"Why is information technology investment not paying off?"

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Assignment presented in partial fulfilment of the requirements for the degree of Master of Philosophy (Information and Knowledge Management) at the University of Stellenbosch

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April 2005

Declaration

I the undersigned hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: Date:.

Abstract

This paper discusses factors that contribute to information technology (IT) investment not paying off as might have been expected. The main purpose is to describe this IT productivity paradox. The paper explores ideas that align organizations' business strategies and information technology as a key to achieving improved productivity. Which are possible to properly measure in terms of the financial results? The main aims and objectives are to find out why managers invest in IT; whether there is a phenomenon such as an IT productivity paradox; whether IT pays off as expected; and how IT impacts on organizations. The study will investigate options for proper management of information technology and data structures. It is necessary to ascertain whether ensuring proper IT implementation has a positive impact on productivity, leading to increased innovation and performance.

The research design builds on research done on the use of IT in organizations, using a qualitative research method. This research paper looks at organizational issues such as IT management styles, political and ethical issues, and work settings. The paper looks at organizations across the service and manufacturing sectors to determine their production, innovation, and profits into their existing organizational processes and how technology is interpreted. A group of IT users, IT managers and analysts were used as a sample to study the way IT managers and knowledge workers encounter information technology in organizations. The research method used in this research paper is called the informant approach, to take points of entry IT users would provide. This means that the interviewee, in this case the IT user was questioned on the use of information technology tools to gather information. In this study the aim was to conduct interviews with IT users and those they work with about their experiences. The sampling population was selected on the basis that they use this technology. In the data collection method a second interview was used to gather first-hand responses from the respondents to help me consolidate the information gathered to validate and ensure that it is reliable. The validity and reliability aspect of this research paper are based on the main sources of data and interpretation and adopts coding as the main technique of analysis.

The internal reliability of this research methodology concern itself with the research methods that were used within this research paper. Measures to be taken in the paper are to obtain internal reliability in systematic gathering of data. The last part of this paper presents the conclusions and recommendations for changes to be made by managers and those investing in

IT. IT managers should plan strategically when dealing with sales and marketers in order to put business needs before the needs of IT or systems. Technology should fit business needs rather than the business adjusted to fit the technology. IT should not cost an organization any additional profit it generates.

Opsomming

Belegging in Informasietegnologie skyn nie so betalend te wees as wat aanvanklik verwag is nie. Hierdie studie beskryf bogenoemde IT produktiwiteitsparadoks, en ondersoek faktore wat daartoe bydra. Verder word planne wat ten doel stel om organisasies se besigheids-strategie en IT te laat saamwerk ten einde produktiwiteit te verhoog, ondersoek. Is dit moontlik om hierdie te meet in terme van finansiële resultate? Ander voornemens is om te bepaal waarom bestuurders in IT belê, is dit so betalend soos aanvanklik geskat is, hoe dit die maatskappy beïnvloed en bestaan daar werklik 'n verskynsel soos die IT produktiwiteitsparadoks?. Hierdie studie sal moontlikhede ondersoek vir kundige bestuur van IT en datastrukture. Dit is nodig om vas te stel of die deeglike toepassing van IT 'n positiewe uitwerking het op vernuwende denke en produktiwiteit.

Die navorsingsontwerp is gebaseer op navorsing wat reeds gedoen is oor die gebruik van IT in organisasies. In hierdie navorsing word ondersoek ingestel na organisatoriese kwessies soos IT bestuursmetodes, politieke en etiese invloede en werksomstandighede. Hierdie dokument neem maatskappye regoor die diens- en vervaardingsektore in oënskou ten opsigte van hul produksie, vernuwende idees en winsmarge, hoe hierdie aspekte inpas in hul huidige organisatoriese prosesse en hoe tegnologie interpreteer word.

'n Groep van IT gebruikers, IT bestuurders en analiste is as monster geneem, ten einde die manier waarop IT bestuurders en inligtingwerkers informasietegnologie teëkom in maatskappye te bestudeer. Die navorsingsmetode wat tydens hierdie studie gebruik is, word genoem die informantbenadering, wat behels om informasie te gebruik wat deur IT gebruikers verskaf word. Dit beteken dat die IT gebruiker ondervra word oor die gebruik van IT toerusting om informasie te versamel. Die doelwit was om onderhoude met IT gebruikers te voer, asook diegene met wie hulle saamwerk, in verband met hul ondervindinge.

Die steekproefpopulasie is gekies op grond daarvan dat hulle IT gebruik. In die data-insamelingsmetode is 'n tweede onderhoud gehou om eerstehandse menings van die respondente te verkry, met die doel om die informasie tot dusver te bevestig as betroubaar. Die geldigheid- en betroubaarheidsaspekte van hierdie dokument is gebaseer op die hoofbronne van data en vertolking en gebruik kodering as die primêre tegniek van analise.

Die intrinsieke betroubaarheid van hierdie navorsingsmetode is gebaseer op die navorsingsmetodes wat gebruik is vir hierdie studie. Stappe is geneem tydens die studie om intrinsieke betroubaarheid te verkry deur die sistematiese verkryging van data. Die laaste deel van hierdie dokument bied die gevoltrekkings aan en ook voorstelle vir veranderings wat gemaak kan word deur bestuurders en diegene wat belê in IT. IT bestuurders behoort strategies te beplan wanneer hulle in aanraking kom met handelaars, om doelgerig die benodigdhede van die maatskappy te stel voor die benodigdhede van die IT en gepaardgaande sisteme. Tegnologie behoort in te pas by die benodigdhede van die maatskappy eerder dat die maatskappy hoef aan te pas by die tegnologie. IT behoort nie die maatskappy meer uit die sak te jaag as wat dit aan wins genereer nie.

Acknowledgements

Firstly, I would like to thank my supervisor Dr Martin van der Walt; without him this thesis could not have been done. I would also like to thank Professor Ben Fouché. Another very special thank you goes to my girlfriend Mamokete Maimane and her family – thank you for your support and advice when I needed it most, and for reminding me that it is not easy but it is worth it.

I would like to express my gratitude to Sappi for sponsoring my studies. I wouldn't have had the courage to further study for MPhil in Information and Knowledge Management degree at Stellenbosch.

I would like to thank my family, my mother Moitheki Mathe, my father Serame Mathe, Vincent and Kgauho, my sisters Pulane, Mapule and Mmathapelo and especially my son Motheho, and my nephews Ofentse, Pontso, Thato and Nkateko.

To my colleagues in MPhil Information and Knowledge Management – thanks for sharing your knowledge with me. It was both challenging and fulfilling. I would also like to thank all the friends who helped me get through the hard times and who were also there to celebrate the good times. Love you guys.

Special thanks go to Gerda Grobler for assisting me to correct my work.

Thanks to Almighty God for affording me an opportunity to press on and study for my Masters Degree.

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CHAPTER 1 INTRODUCTION

The IT productivity paradox is that the correlation between IT and the productivity paradox is covered widely but it is misunderstood. A lot of organizations are increasingly becoming interested in the "productivity paradox," as it is known; which it has consequently elicited a great deal of research. It was decided that an investigation should be conducted to find out what the causality factors are behind IT not paying off as might have been expected.

A hypothetical assumption is that investing in IT is correlated to higher returns in both services and manufacturing sectors: production can be increased by automation in services and manufacturing sectors. Another assumption is that high IT investment increases production.

This paper attempts to address the following questions in relation to the hypothetical assumptions above:

1. Why do managers invest in IT?
2. Does the IT productivity paradox really exist?
3. Does IT pay off as expected?
4. How does IT impact on an organization?

For the purpose of this paper the following terms are keywords in the discussion.

Information technology (IT)

IT is said to be a field or branch of technology devoted to (a) the study and application of data and the processing thereof; i.e., the automatic acquisition, storage, manipulation (including transformation), management, movement, control, display, switching, interchange, transmission or reception of data; and (b) the development and use of the hardware, software, firmware and procedures associated with this processing.

Other definitions refer to IT as hardware, software and related technical routines, and information systems (IS) used in organisational applications, which are increasingly IT-based, that deliver on the information needs of an organisation's stakeholders. Note, however, that some sources referred to in this paper use 'IT' to refer to both IT and IS.

Productivity

Productivity is said to be the amount of output produced per unit of input. But this definition, in my opinion, might be faulty, because output is traditionally defined only in terms of tangible goods, things very easily measured. Things that can be counted are considered as "output". This is too narrow; some industries have no "output", no products to define productivity: e.g. the finance industry, information industry and the service industry.

Paradox

Paradox is said to be a situation wherein a particular commodity appears to be what it is not expected to be. It does not yield the expected or required results.

A concise English meaning of paradox is that it is a seemingly absurd or self-contradictory statement or proposition that may in fact be true. It is an apparently sound statement or proposition that leads to a logically unacceptable conclusion.

Organization

This refers to an organized body of people with a particular purpose, especially a business entity, government department, charity, firm or research organization, which is managed by organizational managers or executives.

'Productivity paradox'

Is a weak relationship between investment in information technology (IT) and financial performance.

IT productivity paradox

Is the lack of empirical support for the positive economic impact of information technology.

Aims

The aim of this study is to explore research, which seems to offer a solution to the problem of IT not paying-off as expected.

In this research paper, the main aims and goals are to look at factors that contribute to information technology investment not paying off as might have been expected. The organizational factors such as basic important aspects of the productivity paradox in relation to information technology are taken into consideration in this research, such as return on investments, why managers invest in IT, the optimistic view of IT, introduction of computers in work settings, four explanations of the paradox, strategic alignment of organizational business and IT, user knowledge of IT tools, user behaviour, knowledge and computer literacy, and the mismanagement of IT, measurement of input and output aspect or results of IT, the time and period lags in realising the results. We still experience information technology glut and other IT related failures.

Objectives

The objective is to investigate the issues related to IT not paying off as might have been expected. The main objective is to incorporate ideas generated by previous researchers into a single instrument to be used as a tool for a solution to this persistently misunderstood problem.

The purpose of this is:

- To thoroughly describe the IT productivity paradox in this research paper, with the intention to further explore ideas that align business processes, business strategies and IT infrastructure as a key to achieving improved productivity;
- To look into a proper measure of the financial results of such an alignment;
- Identify possible reasons and influential factors to IT productivity paradox;
- To discover why IT spending is not increasing production in organizations;
- To demonstrate that it is not spending or investing in IT that is the solution;
- To closely look at Information Technology to ascertain whether ensuring its proper implementation has a positive impact on productivity, increased innovation and performance;
- To study the user and IT relationship to find out why does IT not pay off as expected

This taps into why investment in the work environment is important to the success of investment in information technology. The paper further endeavours to prove that IT does not operate separately in this complex and turbulent system of organizational activity, but there are other elements that add value to the whole productivity. It is necessary to look thoroughly at organizational factors that contribute to the productivity paradox in relation to information technology, to identify such factors and give possible means to deal with the productivity paradox. This study attempts to find out what we know and what we do not know about IT and productivity in organizations across the services and manufacturing sectors. They are aware of persistent problems with IT not delivering the expected results, but continue to invest millions in it.

The paper asks why IT does not pay off as expected regardless of the efforts by managers to improve work settings and business processes in organizations. Efforts have also been made to align business and IT. These issues may be clarified by other research. It appears that the failures of IT productivity is caused by or is due to a lack of immeasurable outcomes and the methods applied misadministration and mismanagement by manufacturers, including user organizations of this information technology. So this paper seeks to find out what the status is with regards to IT spending versus productivity in organizations and to investigate the main reason why organizations continue to invest in IT in this information age.

Methodology

Literature such as journal articles, conference papers and books gathered from libraries are presented in a coherent and summarised manner to produce this research paper in an attempt to address this problem of IT paradox, by finding out what the main purpose of organizations investing in IT tools are. Furthermore, it is necessary to consider user ability to control IT tools and measurement issues. The paper will discuss four explanations of the productivity paradox, the organizational business strategy and IT.

Overview of chapters

Chapter 1: The introduction provides a background to the study of the IT productivity paradox, and states the main aims and objectives of the study. It also provides the definitions of the terms covered in this paper. Chapter 2: Presents the background on the productivity of information technology capital in manufacturing and in the services sector. Chapter 3:

Discusses the questions why managers invest in IT, whereas it still does not pay off as expected. Chapter 4: Focuses on the existence of the IT productivity paradox. Chapter 5: Questions whether IT pay off as expected. Chapter 6: Finds out how IT impacts in an organization. Chapter 7: The research design and methodology is presented to determine how and what impact IT has in organizations. Chapter 8: Presents the results of the empirical study. Chapter 9: This chapter presents the most salient points of the paper and offers recommendations on how to use IT for improved productivity.

CHAPTER 2 LITERATURE REVIEW: BACKGROUND

In their studies Gilchrist, Gurbaxani and Town (2001) found that IT productivity was greater in producer firms than in user firms. Roach (1987) also reported disappointing results involving the productivity of information workers. Along similar lines, Baily and Chakrabarti (1988) noted the absence of significant productivity gains from IT investments. Loveman (1994) investigated IT productivity in the manufacturing sector for the time period 1978-1984 and concluded that the marginal money spent on IT would have been better spent on non-IT inputs to production. The disappointment in IT has been chronicled in articles disclosing broad negative correlations with economy-wide productivity and information worker productivity. Econometric estimates have also indicated low IT capital productivity in a variety of manufacturing and service industries.

The Productivity of Information Technology Capital in Manufacturing

There have been a number of studies of IT productivity in the manufacturing sector. A study by Loveman (1994) provided some of the first econometric evidence of a potential problem when he examined data from 60 business units. He used ordinary least-squares regression to estimate the parameters of a production function. Loveman (1994) estimated that the contribution of IT capital to output was approximately zero over the five-year period studied in almost every subsample he examined. His findings were quite strong to a number of variations on his basic formation and underscore the paradox: while firms were demonstrating a voracious appetite for a rapidly improving technology, measured productivity gains were insignificant. Weill (1990) was also able to disaggregate IT by use, and found that significant productivity could be attributed to transactional types of IT (e.g. data processing), but was unable to identify gains associated with strategic systems (e.g. sales support) or informational investments (e.g. email infrastructure).

The Productivity of Information Technology Capital in Services

It was widely reported that most of the productivity slowdown is concentrated in the service sector (Roach 1991). One of the first studies of the impact of IT was conducted by Cron and Sobol (1983) who looked at a sample of wholesalers. They found that, on average, IT impact was not significant, but that it seemed to be associated with both very high and very

low performers. This finding has engendered the hypothesis that IT tends to reinforce existing management approaches, helping well-organized firms succeed, but only further confusing managers who have not properly structured production in the first place. Strassmann (1990) also reported disappointing evidence in several studies. In particular, he found that there was no correlation between IT and return on investment in a sample of 38 service sector firms: some top performers invest heavily in IT, while some do not. In many of his studies, he used the same MPIT data set discussed previously and had similar results. He concludes that "there is no relation between spending for computers, profits and productivity" (Strassmann 1990). Roach's widely cited research on white-collar productivity (1991), discussed previously, focused principally on the dismal performance of IT in the service sector. Roach (1991) argues that IT is an effectively used substitute for labour in most manufacturing industries, but has paradoxically been associated with bloating white-collar employment in services, especially finance. He attributes this to relatively keener competitive pressures in manufacturing and foresees a period of belt-tightening and restructuring in services as they also become subject to international competition. Similar conclusions are reached by Franke (1987), who found that IT was associated with a sharp drop in capital productivity and stagnation in labour productivity, but remained optimistic about the future potential of IT, citing the long time lags associated with previous "technological transformations" such as the conversion to steam power. Based on previous empirical research, there seems to be little relation between investment in information technology (IT) and financial performance (often referred to as the productivity paradox). The lack of good quantitative measures for the output and value created by IT has made the MIS manager's job of justifying investments particularly difficult. Academics have had similar problems assessing the contributions of this critical new technology, and this has been generally interpreted as a negative signal of its value. As is well known, productivity is the fundamental economic measure of a technology's contribution. With this in mind, company executives and line managers have increasingly begun to question their huge investments in computers and related technologies.

