	Non-value adding cost	1☐	
	Necessary business expense	2☐	
	Return-producing investment	3☐	
	Strategic asset	4☐	/5

6. How would you characterise your organisation's use of IT [*please circle only one*]	We compete at the cutting edge of innovation and use IT as a competitive weapon	1☐	
	We view IT as a critical and essential investment area, and invest in leading, but proven, technologies	2☐	
	We stay current on technology, without getting too far ahead our competition	3☐	
	We take a conservative approach using proven, mature technologies	4☐	
	Other (please specify)	5☐	/6

7. How do you rate the effectiveness of your IT organisation?	Not at all effective	1☐	
	Somewhat effective	2☐	
	Acceptable	3☐	
	Effective	4☐	
	Very effective	5☐	/7

Indicate in the appropriate block to what extent you agree or disagree to the following statements:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
8. IT provides our company the ability to increase sales	1☐	2☐	3☐	4☐	5☐	/8
9. IT provides a way for our company to reduce costs	1☐	2☐	3☐	4☐	5☐	/9
10. IT gives our company competitive advantage	1☐	2☐	3☐	4☐	5☐	/10
11. IT supports and is aligned to business strategy	1☐	2☐	3☐	4☐	5☐	/11
12. IT is an important component of our business strategy	1☐	2☐	3☐	4☐	5☐	/12
13. IT is a tactical aspect of our business	1☐	2☐	3☐	4☐	5☐	/13
14. IT is a core competence in our company	1☐	2☐	3☐	4☐	5☐	/14
15. IT supports the needs of the business	1☐	2☐	3☐	4☐	5☐	/15
16. IT plays an integral role in meeting customer requirements	1☐	2☐	3☐	4☐	5☐	/16
17. IT does a good job in meeting customer requirements	1☐	2☐	3☐	4☐	5☐	/17

18. What do you believe are the risks or issues that would make you hesitate in investing in IT? *[please tick all that apply]*	Unclear return on investments	1☐	
	Uncertain about the role of industry exchanges	2☐	
	Other capital projects have higher priority	3☐	
	Rapidly changing technology	4☐	
	Wait to see proven applications in this industry	5☐	
	Security issues	6☐	
	Instability of technology	7☐	
	Top management commitment	8☐	
	Lack of business leadership	9☐	
	Lack of people with appropriate skills	10☐	
	Other (please specify)	11☐	/18

ANNEXURE D: SURVEY RESULTS

		n	%
1. Gender:	Male	27	54.0%
	Female	23	46.0%
Total		50	100.0%

		n	%
2. Age:	18 - 24 yrs	2	4.0%
	25 - 34 yrs	15	30.0%
	35 - 49 yrs	29	58.0%
	50 - 59 yrs	4	8.0%
Total		50	100.0%

		n	%
3. Employee level:	General Staff/ Administrative	14	28.0%
	Supervisory/ Junior Management	8	16.0%
	Middle Management	15	30.0%
	Senior Management	6	12.0%
	General Management	2	4.0%
	Executive Summary	5	10.0%
Total		50	100.0%

		n	%
4. Department:	Finance	10	20.0%
	Human Resources	10	20.0%
	Operations	10	20.0%
	Information Technology	10	20.0%
	Support Services	10	20.0%
Total		50	100.0%

		n	%
5. What is the predominantly view of IT by senior management?	Non-value adding cost	5	10.0%
	Necessary business expense	23	46.0%
	Return-producing investment	9	18.0%
	Strategic asset	13	26.0%
Total		50	100.0%

		n	%
6. How would you characterise your organisation's use of IT?	We compete at the cutting edge of innovation and use IT as a competitive weapon	6	12.0%
	We view IT as a critical and essential investment area, and invest in leading, but proven, technologies	14	28.0%
	We stay current on technology, without getting too far ahead our competition	16	32.0%
	We take a conservative approach using proven, mature technologies	14	28.0%
Total		50	100.0%

		n	%
7. How do you rate the effectiveness of your IT organisation?	Not at all effective	2	4.0%
	Somewhat effective	18	36.0%
	Acceptable	23	46.0%
	Affective	7	14.0%
Total		50	100.0%

		n	%
8. IT provides our company the ability to increase sales	Strongly disagree	4	8.0%
	Disagree	12	24.0%
	Neither agree nor disagree	9	18.0%
	Agree	20	40.0%
	Strongly agree	5	10.0%
Total		50	100.0%

		n	%
9. IT provides a way for our company to reduce costs	Strongly disagree	4	8.0%
	Disagree	13	26.0%
	Neither agree nor disagree	10	20.0%
	Agree	17	34.0%
	Strongly agree	6	12.0%
Total		50	100.0%

		n	%
10. IT gives our company competitive advantage	Strongly disagree	3	6.0%
	Disagree	13	26.0%
	Neither agree nor disagree	11	22.0%
	Agree	16	32.0%
	Strongly agree	7	14.0%
Total		50	100.0%

		n	%
11. IT supports and is aligned to business strategy	Strongly disagree	3	6.0%
	Disagree	15	30.0%
	Neither agree nor disagree	11	22.0%
	Agree	18	36.0%
	Strongly agree	3	6.0%
Total		50	100.0%

		n	%
12. IT is an important component of our business strategy	Strongly disagree	1	2.0%
	Disagree	4	8.0%
	Neither agree nor disagree	5	10.0%
	Agree	28	56.0%
	Strongly agree	12	24.0%
Total		50	100.0%

		n	%
13. IT is a tactical aspect of our business	Strongly disagree	2	4.0%
	Disagree	4	8.0%
	Neither agree nor disagree	8	16.0%
	Agree	30	60.0%
	Strongly agree	6	12.0%
Total		50	100.0%

		n	%
14. IT is a core competence in our company	Strongly disagree	3	6.0%
	Disagree	14	28.0%
	Neither agree nor disagree	13	26.0%
	Agree	13	26.0%
	Strongly agree	7	14.0%
Total		50	100.0%

		n	%
15. IT supports the needs of the business	Strongly disagree	2	4.0%
	Disagree	8	16.0%
	Neither agree nor disagree	13	26.0%
	Agree	21	42.0%
	Strongly agree	6	12.0%
Total		50	100.0%

		n	%
16. IT plays an integral role in meeting customer requirements	Strongly disagree	10	20.0%
	Disagree	7	14.0%
	Neither agree nor disagree	28	56.0%
	Strongly agree	5	10.0%
Total		50	100.0%

		n	%
17. IT does a good job in meeting customer requirements	Strongly disagree	6	12.0%
	Disagree	10	20.0%
	Neither agree nor disagree	12	24.0%
	Agree	18	36.0%
	Strongly agree	4	8.0%
Total		50	100.0%

		n	%
18. What do you believe are the risks or issues that would make you hesitate in investing in IT?	Unclear return on investment	21	42.0%
	Uncertain about the role of industry exchanges	6	12.0%
	Other capital projects have higher priority	7	14.0%
	Rapidly changing technology	15	30.0%
	Wait to see proven applications in this industry	7	14.0%
	Security issues	14	28.0%
	Instability of technology	23	46.0%
	Top management commitment	16	32.0%
	Lack of business leadership	20	40.0%
	Lack of people with appropriate skills	33	66.0%
Total		50	