CHAPTER 3 WHY DO MANAGERS INVEST IN IT?

This part of the paper deals with the question why IT managers invest in IT. Earlier studies by Erik Brynjolfsson, (1993) and Paul Strassmann, (1990) have attempted to find a relationship between IT and productivity in the manufacturing and services sectors.

3.1 Information Technology investments

The main reason why managers in organizations invest in IT is still unclear and misunderstood widely. Managers initially have preconceived ideas and perceptions that IT is a solution. On the other side, IT sales marketers are always selling new and emerging information technology tools, which are said to be a solution from the sales and marketers' point of view. The following points were discussed recently in a newspaper, the *Daily Sun* (2004). A newspaper article published by the *Daily Sun* (Monday 10, 2004, p. 21), "Tomorrow: Understanding Computer Jargon", on ways to aid managers in dealing with IT investment issues cautiously and reasonably.

3.1.1 Information Technology should bring wealth

The main reasons why managers invest in Information Technology are that they need IT in organizations to create wealth, to improve efficiency, provide better service and increase profitability. But managers in organizations need to have clarity from the outset with regards to the purpose of IT, as it often becomes an end in itself. Managers in organizations should ensure that they do not lose sight of the original purpose why they invest in IT.

3.1.2 Needs versus Affordability

IT managers in organization have to put business needs before those of the system. Information technology has to fit the business needs rather than the business made to fit the technology to realise the potential IT possess in bringing expected results. IT should be affordable. Managers in organizations hope to achieve competitive advantage over other competing organizations when investing in IT. IT provides some unique advantage and assists an organization to increase its turnover or profitability or both. But this does not seem to be the tendency amongst organizations, as every new IT system is installed, with no decision to implement the tools most effectively and use them until the results are recognized and measurable.

3.1.3 Increase net asset value

Managers aim to increase the net asset value of IT. A golden rule is that information technology should not cost an organization any additional profit it generates, it must play a part in increasing the return revenues, and it must also contribute to an increase in the net asset value of its business.

But IT managers in many organizations discover too late that their IT system is too expensive a solution for the cost savings it delivered. Choosing the system most suited to the business is one of the most difficult tasks. Managers do not take sufficient time deciding on the system, leading to lower production levels.

3.1.4 Set out detailed specifications

IT managers in organizations need to avoid traps to identify the specific results they require the system to deliver. Further the IT Managers need to qualify the costs involved and challenge the solutions suggested by Information Technology experts. Get a number of organizations to put forward a system proposal. To determine, which organization provide the suitable system to yield the expected results. This must convince IT managers that the solution to their problem is simple-to–operate, user–friendly, jargon-free and cost-effective system that is relatively cheap to install and operate. Information technology must be flexible, easily adaptable, and operational training should be included. The full cost of the system (the final 20%) must only be payable once the system is operational. IT Managers still experience IT not paying off as expected, since the systems development life cycle is difficult to undertake. It is a highly specialized field in information technology field.

3.1.5 End user needs and a sense of ease

IT users, stakeholders and the people in organizations make information technology or information systems work. If the workforce is not fully involved in the process of implementing and working an IT system, they will never enjoy the full benefit of the system. Productivity will not be improved as expected. Ensure that the workforce is in control of the technology and not the other way round. To ensure that there is a positive feeling about the use of the system and that it is working for the organization *Daily Sun* (2004). A newspaper article published by the *Daily Sun* (Monday 10, 2004,

p. 21), "Tomorrow: Understanding Computer Jargon", pointed out the following basic principles that apply in IT investments.

That there should be return on investment in IT; IT should reduce or eliminate travel; reap significant cost savings; IT should enable sharing documents; IT should facilitate storage of documents; IT should eliminate paper documents to reduce time and costs; IT should help trace and make calls. Information technology should increase productivity levels.

3.1.6 Return on Investment (ROI) on IT

The article covered the studies from an econometric perspective and suggested that in the technology industry thrives on competition, while potential clients are seeking the true immediate value of a service. With a technological solution, the benefits must be measurable in a client's environment that impacts on the work processes and increases results within the organization. Information technology should bridge the gap between users by seamlessly centralizing information and document control. IT should enable users to share knowledge, collaborate on files and make decisions, which maximize the efforts of the corporate, mobile and decentralized workforce regardless of geographical location. But in most service sectors this is hard to achieve, since it is hard to measure IT production.

3.1.7 Reduce or eliminate travel, to reap significant cost savings

It was also pointed out that information technology managers believe that IT should allow groups to communicate on any given project at any time from any place. This eliminates the necessity for travel, therefore decreasing travel expenses. In most service sector organizations this seems to yield results, while it does not solve the problems of financial spending, which are still high *Daily Sun* (2004). A newspaper article published by the *Daily Sun* (Monday 10, 2004, p. 21),"Tomorrow: Understanding Computer Jargon".

3.1.8 Sharing Documents

Managers invest in IT with the hope of facilitating a process of sharing electronic documents, which are continuously being created, amended, moved and deleted. Documents on a central server allows for users to easily and quickly access when they

are needed. This eliminates the time searching for documents as well as the time spent ensuring that the documents are the latest versions. Additionally, this feature also permits for documents to be edited, in which case others will be notified of the updated changes, resulting in process efficiency. IT systems still crash and the most effective document management systems have not been discovered one to facilitate and better manage electronic information.

3.1.9 Document storage

IT managers invest in IT with the aim of preserving knowledge and information generated in organizations. Some components of IT, such as email, are the tools most commonly used to communicate and collaborate. However, by its very nature, email lacks the security, traceability and guaranteed delivery required by today's demanding economy. The solution employed by technology allows for document organization, the confirmation that a colleague is online when sending a message, and security. The technological solution offers version control to eliminate multiple versions, which inevitably create information silos and countless documents. This decreases the amount of unnecessary documents.

Additionally, it also improves time management by knowing which colleagues are online and when to send them documentation. But this does not solve the problem; while it improves efficiency and contributes positively to communication, it does less to enhance production in the service sector.

3.1.10 Documents, paper elimination, reduce time and costs

Information technology managers invest in IT in the belief that IT will eliminate the paper work. With editing and updates completed online, users are notified when a document is being updated or checked out. The advantage is that others will receive the new updates immediately online; there is no requirement for distributed paper updates being handed out, therefore the cost of paper and printed materials is decreased. A large number of employees still prefer printing out and the clutter the printers with print queues, in order for them to read and edit physical copies before finalising versions. This is a simple indication that IT does not pay off as expected. Perhaps IT users need to change their working methods and human behaviour for IT results to be noticeable.

3.1.11 Control telephone contacts

Managers invest in IT with the aim that it will help in controlling the number of telephone contacts, as users may contact their clients, partners and vendors by instant messaging. This decreases the number of calls placed throughout the day, therefore increasing productivity as well as decreasing the cost of long-distance calls. But the number of calls cannot be used on its own as a measuring instrument to draw conclusions about production in organizations.

3.1.12 Increase Production

Regardless of the limitations of such instruments and of the efforts of IT users, managers and other stakeholders, at least the following should be widely recognized as benefits of IT and increased productivity. Information technology changes the way in which people work. It provides everyone within an organization one place to get all resources, minimizing the time spent searching for information, documents or updates on files. To measure the return on investment in productivity is difficult, because productivity does not involve the elimination of specific costs or quantifiable increases in revenues. Productivity is very important to consider in organizations because of the many departments and potential employees who are mobile within the organization. The thought of how productive an organization is at hand.

3.2 OPTIMISTIC VIEW

The optimistic view is that IT will pay off as expected over time. The results will be more tangible and visible enough to encourage managers to invest more in IT. In the optimistic view on technology and development, new information and communication technologies (ICTs) are seen and promoted as a means to solve development problems of organizations. These problems are perceived as barriers to economic growth. IT should enhance the quality of working life as it has helped eliminate burdensome tasks (materials handlers):

- Makes jobs more attractive for the secretaries;
- Improves morale for hospital emergency workers;
- Attracts top -quality staff in accounting; law and other professions;
- Improves safety, security and comfort of employees.

Above all these basics in IT acquisitions, authors in previous research papers indicate that the failures of information technology are as a result of a lack of measurable outcomes, even though the optimistic view highlights good points about the contribution IT makes. In a closer look at the most important economic measure of information technology's role and contribution in organizations, IT pays off. But the researchers, information technology specialists and academics have had similar problems to Erik Brynjolfsson, (1993) and Paul Strassman (1990) in evaluating the role and the contribution of this critical new or emerging information technology in their organizations. The disappointment in information technology has been found in articles disclosing broad negative correlations with economy-wide productivity and information worker productivity, apart from of the optimistic view. Econometric estimates have also indicated low IT capital productivity in a variety of manufacturing and service industries. The economic and information or knowledge worker productivity factors involved have led to a shift from profit as a clear indicator of production towards innovation and knowledge as the most important factors of production in this information age. This results in an incorrect perception of information technology as a solution by information and knowledge workers in organizations. Research of the relationship between higher IT spending and lower productivity in organizations economy considered the main important activity to find out the purpose IT should accomplish. The way IT spending correlates to productivity has yet to be shown. Issues such as return on investment in IT, value of IT and labour productivity remain highly elusive.

Productivity comes from working smart in organizations. It is said that in manufacturing, production can be increased rapidly by automation. It is easy to measure, which has brought huge changes with regards to time, effort and the number of products manufactured at a given time. IT cuts jobs and changes the workflow patterns. IT has evolved to make processes easier to manage. Information technology needs human intervention at some point. It needs to be controlled and managed on continuous basis as well.

3.3 Introduction of Computers in work settings

Managers invest in IT with a insight that it will solve all their problems and instantly increase production. When computers were introduced, they seemed to offer a solution and were widely used in general office settings.

Some people embraced information technology and some suffered major psychological and physical challenges. Roach (1991) said that most of the productivity slowdown is concentrated in the service sector. Service productivity growth was comparable to that in manufacturing, but since then the trends have diverged significantly. Meanwhile services have dramatically increased as a share of total employment and to a lesser extent, as a share of total output.

Services use over 80% IT; this has been taken as indirect evidence of poor IT productivity. The first studies of information technology's impact conducted by Cron and Sobol (1983) looked at a sample of wholesalers. They found that on average information technology's impact was not significant, but seemed to be associated with both very high and very low performers. Paul Strassmann (1990) reported disappointing evidence in several studies. In particular, he found that there was no correlation between information technology and return on investment in a sample of 38 service sector firms: some top performers invest heavily in IT, while some do not. In many of his studies, he used the MPIT data set and had similar results. He concludes that "there is no relation between spending for computers, profits and productivity" Paul Strassmann (1990).

In a research of the data behind the studies of IT performance, it looks as if the measurement of IT production is at the core of the productivity paradox. Although it is too early to conclude that information technology's productivity contribution is below par, a paradox remains in our (human) inability to document any contribution thus far. The second aspect is that if there are possibly important lags between cost and benefit, then short-term results look poor but ultimately the pay-off will be proportionately larger. This is seen in the time of learning and development amongst workers, be it the new technology or other business processes and the changes that are inevitable in organizations, which will be treated as an important aspect in this study.

The positive and negative impact of information technology on variety in measured productivity is econometrically and theoretically supported by Brooke (1991), who conducted a case study in the financial sector, where computers use is at its highest level. The number of information or knowledge workers is also higher in the financial sector than in sectors such as academic, social development and other professional sectors. It has been established that a number of practices by economic analysts tend to understate productivity growth. The productivity paradox benefits and return on investments in information technology can take several years to show up on the bottom line. New technologies may not have an immediate impact is a common phenomenon in organizations. Recent surveys in organizations suggested that many expected it to take as long as five to seven years for information technology investments to pay off or yield the expected results. Eric Brynjolfsson (1993) said that IT may be beneficial to an organization by improving its business processes and will be productive for the industry as a whole by increasing production levels or the economic side as a whole and that information technology gives its own form or rearranges the profits and shares of the business entities. Redistribution may be more of a factor with information technology investments than for other organizational investments. For instance, IT may be used disproportionately for market research and marketing, activities which can be very beneficial in improving supply and demand of products, useful to the organization by improving production levels, changing the work processes while adding nothing to total output.

The redistribution hypothesis would not explain any shortfall in IT productivity at the organizational level: with inadequate IT budgets. Organizations would lose market share and profits to high IT investors. Organizations not using information technology will not benefit from the market, compared to those using and investing in information technology with reasonable expectations. Paul Strassman (1990) pointed out that investments are made because the executives, managers and decision-makers are acting in the interests of the organizations. The same managers are also affected by the many difficulties that researchers have in quantifying the benefits of IT, e.g. the difficulties to finding appropriate measurement instrument. This results to difficulties in bringing the benefits and rewards if work and incentives are not appropriately adjusted. The result is that IT might increase organizational slack instead of output or profits. In some instances the rewards do not even appear directly measurable.

The difficulties of system design, software engineering and the rapid advancing technology leaves little time before information technology is implemented. Successful information technology assessment and implementation processes must not simply impose new technology on old processes, to ensure that the results are evident enough. IT managers in organizations are continuously investing large sums in the technology. This does not suggest that the individuals within the organizations that make investment decisions are rewarded and benefit from IT. Because there are no comprehensive models to measure the changes IT brings. Investigations on IT and productivity have not been at all satisfactory, raising frustration and misunderstanding of the measures and methods commonly used for assessing productivity in organization and the industries. Causal factors of the productivity paradox should be identified and removed, if possible. The dimensions of the paradox are also disturbing and highly challenging a sense that the results are not tangible. We still experience less productivity despite investing millions in IT.

Eric Brynjolfsson (1993) explained the four hypotheses about: firstly measurement errors of IT capital are due to rapid price and quality changes, secondly failure of economic statistics to measure qualitative improvements in the output of service industries; thirdly time lags in the same side and lastly the mismanagement of IT tools. The stakeholders involved in information technology must be aware at all times that our IT tools are still blunt. A link between information technology and productivity is covered widely and discussed but it remains misunderstood. A lot of organizations are increasingly developing an interest in the productivity paradox. Productivity factors involved have led to the shift from productivity to profits. Innovation and knowledge are the most important factors of production. This has affected the way information technology is perceived by information and knowledge workers in organizations. Information technology manufacturing companies have created this assumption from their marketing perspective that information technology delivers according to the expectations of the IT managers. Office automation has changed the way organizations run their business and render their services, but is has not generated the expected levels of production in organizations, regardless of the notion that IT delivers.

3.4 Investments and IT difficulties

Willcocks L.P and S. Lester (1997) note that evaluation and management efforts regularly run into difficulties of three generic types:

- Firstly, many organisations find themselves in a Catch-22 situation. For competitive reasons they cannot afford not to invest in IT, because economically they cannot find sufficient justification, and evaluation practice cannot provide enough underpinning for making the investment;
- Secondly, for many of the more advanced and intensive users of IT, it seems that as the IT infrastructure becomes an inextricable part of the organisation's processes and structures, so it becomes increasingly difficult to separate out the impact of IT from that of other assets and activities;
- Thirdly, despite the high levels of expenditure, there is widespread lack of understanding of IT and information systems (IS) as major capital assets. While senior managers regularly give detailed attention to the annual expenditure on IT/IS, there is little awareness of the size of the capital asset that has been bought over the years.

Failure to appreciate the size of this investment leads to financial technology/financial information systems being under-managed, a lack of serious attention is given to IT/IS evaluation and control, and also a lack of concern for discovering ways of utilising this IT/IS asset base to its full potential. A downside side to why IT has not paid off as we still experience these difficulties which have most often been sought through variants on the mantra: 'what gets measured gets managed" As a dominant guiding principle more, and more accurate, measurement has been advanced as the panacea to evaluation difficulties. In a large body of literature, while some consideration is given to the difficulties inherent in quantifying IT impacts, a range of other difficulties are down-played, or even ignored. These include, for example:

- The fact that measurement systems are prone to decay;
- The goal displacement effects of measurement;
- The downside that only that which is measured gets managed;
- The behavioural implications of measurement and related reward systems; and
- The politics inherent in any organisational evaluation activity.

Despite of the efforts being made, information technology has not paid off yet as expected.

In conclusion, there are several important reasons why managers invest in IT. Managers aim to improve the output levels in production in both the service manufacturing sectors. Managers want to benefit from IT by increasing the quality products, providing variety, customer satisfaction, quality service delivery. Managers invest in IT with an aim to manufacture products with high level of speed and responsiveness. Investment in IT is done to enable companies to handle more products and more variations of existing products. Managers invest in IT with the hope of creating wealth, improving efficiency, producing better quality and increasing profits in organizations. Managers aim to use IT for competitive advantage and increase the return on revenues and increase the net asset value. Managers hope to benefit from IT by improving the quality of life of the information worker by enabling workers to share information, facilitate document storage and trace business process for improved production. Managers invest in IT with hope of managing work easily, and saving time and effort.

CHAPTER 4 DOES IT PRODUCTIVITY PARADOX EXIST?

4.1 Background

The second question addressed in this paper is finding out more about the reaction to the productivity paradox and to try to explain whether it exists. Table. 1 below summarises all the studies done to prove that the IT paradox exists. Eric Brynjolfsson (1993) identified four categories to explain the existence of the IT productivity paradox:

- Measurement errors of IT capital due to rapid price and quality changes, and failure of economic statistics to measure qualitative improvements in the output of service industries;
- Time lags, an argument put forward by Paul David (1990), which said that IT would not have a measurable impact on productivity until it reached a critical mass of diffusion and experience;
- Management practices, which had not yet evolved to take advantage of the potential of the technology; and
- Redistribution, i.e. IT might help individual organizations relative to competitors, but not increase productivity in the whole economy. Yet there is still the inconsistency in IT usage in organizations. The results are still not tangible enough to declare IT as a solution or productive.

4.2 Economy-wide Productivity and Information Worker Productivity

Managers look at the information and knowledge workers as the main cause of IT not paying off without considering problems brought by IT. There are some notions that, since IT improves productivity; those organizations in different industries making the most-intensive use of IT should show higher productivity growth than industries that use IT less intensively (Magrassi, 2000). In my opinion this still needs to be proved. A closer examination of the alarming relationship between higher IT spending and lower levels of productivity in the economy of the entire organization is not the driving force because of other factors affecting productivity. The way in which IT spending correlates to productivity has yet to be shown as new or emerging ways of measuring productivity are discovered over time. Even issues such as the returns on IT, the value of IT and labour productivity remain highly elusive. Research in information technology capital stock and the Gross National Products in developed countries have

shown positive results, but at an enterprise or organizational level this is still to be proven. This is not at all to say that information technology, specifically computers, may not have achieved significant effects in specific areas, such as transaction processing, or on other characteristics of the economy, such as employment shares, organizational structure or product variety. This in a way rather suggests that very large transformations in capital are needed to measure the output under acceptable assumptions on rates of return. The growth in IT stock continues to be significant.

Study and Date	Sample	Findings
CRITO studies		
Kraemer and Dedrick, 1994	12 Asia-Pacific countries, 1984-1990	IT investment positively correlated with GDP and productivity growth
Dewan and Kraemer, 1998 and 2000	36 countries	IT capital positively correlated with labour productivity in developed countries. IT capital shows no significant correlation with productivity in developing countries
Kraemer and Dedrick, 2001	43 countries	Growth in IT investment correlates with productivity growth. Level of IT investment (% of GDP) not correlated with productivity growth.
Melville, 2001	31 industries, 1965-1991	IT returns are positive for US as a whole. Benefit of IT increases with time. Higher IT returns accrue to high-growth industries.
Plice, 2001	Six industry sectors for 38 countries	IT capital shows 5-8 times higher ROI then non-IT capital for developed countries.
Gurbaxani, Melville and Kraemer, 1998	1694 firms, 1987-1994	Degree to which employees are networked is positively correlated with firm output.
Gilchrist, Gurbaxani and Town, 2001	Panel of Fortune 1000 US firms, 1998	IT productivity is greater in producer firms than in user firms.
Tallon, Kraemer, Gurbaxani, 2000	150 firms, 1998-1999	Greater alignment of IT with business strategy results in greater IT profits
Ramirez, 2001	200+ US firms, 1998	Use of employee involvement, TQM and reengineering enhances IT returns.
Other Studies		
Lichtenberg, 1995	US firms 1998-1991	One IS employee can be substituted for six non-IS employees without affecting output.
Hitt & Brynjoflsson & Hitt, 1997	600+ large US firms, 1987-1994	Firms that adopt IT and decentralized organizations are 5% more productive than those that adopt only one of these.
Brynjolfsson and Yang, 1998	Fortune 1000 US firms, 1987-1994	The market value of $1 IT capital is the same as $10 of the other capital stock.
Oliner and Sichel, 2000	US, 1991-1995 and 1996-1999	IT capital accounts for about 2/3 of acceleration in productivity growth after 1995.

Pohjola, forthcoming	39 countries, 1980-1995	IT investment shows 80% gross returns for OECD countries. No significant returns for developing countries.

Table 1: Summary of earlier IT pay-off studies

4.3 The Productivity of Information Technology Capital in Manufacturing

Productivity comes from working smart in organizations. In manufacturing, production can be increased rapidly by automation. Information Technology does not exist as a separate component on its own and in its own environment; there is a need for human intervention at some point. As part of this human intervention, it needs to be monitored and upgraded. As with new and emerging technology, unforeseen problems arose when computers were introduced and were widely used in the general office settings. IT was embraced well by many, while some experienced major psychological and physical challenges. That led to the development of the paradox.

4.4 The Productivity of Information Technology Capital in Services

Roach (1991) mentioned that most of the productivity slow-down is concentrated in the service sector. Service productivity growth was comparable to that in manufacturing, but since then the trends have diverged significantly. Meanwhile services have dramatically increased as a share of total employment and to a lesser extent as a share of total output. Because services use over 80% IT, this has been taken as indirect evidence of poor IT productivity. This finding has engendered the hypothesis that IT tends to reinforce existing management approaches, helping well-organized organizations succeed, but only further confusing managers who have not properly structured production in the first place. Measurement problems are even more acute in services than in manufacturing. Although a number of the dimensional factors of the IT productivity paradox have been stated, the question still remains as to whether information technology is having the positive impact expected. In particular, better measurement of information and knowledge worker productivity are explanation for why IT capital has not clearly improved organization-level productivity in manufacturing and services sectors. Four basic explanations in support of Strassmann (1990) and Eric Brynjolfsson (1993) that Information Technology are contradictory.

4.5 Categories of IT Productivity Paradox

4.5.1 Four Explanations for the Paradox

The first category of the paradox is that measurement errors of IT capital are due to rapid price and quality changes, and failure of economic statistics to measure qualitative improvements in the output of service industries; the problem is the time lags focussing on the time over which the results are expected. In a closer examination of the data behind the studies of IT performance, it looks as if the issue of measurement is at the core of the productivity paradox. Although it is too early to conclude that IT's productivity contribution is at lower levels, a paradox still remains in our inability to identify any contribution thus far. Proposed explanations can be grouped into four categories as identified: immeasurable outputs and inputs; the lags due to learning and adjustment; redistribution and dissipation of profits; and mismanagement of information and technology in organizations by the workers. The index on the IT productivity paradox has not been analyzed yet out of the two explanations pointed out, due to shortcomings in research and not practice. Traditional measures of the relationship between inputs and outputs fail to account for non-traditional sources of value. The second aspect is that, if important lags between cost and benefit exist, then short-term results look poor, but ultimately the pay-off will be proportionately larger. Organizations lack a visionary dimension as far as the IT they invest in is concerned, namely that it is an enabler over a particular period of time, mostly over the long term rather than the short term. This is seen in the time of learning and development amongst workers, be it the new technology or other business processes and the changes that are inevitable in organizations. Learning and development in the field of IT occur over a long period for increased production from a training and development perspective.

4.5.2 Measurement of Errors

Outputs that contribute to the IT productivity are not properly measured, though output can at times be unreliable. It is important to note that measurement errors need not necessarily bias IT productivity if they exist in comparable magnitudes both before and after IT investments. The benefits ascribed by executives in organizations to IT – increasing the quality, improving variety, affecting customer service, having an effect

on speed and responsiveness – are precisely the aspects of output measurement that are poorly accounted for in productivity percentages as well as in most organizations' accounting numbers. This may then result in systematic underestimates of IT productivity.

4.5.3 Output Measurement

Prices need to be adjusted to remove not only the effects of inflation but also to take into consideration quality changes. Measurement output problems are usually arising from the difficult situation of developing accuracy, the quality of products -adjusted in relation to the price deflators.

Additional problems arise when new products or features are introduced. This is not only because they have no predecessors for direct comparison, but also because variety itself has value, and that can be nearly impossible to measure. The positive impact of IT on variety and the negative impact of variety on measured productivity has been econometrically and theoretically supported by Brooke (1991). He argued that lower costs of information processing have enabled companies to handle more products and more variations of existing products. The increased scope has been purchased at the cost of reduced economies of scale and has therefore resulted in higher unit costs of output. For example, if a manufacturer chooses to produce more different products and of different sizes of products, which may have value to consumers, existing productivity measures rarely account for such value and will typically show higher "productivity" in a firm that produces a single type of a product and size. That is why the paradox still exists. Higher prices in industry with increasing product diversity are likely to be attributed to inflation, despite the real increase in value provided to consumers.In services, the problem of unmeasured improvements can be even worse than in manufacturing. For instance, ATMs are one example cited as unmeasured quality-improvement equipment. Some IT systems are hard to measure, which is why we still remain with the paradox and the determination of the value IT adds to banking customers. Organizational percentages implicitly assume it is all captured in the number of transactions, or worse, that output is a constant multiple of labour input!

In a case study of the financial sector, where computer usage and the numbers of information and knowledge workers are higher, it was identified that a number of practices by the economic analysts tended to understate productivity growth.

4.5.4 Input Measurement

If the quality of work life is improved by computer usage (less repetitive retyping, tedious tabulation and messy mimeos), then theory suggests that proportionately lower wages can be paid. Thus the slow growth in clerical wages may be compensated for by unmeasured improvements in work life that are not accounted for in government statistics. A related measurement issue is how to measure IT stock itself. For any given amount of output, if the level of IT stock used is over-estimated, then its unit productivity will appear to be less than it really is. The organizations overstate the decline in the computer price deflator.

To the extent that complementary inputs, such as software, or training, are required to make investments in IT worthwhile, labour input may also be over-estimated. Although spending on software and training yields benefits for several years, it is generally expensed in the same year that computers are purchased, artificially raising the short-term costs associated with computerization. On the other hand, IT purchases may also create long-term liabilities in software and hardware maintenance that are not fully accounted for, leading to an underestimate of IT's impact on costs. With regards to input measurement, there is scepticism about the measurement problems as to whether they can explain much of the slowdown in production. Many measures point out that service quality has gone down, not up. Further, questioning the value of variety.

4.5.5 Time and Period Lags effect on Information Technology Investment

An explanation for the paradox is that the benefits and return on investments from IT can take several years to show up on the bottom line. The idea that new technologies may not have an immediate impact is a common one in organizations. In recent surveys of executives in organizations it is suggested that many expected it to takes at much as five to seven years for IT investments to pay off or yield the expected results. The other recent studies done by Brynjolfsson *et al.* (1991a) found lags of two to three years before the strongest organizational impacts of Information Technology were

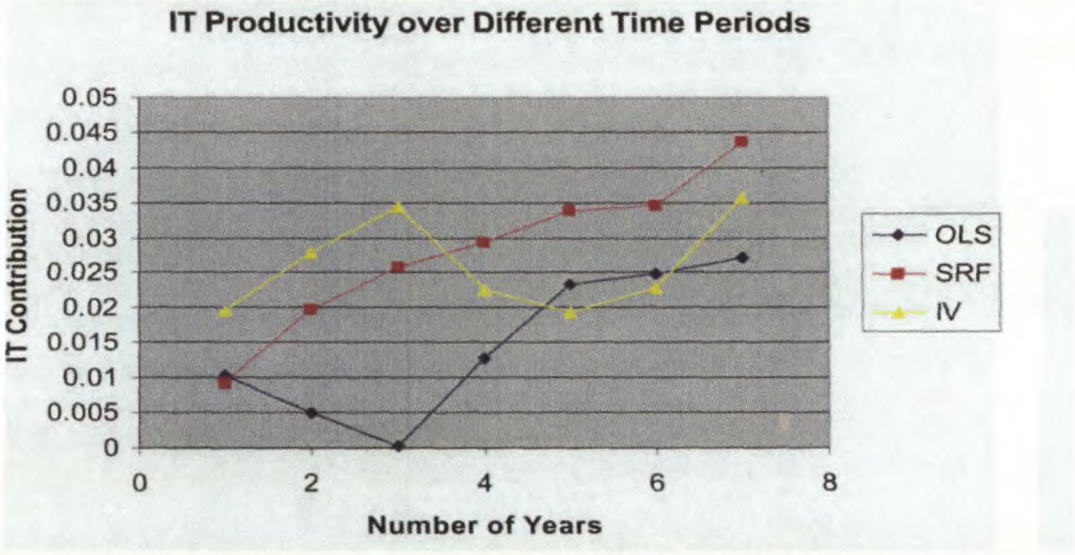
realised and achieved. The benefits from investments in infrastructure (IT) can be huge; they are usually indirect and often not immediate.The existence of lags has some basis in theory. Because of its unusual complexity and novelty, firms and individual users of IT may require some experience before becoming proficient.

According to 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 it might appear that the investment was inefficient. Realising the lag of the benefits of IT is one of the explanations for the IT productivity paradox. Two different sources of lags are discussed in the literature. The first type comes from the fundamental changes in the infrastructure and has a long lag structure (David, 1989). New structures and processes based on new technology have to diffuse throughout the production system (Brynjolfsson & Hitt, 1998). In the case of the electronic dynamo, for example, it took more than 20 years for the new infrastructure to take hold (David, 1989). Another source of the lagged effect of IT is individual and minor organizational adjustments. It has a shorter lag structure. Several studies reported a 1- or 2-year lag for individual users and organizational adjustments Brown *et al.*, 1995). While the methodologies applied in these studies are different, they found that the effectiveness of the organization that adopted IT increased one year after the system installation.

These results imply that it takes about a year for the individual users to familiarize themselves with the new system and for organizations to make minor adjustments. Only after organizations and their members can fully utilize the system will they reap the benefits that IT can provide. Due to the lack of sufficient longitudinal observations, this study looked at testing only the 1-year lag. Six years of data are available. This has not given any enough degrees of freedom to apply sophisticated distributed lag models. Thus, the hypothesis for the lagged effect focuses on the individual learning and minor organizational adjustments needed to take advantage of IT investment. My opinion is that, if IT managers and end-users practice patience and give IT a reasonable time to deliver expected results, the comments on IT would be more positive. Erik Brynjolfsson (1998) in the Graph 1 below analyses IT investment and IT productivity as presented in relation to the time lag.

The data related to this are discussed. The vertical axis represents estimates of the productivity growth contribution of IT capital. The numbers are estimated output elasticity of IT capital, which represent the percentage change in output for a small percentage change in the quantity of IT. The value would be approximately .01 if IT has a "normal" rate of return. These estimates were computed by linear regression and the different lines represent different statistical techniques.

Graph 1: Analysis of IT Investment and IT productivity over time period



"OLS" refers to ordinary least squares. "SRF" (semi-reduced form) is similar to OLS except that labour expense was not included in the list of inputs to reduce biases on the IT estimates from reverse causality between output and labour expense. "IV" indicates instrumental variables regression, which is an alternative way of addressing reverse causality. Comments from other IT gurus are that if information specialists, managers, executives in organizations are accounting for lags, this explanation for low IT productivity growth is optimistic. In time not only we will benefit from the then-current rewards of the technology, but there will be additional benefits to make up for the extra costs incurred.

4.5.6 Redistribution

A third possible explanation is that IT may be beneficial to an organization, but not at all productive for the industry as a whole or the economic side as a whole: IT gives its own form or rearranges the profits and shares of the pie without changing it at all. Rearrangement of the profits and shares is the same argument for why redistribution may be more of a factor with IT investments than for other investments. For instance, IT may be used disproportionately for market research and marketing activities, which can be very beneficial to the firm while adding nothing to total output Baily *et al.,* (1988). The redistribution hypothesis would not explain any shortfall in IT productivity at the organizational level: with inadequate IT budgets would lose market share and profits to high IT investors. This means that those not catching the bandwagon will not benefit from the market at all, as compared to those using and investing in information technology.

4.5.7 Mismanagement

Investments are done without acting according to the initial purpose and in the interests of the organizations. The same managers are also affected because of the many difficulties that researchers have in quantifying the benefits of IT results. IT Managers are finding it difficult to bring the benefits and rewards if work and incentives are not appropriately adjusted. The result is that IT might increase organizational slack instead of output or profits. In some instances the rewards do not even appear directly measurable IT effectiveness. This may emanate from internal difficulties of system design and software engineering, but also because the rapidly advancing technology leaves little time for time-evaluated principles to better diffuse before being implemented. It does not mean that successful IT assessment and implementation process must not simply overlay new technology on old processes.

Researchers consider and propose that the currently low productivity levels are a result of an economy in transition, in this case to the "information age". For the mere fact that organizations are continuously investing large sums in the technology suggests that the individuals within the organizations that make investment decisions are getting some rewards and benefits or at least believe they are getting some benefit from IT. There is no better approach and not even comprehensive models yet of the internal structures, arrangements of organizations and researchers, at least in

economics. In conclusion, these factors confirm that the IT productivity paradox still exists. A lot still needs to be done to enhance IT to pay off as expected. IT really is not productive at an organizational level.

CHAPTER 5 DOES IT PAY OFF AS EXPECTED?

5.1 Business and IT Alignment Results in Productivity Paradox Payoff

5.1.1 Background

Raymond Papp (1999) stated that the debate concerning information technology (IT) productivity or the apparent lack of such productivity is anything but friendly. The "productivity paradox" theory has been supported by Brynjolfsson (1993) and rejected by De Jager (1995) Rayner, (1995) in the literature. IT has been found to increase productivity by improving customer satisfaction, quality, service and convenience in several industries. These intangibles are difficult to quantify. It is sometimes impossible to accurately measure such intangibles, for while they allow companies to differentiate themselves from their competition and gain a competitive advantage, there is no clearly defined performance "metric" or equation to measure these "returns" or intangible gains. Alignment between business and IT is said to be a key to achieving improved productivity from IT. Aligning the business and IT strategies together with the infrastructure, it is possible to measure the financial result of such alignment, which may result in IT paying off as expected.

5.1.2 Implications of alignment

Alignment is important to organizations for many reasons. The primary reason is to ease the development and implementation of cohesive organization and IT strategies that enable businesses to focus on the application of IT to improve. Understanding and leveraging the business-IT partnership, organizations can concentrate on the application of IT to enable the business strategy. This harmony can be extended and applied throughout the organization as new opportunities are identified.

Alignment enables an organization to maximize its IT investments and achieve harmony with its business strategies and plans, leading to greater profitability. The alignment of IT and business strategy to incorporate the capabilities of IT and to transform the business has increased in importance over the past few years as firms strive for competitive advantage in a diverse and changing marketplace (Faltermayer, 1994; Adcock *et al.*, 1993; Cardinali, 1992).

In the light of this, there has been a great deal of research and insight into the links between business and IT. Chan and Huff (1993), Luftman *et al.* (1993), Henderson *et al.* (1992) have said the role of partnerships between IT and business management, as well as the need to understand the transformation of business strategies resulting from the competitive use of IT Boynton et al., (1993) and Davidson, (1993). Organizations have also been able to change not only their business scope, but also their infrastructures as well as a result of innovation regarding IT (Keen, 1991; Foster, 1986). Traditional methods of developing business strategies have failed to take full advantage of IT. Technology was typically treated as costly or viewed as an "expense" rather than adding value to business.

Alter (1995), Henderson and Venkatraman (1993) and Pyburn (1991) argue that strategic alignment sheds new light on IT and its role in the development of business strategies. Strategic alignment considers both the strategic fit between strategy and infrastructure as well as a functional integration between business and IT. By focusing on business and IT, strategic alignment addresses both strategy and infrastructure concerns to achieve alignment among these four areas. Several frameworks have been proposed to assess the strategic issues regarding the role of IT as a competitive weapon. These frameworks serve to define the two dimensions that comprise the alignment model. These include Fit, which is defined as the alignment of external and internal environments within an organization, and Linkage, which is the alignment of the IT and business domains of an organization (Henderson and Venkatraman, 1993; Venkatraman and Camillus, 1984).

Strategic alignment remains a key area of focus among business executives. Methods exist with which to determine the type of alignment an organization is following and there has even been research into the factors, which aid and hinder the achievement of alignment. What has been identified, as a deficiency currently in alignments is a lack in a financial performance metric with which an organization can benchmark itself against its competition, controlling for industry classification or similar alignment perspective.

5.1.3 Information Technology and Strategic Alignments Models

Part of the literature covered in this paper explores the financial performance and alignment of organizations over the past few years. From these data a regression equation to measure performance controlling for alignment perspective and industry classification is proposed. Such an equation provides organizations with an idea of where they stand, on average, within their respective industry and among organizations following the same alignment perspective. The implications for organizational managers are also covered and discussed as well as the general strategies for managers to facilitate and enhance information technology investment. Traditional models, which link domains either horizontally or vertically, previously focused only on business or IT.

The classic strategy-structure fit or IT strategy- infrastructure fit models are no longer sufficient to address the complex interrelationships that exist between IT and the organizations' business strategies. The relationships between the horizontal domains of business and IT strategy, and business and IT infrastructure are difficult to understand due to complexities (Miles and Snow, 1978). Figure. 1 below illustrates the strategic alignment model. While it is important from an alignment perspective, IT strategy-infrastructure fit model is not sufficient in itself to explain the diverse, complex relationships required to link IT strategy with the overall business strategy.

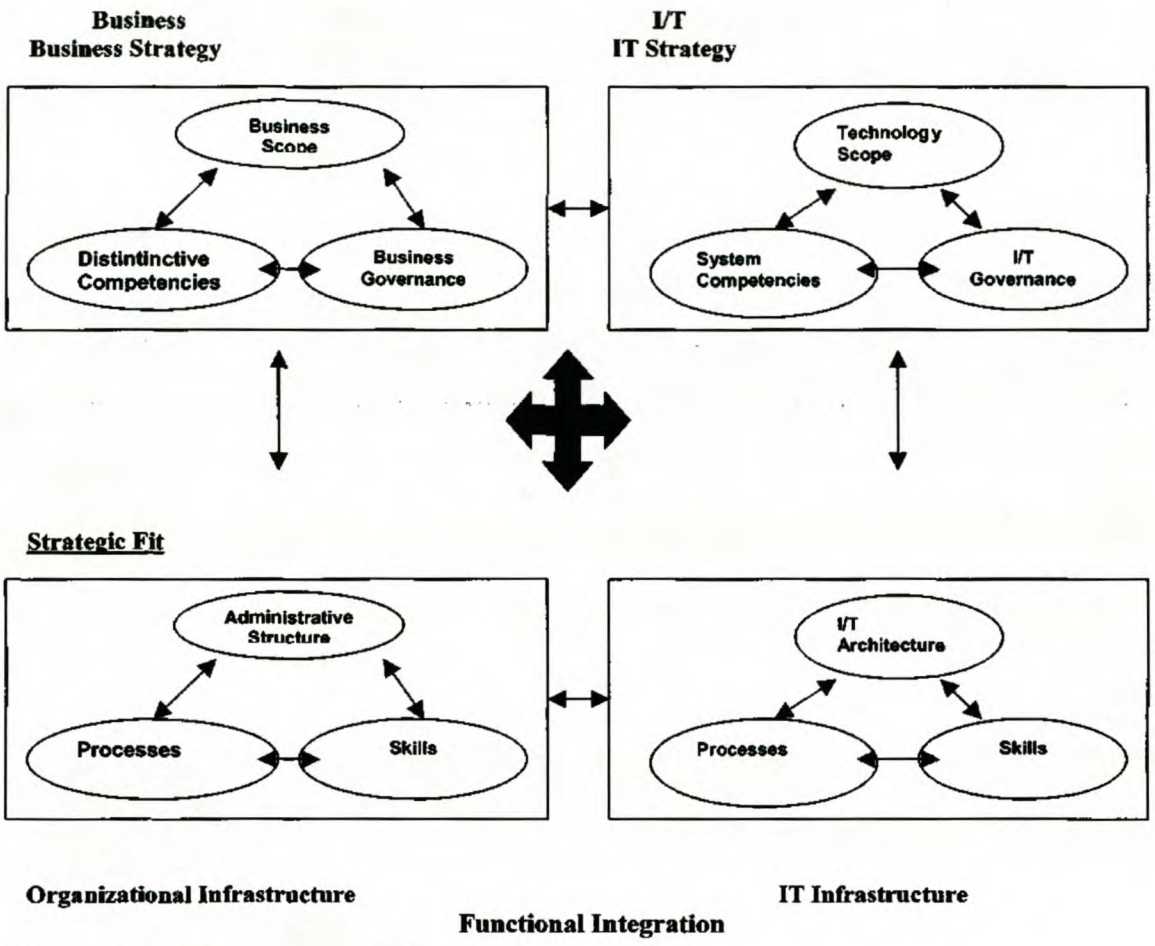


Figure 1: The Strategic Alignment model

The strategic alignment model in Figure: 1 addresses this insufficiency. The strategic alignment model, the framework for this study, is based on the theoretical construct developed by Henderson and Venkatraman (1990). The model used here explores the interrelationship between business and information technology. It is based on two distinct linkages: strategic fit and functional integration. Strategic fit is the vertical linkage concerned with the integration of the external environment in which an organization competes (e.g. organizational scope, partnerships, alliances, core competencies) and the internal environment in which an organization performs (e.g. organizational structure, human resources, business processes). Functional integration is the corresponding horizontal link between business and IT. These two linkages are used to determine the relationships between information technology and business.

This gives us hope that IT will pay off as expected. The model is divided into four quadrants:

- Business strategy;
- IT strategy;
- Organizational infrastructure and processes; and
- IT infrastructure and processes.

These four quadrants are interrelated. The way they relate represents a perspective. Effecting a change in any single domain requires the use of three out of the four domains to ensure that both strategic fit and functional integration are properly addressed. A total of 12 perspectives (which encompass three of the four domains) have been identified and described in the literature (Papp, 1995, 1998; Papp *et al.*, 1995; Luftman *et al.*, 1995).

Fusion is the combination of two perspectives. In fusion, the pivot and the anchor domain are not adjacent to one another, but rather across from each other on the diagonal. Since there are two "paths" from the anchor to the impacted domain, it is necessary to identify the weaker of the two pivots and implement this perspective first. Previous research has not only identified and described the above perspectives, but it has also found that a combination of two perspectives called fusion is common Papp, (1995); Luftman, (1996). The most common perspective focuses on both organizational infrastructure and IT strategy. This combination results in a fusion of two perspectives, strategy execution and technology potential, into IT infrastructure fusion. The fusion construct can be extended to include all eight of the previously described perspectives, resulting in four distinct types of fusion Papp, (1995); Luftman *et al.*, (1995). Strategic alignment, the appropriate use of IT in the integration and development of business strategies and corporate goals, remains the key concern of business executives King, (1995); Watson and Brancheau, (1991). Alignment's importance has been well-known and documented for almost a decade (Brancheau and Wetherbe, (1987); Dixon and John, (1989); Niederman *et al.*, (1991) and this trend has continued as indicated from its recent top-ranking in the business press by executives King, (1995). Clarity is needed on how to achieve harmony between business and IT, and what the impact of misalignment might be on the organization's profitability and financial wellbeing.

5.1.4 Financial performance of Information Technology and Strategic Alignment

Once an organization has identified its alignment perspective, according to Papp (1995), and Papp and Luftman (1995), the next step is to determine the impact of financial performance on that alignment perspective. Specifically, do any of the traditional (or non-traditional) financial measurements affect an organization's alignment perspective? In an attempt to answer this question, 18 financial measurements were studied for their effect on a firm's alignment perspective.

These measurements included:

Return on investment (ROI);
Return on sales (ROS);
The current and quick ratios (which measure short-term liquidity and solvency);
Gross profit;
Pre-tax income;
Net sales;
Growth in earnings/share (EPS);
Income growth;
Sales growth;
Earnings/share; and
Current and long-term debt-to-equity.

The financial factors outlined in this study appear to have a direct impact on the organization's perspective and industry classification. These seven factors suggest the likelihood of achievement given a specific perspective or industry. They provide management with a vehicle for forecasting possible outcomes regarding financial performance. When aligned with IT, management should follow the steps below to achieve alignment as a means of improving performance and profitability.

ALIGN organizational strategies by:

- Assessing the organization's perspective using the alignment model;
- Learning to recognize and leverage IT within an organization to maximize efficiency;

- Incorporating financial measurements suitable for your particular industry when assessing alignment;
- Giving everyone in the organization a clear and useful role to facilitate synergy between IT and the business;
- Never stopping the assessment of alignment within the organization.

This alignment strategy is a continuous, dynamic process requiring constant monitoring. Strategic alignment remains one of the leading areas of focus among business executives. Assessment of an organization's perspectives along with the analysis of the financial performance factors provides management with a vehicle for forecasting possible outcomes regarding financial performance.

The importance of cooperation between business and IT to maximize investment in technology remains clear. As IT plays an increasing role in defining corporate strategies, its correct application will facilitate both a more competitive and profitable organization.

The careful assessment of an organization's alignment is important to ensure IT is being used to appropriately enable the business strategy. In assessing new technologies, policymakers should allow time between the adoption of the technologies and the realization of productivity gains attributable to them. Productivity growth has been much lower than might be expected. But an improvement as learning processes took effect, and resource management and the use of inputs has became more efficient. In conclusion, an answer to the question of whether will IT pay off in time. When properly aligned with the business strategy, IT is likely to pay off as expected. As for financial results, IT can increase financial rewards, if it is well managed and strategically aligned.

5.1.5 Strategic use of information technology for increased innovation and performance

In his study of a comparison of the emerging "information age" with the industrial revolution, Kaplan (1989) has prompted a new approach to management accounting. He said that advancement of information technology, globalization, the emergence of the Internet and the changes in the economics of the world has prompted organizations to compete with the rest of the world, resulting in stiff competition amongst industries, businesses and organization in this information age in which there has been a shift from production to profits and innovation, as well as a use of knowledge and skills to leverage organizational performance and remain competent in this ever-changing knowledge and economic society. It has come to be a matter of concern amongst organizations to be productive at all costs, using the available technology coupled with knowledgeable workers and capital in such organizations. Thus a review of the IT productivity research indicates an analogous opportunity to rethink the way we measure. D'Aveni (1994) denotes this, in its most extreme form, as hypercompetition. He argues that organizations are increasingly finding themselves in stiff business environments facing rapid increases in both turbulence and complexity, leading to enhanced uncertainty and increased competition. This has also led to an increased focus on innovation as a means of creating and maintaining sustainable competitive advantages (cf. Nonaka and Takeuchi, 1995). Efficiency and rapid access to knowledge and information are becoming paramount in this development.

Consequently, spending on information technology (IT) has surged during the last decade, while a number of authors have expressed considerable uncertainty as to the benefits of IT. It was found that 80-90 per cent of IT investments did not meet their performance objectives. Raymond Papp's (1999) argument is that IT has failed to produce the surge of innovations necessary for a new wave of productive creation of economic wealth. Brody (1991) makes the point that IT has been subject to a high degree of technology push and rhetorical prognostication regarding its economic and social impacts, but that the reality has fallen far behind the rhetoric. Nobel Laureate in economics, Robert M. Solow (1987), has noted that he could see the computer age everywhere but in the productivity statistics. It was found that there is consistency

with the findings and arguments presented in a number of recent studies by Brynjolfsson, (1993), Dos Santos *et al.* (1993), Loveman, (1994); Morrison and Berndt (1990), Strassman (1990) and Wilson (1993), who have pointed out that there is little or no relation between the investment in IT and the performance of the company, particularly in relation to productivity improvements. This has been regarded as the "productivity paradox" of IT in literature.

Dos Santos, Peffers and Mauer, (1993), in their study of the impact of information technology investment, information systems research said that in determining whether investments in IT have an impact on organizations performance has been and continues to be a major problem for information systems researchers and practitioners. Quinn's (1996) argument is that, although not reflected in macroeconomic measures of productivity or standard financial measures of financial performance, there is little doubt that information technology has improved performance enormously. Hypercompetition is creating an increasing focus on innovation, using conventional productivity measures, as the only performance indicator would be inadequate when studying the impact IT has on businesses. Investing in information technology does not ensure its proper implementation. Consequently there is a need to consider what organizations are using IT for and its consequences for innovation and a variety of performance measures. The research question asked is: How does the use of information technology affect successful innovations and organization performance? Basically the idea is that different uses of IT affect different outcomes to different degrees.

5.1.6 Successful Innovations and Performance

Raymond Papp (1999) mentions that Kotabe and Swan (1995) state that one of the most imposing obstacles to the understanding of innovation has been the lack of a meaningful measure. Prior research has yielded no definite definitions of measures of innovation, and hence there is still some controversy over the issue. It was documented that the definition of innovation as "any idea, practice, or material artefact perceived to be new by the relevant unit of adoption". Raymond Papp (1999) argued that being new is not the same as being desirable. Their focus is not on innovation in the sense that it is sufficient simply to adopt an innovation. In addition it needs to be successfully implemented.

Presently a study in productivity paradox by Strassmann, P.A. (2001) has its main focus on how the use of IT affects both successful innovation and performance. For instance, it was mentioned that heavy investment in R&D and product innovation might enable an organization to enter successfully into new product-market domains and consequently enhance growth in the long run. This may detracted from short-run profitability. This is an indication that what is good for innovation might not be good for performance and vice versa.

In conclusion IT can play a role in innovation and improve an organization's performance in this global economy and hypercompetitive era, which is a clear indication that IT will pay off without attaching any financial value to the results.

5.1.7 Performance

My opinion is that performance is closely linked to productivity in any given industry. A continuous search for measures of performance is a viable alternative to measuring productivity; the literature where performance is used is very extensive, but shows a lack of consensus as to the meaning of the term. This is also consistent with the findings. It was pointed out that the use of the term performance by researchers included many constructs measuring alternative aspects of performance. The vast majority of studies have used financial measures of performance. The reason for this obsession with financial performance measures is partly because financial performance is at the core of the organizational effectiveness domain, and partly because it is one of the most easily quantifiable industrial parameters.

5.1.8 Taking Users into Consideration

Users are an important component of organizations. Users should be regarded as important role players in ensuring that IT pays off as expected. They control, manage and make decisions on information systems, strategies and business models to use for the sake of productivity. Despite widespread investments in information technologies, very little of productivity paradox can be shown to positively impact on the organizations profits.

The argument here is that information processing technologies; offer diminishing returns, while investments in knowledge technologies, offer increasing returns. Such a shift, in order to be effective, must be built with a core focus on meeting the users' needs in knowledge work. For this purpose topics reviewed include knowledge retrieval, including knowledge servers and their architecture; knowledge capture; and knowledge navigation and discovery, which I will not dwell on much. Knowledge-gathering processes and knowledge technologies are human-centric processes that are the main reason such processes will be mentioned in passing. Information technology does not and does exist accompanied as mentioned in arguments formulated by authors not clear what this means. The emphasis is on the fact that it requires human intervention for IT to deliver as expected by managers in organizations.

People who are action-oriented tend to pursue interactive, social knowledge. Knowledge technology to motivate such people should support engaging, proactive search processes that uncover intriguing information almost continuously to maintain attention. This is to say a shift from Information Technology (IT) to Knowledge Technology (KT) yields much better and anticipated results. Such a shift toward KT will, hopefully, build on the user's needs in knowledge work. Rather than automating processes to achieve cost savings only, knowledge technology needs to evolve toward empathetic designs that help the user add value in a corporate context. Moreover, technology should help the user to be effective in an idiosyncratic way, characteristic of the particular user's way of working with knowledge. Some people work better in intense and continuous collaboration with others, others do better with intermittent collaboration to bring productivity to its heights.

In organizations every commodity coupled with IT and KT has its challenges. For instance, KT has to address the characteristics of knowledge itself that:

- Knowledge is a commodity that cannot be taken off the shelf like a book;
- The change in content is due to the nature of knowledge being endogenous to the people who "have" it in the sense of being able to recreate the knowledge and share it in a particular context. Knowledge is something that is internalized, thus mixing with personal characteristics of people as well as embedded in contextual, and social characteristics of situations;

- Knowledge has its lifespan: knowledge needs to be continuously recreated;
- Corporate incentive systems in their emphasis on individual performance and measurable outcomes may have done severe damage to people's native instincts in knowledge sharing;
- In user knowledge profiles, knowledge is idiosyncratic – people have personal approaches to knowledge and knowing; the motives to search for knowledge differ, so do the triggers that set people off to search for knowledge.

Figure 2 below, adapted from Guns and Välikangas (1998), suggests a shift toward knowledge technologies and will, hopefully, build on the user's needs in knowledge work. Rather than automating processes to achieve cost savings only, knowledge technology needs to evolve toward empathetic designs that help the user add value in a corporate context. Moreover, technology should help the user to be effective, characteristic of the particular user's way of working with knowledge Guns and Välikangas, (1998). Sophisticated knowledge technologies need to build on an understanding of user idiosyncrasy in knowledge work. This figure shows the importance of knowledge technology-driven processes in organizations in that they also contribute positively to the production levels. It carries an idea that IT does not exists as a component on its own, but needs to be matched with knowledge technologies, which are human, or people-driven processes.

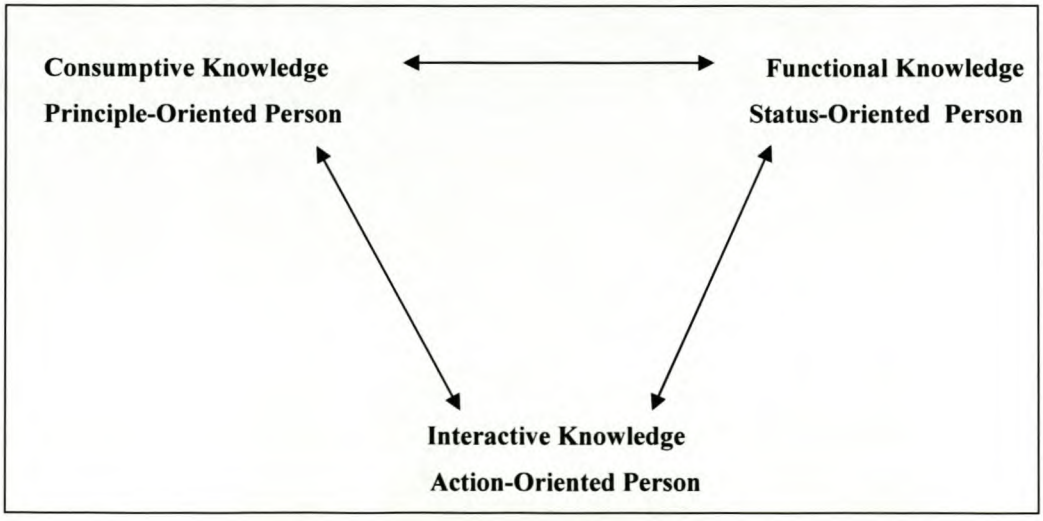


Figure 2: Knowledge Profiles

Productivity studies indicate that knowledge workers in a range of functions – sales, marketing, personnel, project management, research, etc. – spend large amounts of time searching for answers to questions. Sometimes the information they seek is in the head of an unknown colleague whom they must first identify, then access.

Other times, the information might exist in a corporate database, in an archived audio file, on the Internet or on a supplier company's intranet. Knowledge servers are software systems that leverage the power of networked computing resources (high-speed servers, high-capacity storage and ubiquitous desktop PCs) to deliver this information to users in a more timely manner and often from a greater number of sources than a human could access unaided. Knowledge servers also have the potential to add value to the information they process and deliver. For example:

- Knowledge servers can automatically translate documents;
- Knowledge servers can connect users with common interests – for example, a marketing analyst who is researching, e.g. Mozambique, for instance, and a marketing analyst in another office who is researching Zambia and Angola – to form dynamic communities that encourage collaboration and avoid duplication of effort;
- Knowledge servers can use context understanding to sort documents from a news aggregator into predefined categories;
- When a knowledge server responds to a user's query, the server can adapt its response to the profile of the user and the context of the query. In this way, the knowledge server may eliminate technical information in response to a marketing manager's query, but deliver highly technical content to a scientist who had placed the same query;
- Through the analysis of information that a user draws from a knowledge server, knowledge servers can create highly specific user profiles that enable targeting of personalized services;
- Some knowledge servers can access human experts as information sources if electronic sources fail to deliver a satisfactory response. In such situations the knowledge server stores the expert's answer together with the query, thereby avoiding the need to contact the expert if a user poses the same query some time in

the future. As knowledge in the knowledge server accumulates, human experts should receive progressively fewer queries;

- The knowledge server can report on query activity for each department or user to help identify knowledge deficiencies and training requirements.

This knowledge management tool acts as an enabling technology for knowledge workers' functions in an organization. In that way it can improve IT functionality, which is easier to depict or identify for the purpose of measurement.

This issue is mainly focused on the how KT tools are meant to improve the workers' functions, tasks and enabling them to deliver according to their job requirements. It is then said that the ultimate frontier of KT is enabling and equipping people to create, share, contemplate and apply live knowledge.

Live knowledge is knowledge that is in the process of being recreated (rather than stored as information), in the process of being communicated among people in a community and across communities (rather than e-mailed), in the process of being thought about and reflected (rather than written in a book) and in the process of being applied (rather than being written as a know-how manual). The most interesting insights come not from finished dissertations, but from dissertation proposals.

Some will say that such a world will produce a lot of half-baked ideas and failing measures, and that it is better to wait and see the knowledge when it is carefully evaluated, appropriately packaged and properly communicated. For some, this approach to KT may indeed be a preferred approach. They trust the world will not change faster than the process that produces well-founded knowledge. For others, life is inherently messy and so is knowledge. For those with an appreciation of the messy nature of knowledge, fast insights are worth more than careful articulations of true statements in a world of uncertainty, change and complexity. KT of the future needs to meet the user needs of both groups and more – keep knowledge honest and efficient by recording, sharing and evaluating it, but also keep the pursuit for new knowledge alive, unhampered by knowledge accountants and technologies which already have the answer for all our questions. Computers as machines have their own effects on buildings and office occupants. Such effects are seen in visual fatigue from glare and

muscle fatigue from the constrained positions of the monitors, with lighting contributing to such fatigue and causing vision and posture problems. Ailments caused by awkward and repetitive motions also develop. This result in reduced productivity from disruption, fatigue, from a cramped, cluttered workspace and stress caused by a poor office environment. Power interruptions and lost time due to overloaded circuits also contribute to the level of production of the knowledge worker.

In conclusion, people are the main driving force behind IT paying off as expected; in organizations they carry the vision and the skills to leverage IT to its full capacity for productivity. Recognition should be given to users to play a meaningful role in ensuring IT pays off as expected. The idea proves to be a good one to yield expected results, regardless of the shortcomings of IT in organizations.

5.1.9 What are the implications for managers?

How should executives and managers view the results of these studies?

The following are points for consideration.

- It has been claimed that the original productivity paradox has been resolved, that on average IT spending does pay off, and there is no need to fear that technology investments are a systematic waste of scarce resources. Rather, managers should be concerned with whether their own IT investments will pay off, and what they can do to maximize the returns on those investments.

- As for the new paradox, in spite of the optimistic findings about the high returns on IT investments, managers cannot simply give R2000 to their favourite IT vendors and expect to get R4000 in return. First, the results are an average and not a guarantee of any company's likely return. Second, as many of the studies point out, the most important variables are organizational structure and management practices. In fact, a study by Brynjolfsson and Hitt (1996) found that organizations that invest heavily in IT within centralized organizations perform worst of all. Studies found that management practices such as IT alignment with business strategy, employee involvement, total quality management and re-engineering, enhance IT returns Tallon, Kraemer and Gurbaxani, (2000); Ramirez, (2001). At the case study level, we can compare an organization which has been very successful investing in IT to refine and extend its

well-designed direct business model, to another, which invested heavily in a different technology implementation to improve the performance of its complex indirect business model, with poor results.

- The biggest concern for managers should be restructuring their organizations and implementing effective management practices. In such an environment, IT investments are likely to be most productive. Figure 3 below presents a stylised figure, which illustrates the relationship between IT investment and productivity, and two ways in which an organization might increase productivity.

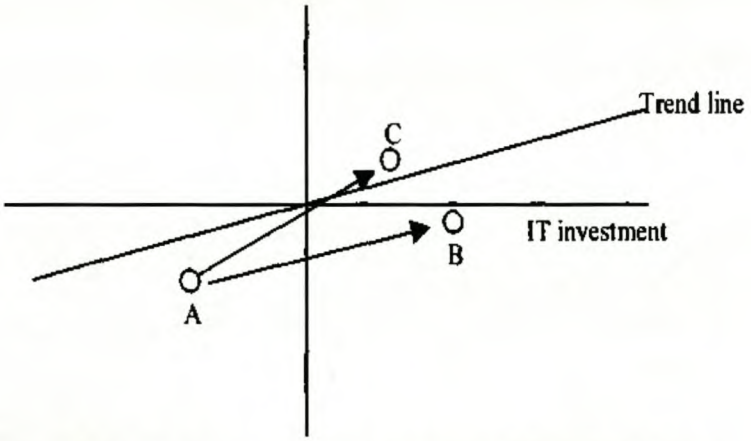


Figure 3: Two paths for improving productivity with IT

The trend line shows the average relationship for a large number of firms, as seen in some of the organizational level studies. But suppose a firm is at point A, meaning it is spending a relatively low share of revenues on IT, and is also below the trend line, meaning it is getting a below average return on its IT investment (probably due to poor management practices).

If that organization increases its IT investment without changing its management practices, it is likely to move parallel to the trend line to point B, an expensive way to make modest gains in productivity. On the other hand, if it increases IT spending (even to a lesser extent), while making corresponding changes in its structure and processes, it could move to point C – a greater gain at a lower cost. The key is getting the business processes right.

Then the IT might be simple or complex, and the investment small or large, but the pay-off will be there in any case because of the joint investment. Research points to several managerial practices that are shown to complement IT investments and improve an organization's performance. Based on surveys, case studies and the work of others, we would identify the following lessons for organizational managers:

- Aligning IT investments with business strategy is critical to the success of IT paying off. This has been stated often in the management and IS literature, yet large numbers of organizations still suffer from poor alignment of IT and business objectives. A key to achieving alignment is greater interaction between business executives and IT executives — involving information systems executives in business planning, on the one hand, and involving business executives more in IS planning and investment decision making, on the other hand Tallon, (2000).

- Decentralized organizations are more successful overall and show better returns on IT investments. The model associated with many successful high-tech organizations is the "virtual entity," which is decentralized internally and has strong links to external suppliers, customers and business partners.

  This model allows for flexibility and responsiveness in dynamic markets, and allows firms to focus their attention on core, strategic functions, while leveraging the capabilities of business partners for other activities. IT and e-commerce play a vital role in coordinating the internal and external relationships in such a model.

- Decentralized IT organizations, coordinated by a strong CIO, appear to be effective in many cases. Two well-known case studies of successful IT use are Dimension Data and IBM Systems. Each has a strong organization CIO who is responsible for setting architectural and infrastructure standards, and designating certain application standards across the company.

But IT projects are largely staffed and funded within functional departments, which have leeway in determining their own spending priorities and choosing applications relevant to their own operations. An IT organization, which formerly was highly centralized, has since moved more responsibility and staffing to individual business units, partly in response to complaints about the centralized, top-down approach taken to the system's implementation.

Information technology is most effective when implemented in conjunction with complementary practices such as total quality management and process redesign. One has to benchmark against other companies to understand where they are in terms of IT investment and performance measures. Most organizations have no idea how they rank in relation to their peers and competitors in variables such as IT spending levels, structure of IT costs (e.g. hardware, software, outside services), or perceptions of IT effectiveness on the part of IT managers and other executives. Participating in benchmark studies such as those conducted by research institutes and firms can provide baseline data for measuring the effectiveness of IT. Organizations have to develop internal methods to measure returns on IT projects, and to learn from successes and failures in order to reduce risk and improve performance in the future. Such metrics need to be developed by teams that include IT managers and managers of functional units, so that they measure outcomes that are most important to business strategies (one aspect of alignment). Measuring the impacts of IT on broad performance variables such as revenue per employee or return on assets is very difficult, so there is a need to develop process-oriented variables that can be translated into dollars and cents impacts.

For instance, inventory turnover improvements can be directly attributed to IT investments and related process changes. It should then be possible to translate such an improvement into a measure of cost savings, if the cost of carrying inventory can be estimated.

As projects are completed, it is valuable to gather feedback from IT staff and others involved as to what problems were faced, how they were solved, and what impact the new systems had on specific operations. This information can be documented and made available through knowledge management systems for others in the company to use. There should also be mechanisms in place for people to interact with others outside their usual work groups and share practical information and experience.

Such development of institutional knowledge can enhance IT performance and also help better align the IT function with overall business strategy.

5.1.10 What are the Implications for the IT Industry?

- Celebrate. The IT industry's products and services do improve customers' productivity, and the resolution of the productivity paradox should encourage IT users to continue to invest. But it is too early to do that, if the general feeling is that IT has not paid off yet.

- IT companies have to promote education and learning about the organizational and management practices that enhance the returns from IT investments and decrease the likelihood of failed investments. Realizing returns from IT investments is not a simple matter. It requires appropriate infrastructure, human capabilities and organizational learning. Employing what is known about successful management practices will help to ensure smart investments and improve IT pay-off.

- IT sales companies need to tone down the marketing rhetoric that creates unrealistic expectations about IT returns. The IT industry is notorious for hyping every minor innovation as "revolutionary" and for making extravagant claims about the capabilities of its products.

  Such rhetoric confuses customers and IT professionals alike. More importantly, it sets customers up for disappointment if a product turns out to be simply useful and leads to scepticism on the part of users. IT companies would do well to heed the admonition "under-promise and over-deliver."

- IT companies have to be a model of success for a customer. Show customers how to use technology to improve performance.

- Most economists do not agree with Gordon Robert (2004) that nearly all of the productivity gains of the past few years can be attributed to the IT industry itself, but there is no doubt that the IT industry has shown exceptional productivity gains and is a heavy user of IT itself. Companies such as Dell, Oracle and Cisco promote themselves as models of how to use IT and the Internet effectively. This not only helps sell products, but it puts the whole company on alert that others are watching, so the company must be a model of effective IT use.

In addition to that Management Information Systems specialists brought the following critical issues to the fray in an attempt to bring an understanding to productivity paradox. Offer an explanation of its role in businesses and organizations. The idea that IT supports the information-processing task in organizations and is further perceived as an enabler of innovation, e.g. courier organization offers first package software that could be used by customer electronically not sure how this should read. Information processing tasks are proposed to ensure IT pays off in the workers' perspective and mainly to change the preconceived ideas that IT is a solution highlighted by the Table 2 below.

Table 2: Information processing tasks

Information Processing	**Description**	**IT tools**
Capturing Information	Obtaining information at its point of origin	Input technologies Examples: Mouse Keyboard Bar code reader
Conveying Information	Presenting information in its most useful; form	Output technologies Examples; Screen Printer Speakers
Creating Information	Processing information to obtain new information	Software technologies Examples: Word processing Payroll Expert system
Cradling Information	Storing information for use at a later time	Storage Technologies Example: Hard disks CD-Rom Tape
Communicating Information	Sending information to other people or to another location	Telecommunications technologies Examples: Modem Satellite

		Digital papers

Others ideas that could ensure that IT pays off as expected are explored and the emphasis is on planning in organizations so that alignment of organizational goals and IT may bring success specifically.

Fusing IT and business together works well to improve productivity. The second idea is practicing competitive intelligence to gain advantage over competitors.

Other ideas that are possible enhancers to IT paying off and elevating productivity are not widely discussed, but mentioned in short such as:

- Building better processes with IT in organizations, e.g. value chain and finding ways to add value;
- Contingency planning by planning for survival even in stiff competition;
- Information and knowledge management by being able to manage your information and knowledge worker better.

Other issues that are pointed out include being aware of the existing relationship between information technology and organizational structure in your organization. Information technology should be perceived as an innovation tool in organizations.

Organizational managers should also be conscious of the environmental changes, developments in the market, behavioural changes of the knowledge workers, which are positively correlated with IT, and organizational changes. The idea in information technology studies is that a smart organization is a permanent learning organization.

5.1.11 Change Management

IT users and managers should deal with the change brought about by an introduction of IT into organizations. It should also be considered in relation to the issues at hand, including globalization, the Internet revolution and the stiff competition and innovativeness of competitor organizations. Organizations change over time, staff

changes the growth of organizations influenced by markets and the changing technologies, which are inevitable in this changing information age and competition.

5.1.12 IT Ethics and Political issues

William Cats-Baril and Roland Thompson Irwin, (1997) comment on the IT productivity paradox by proposed the following IT ethical issues: personal and workgroup productivity, on productivity and Information or Technology. Organizational managers take responsibility of IT as a generic managerial task, including information acquisition and processing, analysis and control, forecasting and simulation, document management, presentation, inter and intragroup communication, managing personal and group schedules, creativity and idea generation and project management.

Politically there are different ways to manage technology in an organization, which managers apply based on information politics, represented well in the Table 3 below.

Table 3: Political models of IT management

Technocratic utopianism	Reliance on technology: model the organization's IT structure and rely on new technology. These organizations are fascinated with technology. There is an assumption in such organizations that IT is a solution. Such organizations will develop databases, desktop workstations, and networks, and purchase large amounts of software. These organizations lack the vision of how all of this technology will be used to further its objectives.
Anarchy	No overall information management Anarchy results when technology is not managed. Management abrogates its responsibilities to control IT. This strategy may encourage the bold to acquire computers and connect them, but as the organization matures, the lack of overall planning and standards will create tremendous problems.
Feudalism	Management of IT by individual business units; limited corporate reporting Executives control technology within their divisions and departments. These executives determine what information to collect and choose the technology for their divisions. They also make the decisions on what information to forward to higher levels of management. Governed by divisional autocracy.
Monarchy	Strong control by senior management: information may not be shared with the lower levels of the organization. In a monarchy the CIO becomes chief information ruler. Instead of playing the consultant role, the CIO establishes and enforces standards that will be followed throughout the corporation.
Federalism	Management through consensus and negotiation about key IT decisions and structures. The federal model may be the most appropriate. The organization tries to reach a consensus on what IT decisions belong at each level and how information should be shared. Recognition that local divisions need some autonomy, and local managers recognize that information belongs to the company and may often be of great strategic value

5.1.13 Influence of Information Technology Management

The analysis also provides support for hypothesis —IT management matters. The results show that different IT management structures have different impacts on the economic performance of an organization. This indicates the importance of efficient IT resource management. Organizations with a CIO who controls organization wide IT resources performed better than those with different formal IT management arrangements. Another interesting point is that organizations with only an Information Resources Manager commission showed no performance differences from the organizations without any formal IT management functions.

This indicates that a CIO, who usually has technical expertise, may play a critical role in managing IT resources. These results also attest to the importance of centralized control of IT resources to assure the compatibility of the systems and data formats across organizations and agencies. Connectivity and compatibility in terms of information and data as well as hardware are critical issues.

Without easy and timely exchange of information, the benefits of using IT are diminished. A centralized decision based on technical expertise can provide a platform on which each sub-unit can build its system to communicate with others.

In conclusion it has been observed that IT surely has hope that it will payoff when strategically aligned with the business, business processes and that partnership should be leveraged to see the results. It is also evident when IT is properly aligned with the business infrastructure inclusive of the people and other relevant components. Financial performance of the investments should also be well determined with the alignment. IT results would surely be noticeable when used for innovation and raising performance level in organization. Organizational managers need to apply the paradigm shift from IT to KT for proper management of information technology by users as important components of the knowledge technology components. Then celebrate IT payoff in organizations.

CHAPTER 6 HOW DOES IT IMPACT IN AN ORGANIZATION?

6.1 The Impact of Information Technology

The early perception of IT recorded in table 4 below. In examining the relationship between the performance of organizations and investments in IT is a difficult task, regardless the perception illustrated in the Table 4 below.

Table 4: Perceptions of IT

Issues	IT a Cost/ Liability	IT an Asset
Are we getting value for money invested in IT?	ROI on IT is difficult to measure; the organization as a whole is unhappy with IT	ROI is difficult to measure; the organization believes IT makes an important contribution
How important is IT?	Stories of strategic IT use are dismissed as irrelevant to the organization	Strategic stories are intrusive
How do we plan for IT?	IT plans are made by specialists or missionary zealots	IT thinking is subsumed within organization or business thinking
Is the IS function doing a good job?	There is general cynicism about the track record of IS	The performance of IS is no longer an agenda item
What is the IT strategy?	Many IT applications are under development	IS efforts are focused on a few key initiatives
What is the CEO's vision for the role of IT?	The CEO sees a limited role for IT within the organization	CEO sees IT as having role in the transformation of the organization
What do we expect of the CIO?	The CIO is positioned as a specialist functional manager	The CIO is valued as a contributor to business thinking and organizations operations.

The difficulties come primarily from the lack of availability of performance measures. Most of the outputs organizations produce are intangible and do not carry market value, which is a convenient proxy for performance in the private sector. One way to get around some of these problems is to change the scope of analysis. The bottom line of the organization's role is service to society. While the contents of service vary depending on society's demands, the basic role of organizations services is to help the private sector perform better. Investing in IT helps organizations improve the efficiency of internal operations through automation. In addition, IT can improve the quality of existing public services, create new types of service that were not previously available, and increase the accessibility of those services. Organizations IT investment and its associated improvements are geared toward increasing value to organizations. When organizations make IT investments, the investments result in some direct benefits that contribute to future cash flows. In addition, the investments may also have indirect benefits in the form of new investment opportunities for the organization. For example, investment in a new technology project may improve a firm's ability to use this new technology in future projects, thus affecting the organization's future investment opportunities.

This study addresses the question: do IT investments affect the market value of the organization? To answer this question, an analysis of the impact of IT investment announcements on the common stock prices of publicly traded organizations. Event-time methodology is used, which is a standard methodology in the accounting and finance. If the market responds by revaluing the organization's shares to reflect the information in the investment announcement, one can conclude that the announcement of an IT investment affects the market value of the organization.

More precisely, if the market expects an IT investment to have a positive net effect on the value of the organization, then that value will be reflected in the market price of the organization's common stock. As a consequence, we can measure the market's assessment of the expected impact of IT investments on total organization value by examining stock price reactions around announcements of IT investments.

However, the market's reaction to IT investment announcements may depend on a number of factors. Industry characteristics, investment timing and the strategies of the organization are examples of factors that are thought to be among the determinants of IT investment value Dos Santos and Peffers (1992), For example, in the early 1980s financial institutions were thought to have more information-intensive processes than manufacturers Porter and Millar (1985). As a result, IT investments may have different effects on firm value in the financial services industry than in the manufacturing industries. Therefore, this study will examine whether firm values in two major industry groups, financial services and manufacturing, were affected differently by IT investments.

Other studies, based on economic theory, have suggested that innovative investments in IT and other technologies may result in greater rewards for investors than follow-up investments. Innovators, or first movers, may be able to obtain superior performance if they can capture favourable market positions, secure scarce resources, or benefit from learning how to restructure processes to take advantage of innovations before their competitors can imitate them. These are important findings for two reasons. The first has to do with the risks of IT investments. Innovative IT applications are very risky investments. The costs can be high and the benefits are difficult to identify in advance. Moreover, innovative IT applications are not protected by patent or copyright laws, and frequently are easily copied by competitors. Consequently, it is difficult to justify investments in innovative IT applications. The evidence that investments in innovative IT applications increase firm value, supports the efforts of managers who have been espousing investments in innovative IT applications to gain competitive advantages.

The second reason has to do with the opportunities that are available to use IT in innovative ways. Each new IT that is introduced provides firms with opportunities to use the technology to change the way the firm conducts its business. In the 1960s and 1970s, the technologies that were available provided firms in the finance and insurance industries with many valuable investment opportunities because IT enabled firms to reduce costs by automating clerical activities. More recently, however, new IT have given companies in the manufacturing industries opportunities to use IT to change design and manufacturing practices, and to change the way in which these firms are linked to their customers and suppliers.

Linking IT investments to organization's performance is difficult because many factors other than the investment affect organization performance, and separating the effects of IT investments from other effects is extremely difficult. The event-study methodology can enable researchers to circumvent this problem by allowing for a direct estimate of the impact of an IT investment on firm value. Such estimates are clearly as good as (if not better than) other measures of IT investment performance that have been used in the extent literature. The event-study methodology could be useful in addressing other interesting management issues involving classes of investments or circumstances in which investments are made. As Eric Brynjolfsson and Lorin Hitt, (1996) said "productivity paradox" of information systems (IS) is that, despite enormous improvements in the underlying technology, the benefits of IS spending have not been found in aggregate output statistics. One explanation is that IS spending may lead to increases in product quality or variety which tend to be overlooked in the aggregate statistics, even if they increase output at the firm-level. Furthermore, the restructuring and cost cutting efforts that are often necessary to realize the potential benefits of IS have only recently been undertaken in many organizations.

Their results indicate that IS spending has made a substantial and statistically significant contribution to organization output. Spending on information systems (IS), and in particular information technology (IT) capital, is widely regarded as having enormous potential for reducing costs and enhancing the competitiveness of organizations. Although spending has surged in the past decade, there is surprisingly little formal evidence linking it to higher productivity. This "productivity paradox" has alarmed managers and puzzled researchers said Eric Brynjolfsson and Lorin Hitt, (1996). Corporations have spent billions on computers, and many firms have radically restructured their business processes to take advantage of computers.
If these investments have not increased the value produced or reduced costs, then management must rethink their IS and IT strategies.

As a result, an assessment of several econometric models of the contribution of IS to firm-level productivity is to be done. In an examination of the data presented by Eric Brynjolfsson and Lorin Hitt, (1996), indicate that IS spending has made a substantial and statistically significant contribution to the output of firms. They found that the contribution of IS to output does not vary much across years, although there is weak

evidence of a decrease over time. There is some evidence of the differences across various sectors of the economy. Technology strategy also appears to affect returns. Eric Brynjolfsson and Lorin Hitt, (1996) pointed out that in an interpretation of the findings, it is important to bear in mind IT specifically computers would not, on average, have higher profitability or stock market returns.

In addition, as with any new technology, a period of learning, adjustment, and restructuring may be necessary to reap its full benefits, so that early returns may not be representative of the ultimate value of IT. Accordingly, he argues that "mismeasurement" and "lags" are two of four viable explanations (along with "redistribution" and "mismanagement") for the collected findings of earlier studies as stated in previously reviewed papers. Eric Brynjolfsson and Lorin Hitt, (1996) have indicated that the primary reason for IT investment was customer service, followed by cost savings. Close behind were timeliness and quality. In practice, the value of many of the benefits of IT, other than cost savings, are not well captured in aggregate price deflators or output statistics Baily and Gordon (1988).Many recent overseas studies have shown both difficulties in establishing the business value of IT, and also indifferent evaluation practice. One 1995-96 study points to sectoral differences, with a majority of financial companies getting 'good' or 'very good' value from IT, while manufacturing and distributive trades are less certain about the IT payoff now, and less optimistic about IT payoffs in the next five years. One noticeable, and worrying, feature of such studies is how often their findings on weaknesses in evaluation practice replicate those of much earlier studies. IT evaluation practice is suggested to assess the impact IT is making in organizations. A key element in making the evaluation cycle dynamic and effective is the involvement of motivated, salient stakeholders in processes that operates the evaluation criteria and techniques.

6.2 Evaluation and Assessment —a systems life-cycle approach

A systems life cycle approach is a clear indication of how IT impacts on an organization. Evaluation and Assessment measures offer an evidence of how IT impacts on an organization as a whole. One way forward for organizations is the notion of an IT/IS evaluation and management cycle. A simplified diagrammatic representation of this is provided in Figure 4.

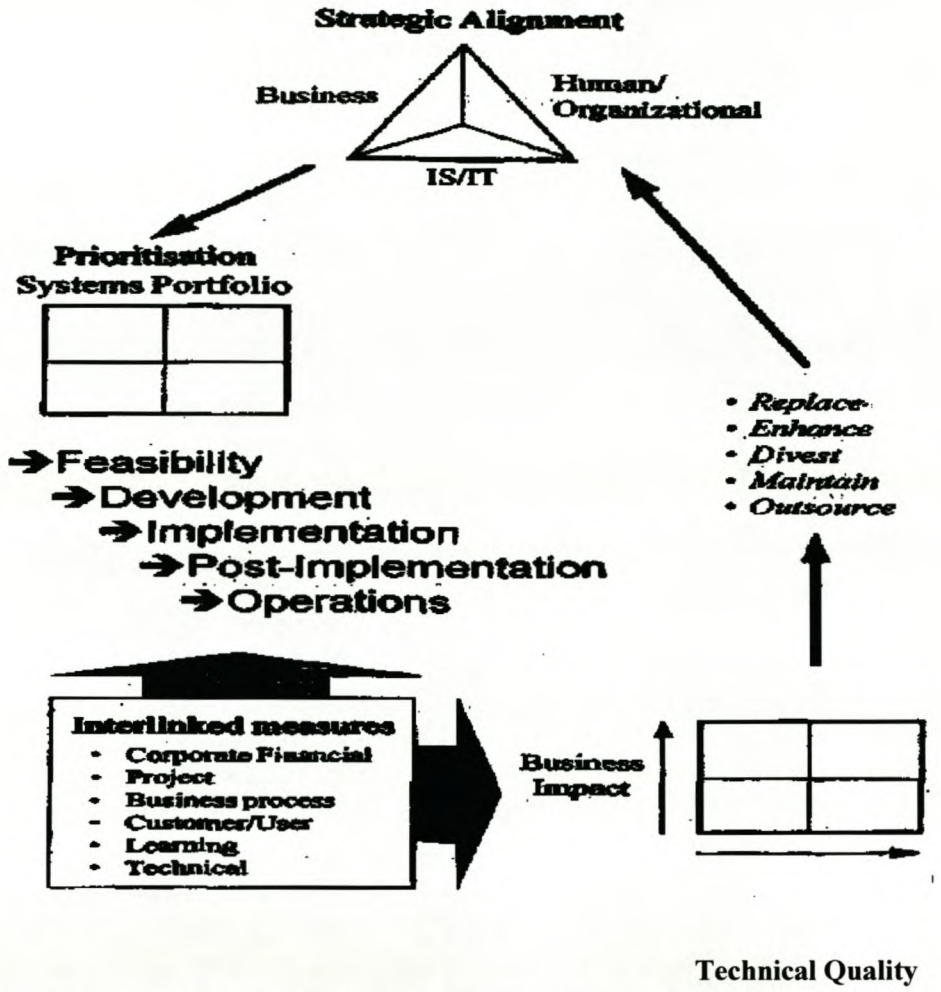


Figure 4: Investing in IT/IS- an evaluation lifecycle

Earlier research found that few organizations actually operated evaluation and management practice in an integrated manner across systems lifecycles. The evaluation cycle attempts to bring together a rich and diverse set of ideas, methods, and practices that are to be found in the evaluation literature to date. Such an approach would consist of several interrelated activities: Identify net benefits through strategic alignment and prioritization. Identify types of generic benefit, and matching these to assessment techniques.

1. Developing a family of measures based on financial, service, delivery, learning and technical criteria.

2. Linking these measures to particular measures needed for development, implementation and post-implementation phases. Ensuring each set of measures run from the strategic to the operational level.
3. Establishing responsibility for tracking these measures, and regularly reviewing results.
4. Regularly reviewing the existing portfolio, and relating this to business direction and performance objectives

Investing in IT/IS is represented well on Figure. 4 an evaluation lifecycle

6.2.1 Prioritisation

The notion of a systems portfolio implies that IT/IS investment can have a variety of objectives. The practical problem becomes one of prioritisation, of resource allocation amongst the many objectives and projects that are put in place.

6.2.2 Feasibility

After alignment and prioritisation, the feasibility of each IS/IT investment then needs to be examined Nievelt, Norris and Peters (1992). All the research studies show that the main weakness here has been the over-reliance on and/or misuse of traditional, finance-based cost-benefit analysis. The contingency approach outlined above helps to deal with this, but such approaches need to be allied with active involvement of a wider group of stakeholders than those at the moment being identified in the research studies.

6.2.3 Development and implementation

The evaluation cycle posits the development of a series of interlinked measures that reflect various aspects of IS/IT performance, and that are applied across systems lifetime. These are tied to processes and people responsible for monitoring performance, improving the evaluation system and also helping to 'flush out' and manage the benefits from the investment. Nievelt, Norris and Peters (1992), suggests the need for six sets of measures. These would cover the corporate financial perspective (profit per employee); the systems project (time, quality, cost); business process (purchase invoices per employee); the customer/user perspective (on-time delivery rate); an innovation/learning perspective (rate of cost reduction for IT services); and a

technical perspective (development efficiency, capacity utilisation). Each set of measures would run from strategic to operational levels, each measure being broken down into increasing detail as it is applied to actual organisational performance. For each set of measures the business objectives for IT/IS would be set. Each objective would then be broken down into more detailed measurable components, with a financial value assigned where practicable.

6.2.4 Post-implementation

One all too often routines phase of review is that of post-implementation Figure 4 (see appendices). Our own research suggests that this is one of the most neglected, yet one of the more important areas as far as IS evaluation is concerned. An advantage of the above schema, in practice, is that post-implementation evaluation rises naturally out of implementation assessment on an on-going basis, with an already existing set of evaluators in place. This avoids the ritualistic, separated review that usually takes place in the name of post-implementation assessment. A detailed discussion on how to perform an effective post-implementation review not discussed further.

6.2.5 On-going operations

There remains the matter of assessing the on-going systems portfolio on a regular basis. Notoriously, when it comes to evaluating the existing IT/IS investment, organisations are not good at drop decisions. There may be several related ramifications. The IT inheritance of 'legacy systems' can deter investment in new systems—it can, for example, be all too difficult to take on new work when IT/IS staff are awash in a rising tide of maintenance arising from the existing investment. Existing IT/IS-related activity can also devour the majority of the financial resources available for IS investment. All too often such failures derive from not having in place, or not operational, a robust assessment approach that enables timely decisions on systems and service divestment, outsourcing, replacement, enhancement, and/or maintenance. As Figure shows, such decisions need to be based on at least two criteria—the technical quality of the system/service, and its business contribution—as well as being related back to the overall strategic direction and objectives of the organisation. Paul Strassman (2001) concludes that it is not how much you spend on IT, but how you manage your IT assets that make the difference.

6.3 Capital asset budget committee

Before building, buying or outsourcing, an information systems project must meet with approval from some form or version of a capital asset budgeting committee in an organization.

6.3.1 Difficulty of quantifying IT investments for the capital asset budget committee

One key theme underlying the capital budgeting issue is that of the complexity of accounting for the sometimes is an ephemeral benefit of an information system, yet still needing to meet the business requirement to quantify its exact cost and payback. The specific nature of the bottom line benefits of an information system are often less readily quantifiable. Information systems returns appear in "soft rand" ways such as increased competitive advantage, improved customer service, enhanced productivity, or staff reductions or reassignments. Several of these items cannot be effectively converted to dollars on an income statement, or calculated for an internal rate of return or NPV estimate.

6.3.2 Difficult to trace the value of IT to the economy

In fact, on a macroeconomic level, there are some who believe that there really is a low return on IT in terms of GNP. There are also many who believe that the benefits to IT at the firm level are perhaps not quantifiable, but may be of greater benefit than some projects with faster or larger paybacks. These concerns are part of a larger body of research in MIS called the "Productivity Paradox of IT". These issues are not only observed at the firm level, but across the economy as a whole. Does IT affect firm performance in a measurable way? Does IT affect the economy in a measurable way? In the early '90s, the value of IT was questioned at the GNP level. Now, with the booming economy, some of this is attributed to an IT effect. New research shows that the return to IT is very high Brynjolfsson and Hitt (1998).

6.3.3 The Challenge of Evaluating the IT Project for investment

According to Laudon and Laudon (2002), Information Systems or Information Technology costs can be divided into two categories of benefits- tangible and intangible. The tangible category includes Laudon and Laudon (2002):

6.3.3.1 Tangible benefits to IT investment

Increased productivity, low operational costs, reduced workforce, lower computer expenses, lower outside vendor costs, lower clerical and professional costs, reduced rate of growth in expenses, and reduced facility costs.

The intangible category includes the following Laudon and Laudon (2002):

6.3.3.2 Intangible benefits to IT investment

Improved asset utilization, improved resource control, improved organizational planning, improved organizational flexibility, more timely information, more information, increased organizational learning, legal requirements attained, enhanced employee goodwill, increased job satisfaction, improved decision making, improved operations, higher client satisfaction, better corporate image.

The costs include the following Laudon and Laudon (2002).

6.3.3.3 IT investment expenditures:

Hardware, telecommunications, software, services and personnel (also training, upgrades, lost employee time)

There are six basic methods used for the formal analysis of capital budgeting for information systems Laudon and Laudon, (2002).

6.3.3.4 IT capital budgeting formal analyses:

Payback method, ROI, cost benefit ratio, net present value and profitability index, IRR. These are from a financial perspective Laudon and Laudon (2002).

Some forms of IT capital investment are necessary, and some forms of IT investment are for strategic, competitive advantage. To have a strategic, sustained advantage over one's competition, Floyd and Wooldridge (1990) argue that the technological edge must be unique, and benefits more easily if one's firm is the first one on the block with a new technology. This research reports a study which investigates if organizations are more likely to have higher returns on IT if there is a tight linkage between organization strategy, organization IT and firm performance. If an organization's IT fits the organization's strategic direction, a firm may exhibit a better ROA.

In conclusion IT has impacted positively in organizations, the industry and well-developed countries. Thought it also carries with itself risk factors when investing in it. Higher investments do not at all guarantee higher returns. IT has opened up opportunities in industries, business, improved the business and workers processes. It has increased profits in businesses and the growth in economy to reasonable levels. IT has brought a change in business processes by automation and knowledge technologies and ensured that managers realize the potential it has in returning the value on investments. It was also found that IT results are also intangible, by being unable to quantify its investments. Its value is said to be untraceable to the economy. Positive results and impact can be realized over-time.

CHAPTER 7 RESEARCH DESIGN AND METHODOLOGY

7.1 Aims

This investigation was generally concerned with an aim of gathering knowledge and ideas surrounding the use of Information Technology in organization to boost productivity. Particular issues of influence and concern are of use in organizations for production and to leverage competitive advantage. Broadly it asks about the mismeasurement, time invested in IT for results. This study stated from motivations that:

1. Identifying factors that contribute to Information Technology investment not to pay off as we thought,
2. The use of Technology in organizations,
3. To identify possible ideas to enhance IT to payoff and generating such from previous research work and present IT user in organizations.

7.2. Designing Fieldwork.

This research design builds on research done into the use of technology in organizations, using a qualitative research method to present some of the specific tools and experiences used to inform the research design of the research and the development for interpretation. In my research I looked at organizational issues and setting over a period of time, to try and see what encounters there were with technology. I wanted to see how organizations across service and manufacturing sector linked production, innovation, and profits into their existing organizational processes and how technology was interpreted.

My problem was to get access to get information from the respondents by being open, co-operative and sincere in discussing the aspects of their work setting as knowledge workers. I also dwelled on the method called Participants observation, which assisted me to surmount the obstacle and problems encountered when trying to get the respondents to participate and co-operate as an individual. In this case I concentrated on IT managers. I wanted to study the way IT managers and Knowledge workers encountered Technology in organization with an aim to improve production.

7.3 Initial concept of Research Method

I decided to use an Informant approach, taking many point of entry an individual such as the IT manager who would to some extend assist in gathering and participating in the research and provide entry into an organizations work setting. The research design then allowed me to map out other various people that use this technology in an organization. I would then conduct interviews with those they work with and ask them to respond on their experiences. The informant (IT manager) and the other will be selected on the basis that they use this technology. This will have an important influence on the research outcomes.

The involvement of the informant in this regard is conceived as being important for practical and theoretical reasons. Interviews were conducted with the respondents the informant and the other users identified in this organizations in an unstructured research design, which are mostly used in literature review for data analysis purposes. A schedule of issues or topics of which questions were created from, were designed in the Table. 5 below and referred as each selected participants were interviewed.

Table 5: Interview questions and issues

Background of Participant	**Information Technology and related tools usage for communication and work.**
Educational background including skills and knowledge with experience Resources	Information use and management attitude Communication tools use Work communication Co-workers and customers communication
Work activities	**IT use and Knowledge**
Work activities e.g. filing, word-processing, systems management, scanning.	IT use IT adoption Network use of IT tools IT attitude Engagement with IT Knowledge with IT Problems with IT Knowledge with implementing IT in organizations Policy issues of IT

The first set of Interview was conducted on 06 July 2004. The interview explored the knowledge of the participants - looking at the work setting, the organizational processes and knowledge workers processes. The interviewing approach started not from the technology side but from particular activities, and attitude towards those activities in organizations. The questioning aimed to find out what the important activities in organizations were and how the participants perceive IT usage in their organizations. The more particular questions were asked about technology in everyday work setting of participants based on earlier remarks of the participant.

7.4 Second stage empirical Data Collection Method

The second Interview focussed on the current ideas and the use of technology, and investigated further experiences and changes brought by technology in organization. I attempted to get the participants to tell me more about their experiences about the IT they use in organization in manufacturing and the service sectors. With an aim to deduce what effect does IT have on their work whether it improves their style of work or disadvantages it carries? The interviews looked for ways technology came to be judged as an enabler rather than a solution. Look specifically at the productivity and profits.

7.5 Data Analysis

Interviewed 3 IT analysts and 3 IT managers and 4 IT users from a service and manufacturing sectors to gather quickly finish the interviews. I used a laptop computer to record the mass of interview transcript. The aim was to extract from this material quotes corresponding to all the issues I had raised and look for new ideas and issues arising directly from the participants. The aim was to balance on one open ended responses to a wide range of responses.

7.6 Validity and Reliability

The section addresses the reliability and validity of the research methodology. The question is how these criteria are met in the design research study whereas interviews are the main source of data and interpretation and coding as main techniques of analysis. Briefly address internal reliability and external reliability and validity. Internal reliability of this research methodology concerns itself with the reliability methods that were used within this research paper.

My measure for obtaining internal reliability included systematic gathering of data by means of prior identified key teams in IT managers and processing data using consistent system.

For the external reliability; the criterion is virtually replicability by means of tracing the research by reporting in such a way that it can be reconstructed by others. This required transparency and explicitness about how technology affects the work setting, how Information Technology brings changes and assist the knowledge worker to generate profit and improve productivity.

CHAPTER 8 RESULTS OF THE STUDY

In this part of the paper I present the results of the research conducted to investigate the use of IT in organizations, specifically the service and manufacturing sectors.

8.1. Results of IT usage versus Productivity levels in services sector

Results of the research conducted to gather knowledge and information why IT does not payoff as expected.

It was found that there is a trend in the services sector that prevails with regards to IT usage and productivity levels. The relationship does not yield positive results. Which are explained according to each IT user presented as follows?

❖ **4 IT End users**

- The 4 IT end users attitudes is negative towards IT which in turn affects productivity levels,
- An element of uncertainty about IT,
- Lack of confidence towards IT,
- Most end users are less knowledgeable with the IT tools in their company.

This affects their level of performance and dealing with their workload though, it is not IT problem. It was identified that the problem is with their attitude towards IT and their behaviour. Furthermore the following was observed with usage of communication tools such as the telephone and email. This two are used extensively to communicate with other co-workers. Their response to this is very reasonable in sense that IT tools are not a solution to problems they experience. Their comments are that it improves communication, easy to use, allows faster response. Enables one to send documents faster but at times its slow, the network crashes and servers are down. The first time IT tools users have problems familiarising themselves with the systems. IT adoption on the part of the user is a painful experience, since this involves change. One of the users responded by saying that, IT managers should allow users sufficient time to learn. Since training and development also involves a process of adoption, familiarisation.

Some users made the following comment that IT managers should allow users to test the IT tools before implementing in organizations. Allow them to play around, trial and error kind of method.

❖ **3 IT Analysts**

The most important contribution that IT can make as observed by IT analysts is that it improves the working processes. IT assists one to be creative, dynamic in their work. This in a way contributes positively to production. IT analysts made a good point by linking working smart to being productive.

Admit that IT comes with its disadvantages as analysts. They would find that IT changes the pattern of work a user is used to. Some results are positive but because of the problems such as unfriendly interfaces, systems errors, screen freeze, network blockage, inaccessible pages, emails returned without being delivered, slow systems, incompatible software and the most common problem of computer crashing.

❖ **3 IT Managers**

IT managers' comments were based on the IT end users and IT analysts' point of view. They dwelled on the negative results and the problems with that IT in organization specifically the service sector as represented by the graph above.

A general feeling about IT in services sector is that it does not solve the problems. Makes working processes easier, communication is improved. All the IT users made very important comment that production results are not tangible enough in the service sector. The number of products produced cannot be seen. The only way one can judge is IT users are productive is when their performance is measured using instruments such as the performance management systems. With an attempt to find out whether can work effectively using the available IT tools.

8.2. Results of IT usage versus Productivity levels in manufacturing sector

The results of the research conducted to gather knowledge and information why IT does not seems to payoff as expected. The relationship does seem to yield positive results. Such results are explained according to each IT user are presented as follows below:

❖ **4 IT End users**

It was found that there is an opposite tendency in the manufacturing sector that prevails with regards to IT usage and productivity levels. With the following results:

- The 4 IT end users attitudes is positive towards IT which in turn affects productivity levels,
- An element of uncertainty about IT is still there because systems still crash,
- Confident towards IT, since it is part of production,
- Most end users are well trained to control and are more knowledgeable with the IT tools in their company, especially in production.

Their level of performance and dealing with their workload thoroughly is enhanced by IT usage. Their behaviour is positively related to the performance and production levels.

Furthermore the following was observed with usage of IT tools such as the computers to monitor the production percentages and the outputs per input. Computers are used extensively to record the speed, products produced and the expected levels of production. The response to this is positive because the results are visible in terms of numbers. The quantity produced is measurable which, is an achievement for production teams. But IT tools also have their disadvantages similar to those experienced by IT users in service sectors which then warrant one to say IT is not a solution to problems they experience. IT improves working patterns, removes the workload, results are immediate, allows faster response. To enable users to send produced goods, faster at a time.

The first time IT tools users have problems familiarising themselves with the systems too. IT adoption on the part of the user is a painful experience, since this involves change and learning new equipments. Time factor was of concern to the users in manufacturing sector. Users need sufficient time to learn. Extensive training and development should be organized to learn the systems. One advantage with the user of IT tools in manufacturing is that they are given practical training sessions to learn and train on the computerised machines. Apprenticeship plays a major role to allow IT user in manufacturing sufficient time to gather knowledge and skills.

❖ **3 IT Analysts**

IT analysts say that computerisation and computer use in manufacturing is contributing positively to production levels in manufacturing sectors. Though it has its own problems and that it should not be perceived as a solution but an enabling tool to increase production. This also involves working smart. The results are positive.

❖ **3 IT Managers**

IT managers' comments were based on the IT end users and IT analysts' point of view. They covered aspects such as learning, training and monitoring. They suggested that if an IT system is introduced in an organization that manufactures products. Learning and mastering the IT tool is important. Most organizations in this sector use the same principle.

A general feeling about IT in manufacturing sector is that it does not solve the problems, but enable production and that the results are tangible and visible enough. IT in manufacturing sector makes production processes easier; results are traceable, communication amongst production team is improved. IT productivity is still to improve in manufacturing/producer organization than in user/services organizations, because of the time lag in investments. The most contributing factor to IT being highly regarded in manufacturing sector is that the out put levels are controllable, raised to unexpected levels at time and change over time. The results are more tangible as compared to the service sector results. There are no comprehensive models yet, of the internal structures, arrangements of organizations and researchers, at least in economics.

Other studies findings in support of the IT usage and productivity levels in organizations a have found that in support of financial theory that suggests to managers to make investment decisions that maximize the value of the organization. Over the announcement period, we find no excess returns for either the full sample or for any one of the industry sub samples. Conversely, cross-sectional analysis reveals that the market reacts differently to announcements of innovative IT investments than to follow-up, or non innovative investments in IT. Innovative IT investments increase firm value, while non innovative investments do not.

Furthermore, the market's reaction to announcements of innovative and non innovative IT investments is independent of industry classification.

These results indicate that, on average, IT investments are zero net present value (NPV) investments; they are worth as much as they cost. Innovative IT investments, however, increase the value of the firm.

The market's reaction to announcements of innovative and non innovative IT investments is independent of industry classification. These results indicate that, on average, IT investments are zero net present value (NPV) investments; they are worth as much as they cost. Innovative IT investments, however, increase the value of the organization.

CHAPTER 9 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSION

In conclusion, our preconceived ideas that IT should deliver have been proven incorrect and are not satisfied at all. The notion that IT is a solution has also failed. Hence a lot of authors argue that the paradox does not exist at all. Moreover the concept is misunderstood due to a myopic approach IT managers have applied in our organizations. The most relevant point is that IT has made significant impact in the manufacturing sector more than in the services sector. Investing in IT is surely correlated to higher returns in manufacturing sectors. In services sector there needs to be more reasonable expectation of IT since the results are still intangible.

IT in the services sector should be perceived as an enabler to reduce or eliminate travelling. IT should be used as an instrument that assists in cutting costs. To enable knowledge workers to share and store documents. Eliminate the paper trails, and increase production. It should be perceived as a wealth generator for organizations. Managers mainly relying on the Optimistic view to see the contribution IT makes such as making jobs attractive, improvement of morale, attracting top and highly skilled staff with an improvement in safety, security and comfort. Production can be increased by automation in manufacturing to higher levels by using IT in business processes. An assumption that high IT investment is positively correlated to increased production has proved to be true from the manufacturing sector but in the service sector it is still awaiting proof.

An idea that aligning business, business strategies and IT is key to achieving improved productivity from IT is still to be practiced in organizations and that requires time and effort to reap the results. It is a recommended approach to align the business and IT strategies and infrastructure, which is possible to properly measure the financial result of such alignment. It is true that it is not spending or investing in IT that is the solution; but the proper management of information technology and data structures that will lead to higher levels of productivity in such organizations. Information Technology properly implemented has a positive impact on productivity. Managers must get back to the basics that IT is there to increase innovation and performance.

It was found that IT investment is positively correlated with GDP and productivity growth in manufacturing sectors. IT capital is positively correlated to labour productivity in developed countries.

IT capital shows no significant correlation with productivity in developing countries. Growth in IT investment correlates with productivity growth. The level of IT investment (% of GDP) is not correlated with productivity growth. Benefits of IT increase with time. Higher IT returns accrue to high growth industries. IT capital shows 5-8 times higher ROI than non-IT capital for developed countries. The degree to which employees are networked is positively correlated with organizational output. IT productivity is greater in producer organizations than in services organizations. Greater alignment of IT with business strategy results in greater IT profits. Use of employee involvement, TQM and reengineering enhances IT returns. One IS employee can be substituted for six non-IS employees without affecting output. Organizations that adopt IT and decentralized organization are 5% more productive than those that adopt only one of these.

IT investment shows 80% gross returns for OECD countries, but no significant returns for developing countries. IT capital accounts for about 2/3 of acceleration in productivity growth in recent years. It is a known fact that IT does not function alone - it needs human intervention and control. So user behaviour, knowledge, and computer literacy is of importance in ensuring that IT delivers the expected results.

Some defects or limitations with IT are that there are no models and formulas to be used in measuring productivity from the service sector as compared to the manufacturing sector. Managers must understand issues in production across industries. Dedicate sufficient time when investing in IT. They also need to understand the dynamics involved in IT spending, such as IT management, IT organization and IT alignment, as well as the strategic alignment and the psychosocial impact of IT in an organization. Managers' perception in organizations about IT should change and they should assume IT as an enabler, not as a solution to better manage information and perform tasks. Remain competitive in this information age characterised by hypercompetition, Internet revolution and globalisation.

Gaps in the study still exist since the instruments used to measure production in manufacturing versus the service sector are still blunt. There is a higher level of uncertainties in organizations about processes such as the feasibility study, systems development and the involvement of users that might require further research.

9.2 RECOMMENDATIONS

Recommendations and suggestions are also discussed with regard to the use of IT for improved productivity. Managers must clearly understand the main purpose why their organizations invest in IT. Managers should perceive IT as an enabler and not as solution. IT managers should be strategic when acquiring new and emerging Technology. We know that IT should bring wealth to improve efficiency, provide better service and increase profitability. Organizations need to have clarity from the outset with regard to the purpose of IT and must never loose sight of the original purpose. Organizations have to put its business needs before the IT or system. Technology needs to fit the business needs and not the business to fit the technology. Organizations need to identify exactly what it wants from an IT system and what can be affordable. The most important thing that the IT system must deliver is competitive advantage and it must support an organization to get over the competition: to provide some unique advantage. Additionally IT should aid an organization to increase its turnover or profitably or both.

To increase net asset value of the organization, IT should not cost an organization or additional profit it generates. IT must play a part in increasing the return revenues and also contribute to an increase in the net asset value of its business. Organizations have to thoroughly assess the costs of their IT systems, whether they are worth procuring or not. Choosing the IT system most suited to its organizational business is one of the most difficult tasks but organizations need to be sure when buying these tools. Managers in organizations need to avoid traps to identify the specific results it requires the system to deliver. To qualify the costs involved and challenge the costs involved and challenges the solutions suggested by IT experts.

A number of organizations have to call on subcontractors, suppliers to put a system proposal. In a way such organizations should go for the best suitable and worthwhile system.

A simple IT system to operate, a user-friendly, a system that is free of computer jargon, cost-effective systems solutions that are relatively cheap to install, operate and maintain. IT must be flexible, easily adaptable and operational training should be included. In terms of the costs involved, managers should avoid paying the full cost of the system. The final 20% must only be payable once the system is operational. End-user needs should be considered with care as people in organizations make IT systems work. If the workforce is not fully involved in implementing and working on an IT system, the results will never enjoy the full benefit of the system.

Managers should ensure that the workforce feels in control of the technology and not the other way round. In turn they feel positive about the use of the system that it is working for the organization. It is proposed that a shift from Information Technology (IT) to Knowledge Technology (KT) be made to realize much better results. Hoping that such a paradigm shift towards Knowledge Technology will build on the user's needs in organizations than IT needs. Automation is not a solution to processes improvement and to achieve cost savings only, as well as knowledge technology needs identification.

It is recommended from a financial perspective that managers have to make investment decisions that maximize the value of the organization. Innovative IT investments should be the order of the day to increase organizations' value, while non-innovative investments do not. When investing in IT, managers should be aware that it could have important strategic consequences for organizations. IT investment decisions have the potential to either improve an organization's competitive position or to allow it to become more vulnerable to competitive forces. This research report provides a guideline for organizational IT managers and users in manufacturing and services sectors to use when aligning IT strategies and business strategies for productivity purposes. This report contributes to the previously produced work on IT assessment in organizations whether it improves productivity levels or is negatively correlated to the productivity levels in organizations. It is recommended that in an attempt to invest in

IT, managers should be aware that it could increase organizations' value but poses many problems, which have been linked to IT, investments and organization's performance.

The undervaluation of IT investments can be overcome by determining how IT investments affect the value of the organization. The following recommendations prove to be a helpful guide to managing IT for recognizable results.

1. Use IT design variables to structure the organization.

One of the most exciting attributes of modern technology is one's ability to use it in designing innovative and highly effective organizations. Use this technology to design components of an organization, or to structure an entirely new type of organization.

- IT design variables, in conjunction with conventional organization design variables, provide one with a tremendous flexibility in designing an organization for increased production.
- The most likely outcome from using these variables will be a flat organizational structure with decentralized decision making. The organization will use electronic communication and linking and electronic customer supplier relationship to form alliances with other organizations.

2. Determine and communicate corporate/ organizations strategy

If in the organization the team is to achieve its strategy, the team must know what it is! Develop a plan for how to use Information Technology. The plan should include the following:

- A list of opportunities for an organization
- A vision of how one's unit should function and the role of IT in that vision.
- A survey of current organizational processes that are good candidates for major improvement through new IT initiatives.

3. Develop a long-range plan for the technological infrastructure.

- Plan for hardware/ software architecture for an organizational unit given the constraints of the corporation; including technology that already exists.
- Plan for the evolution of a network that forms the backbone of one's technology.
- Show willingness to invest in infrastructure.
- Investigate the use of standards to facilitate connection and interorganizational systems.

4. Develop an approach to making IT investment decisions.

- Recognize that there are different IT investment decisions and that they have different returns.
- Develop a structure for making IT investment decisions, for example, a steering committee.
- Provide the information of different kinds to those making IT investments decisions.

5. Develop ongoing management strategies for IT.

- Support users in one's unit and encourage them to work with the technology
- Develop mechanisms for allocating resources to IT.
- Encourage innovation and reward it.

6. Manage systems development

- See that design teams are formed for new projects.
- Participate in the design process.
- Ensure one understands what IT applications will do.
- Review and monitor development projects.

7. Be a user technology.

- Use technology to set an example for others.
- Most success is recognizable when one looks at IT as something that enables the team to be more effective and if one actively manages Information Technology.