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THE IMPACT OF INFORMATION TECHNOLOGY INVESTMENTS ON FIRM PROCESSES AND FIRM PERFORMANCE IN FIJI: AN EXPLORATORY STUDY

By

ACKLESH PRASAD

A thesis submitted in partial fulfillment of the requirements for a degree of Master of Arts

Department of Accounting and Financial Management

The University of the South Pacific

DECEMBER 2005

DECLARATION OF ORIGINALITY

I, Acklesh Prasad, declare that this thesis is an original piece of work, and has been solely compiled by me. Where other sources have been used, these have been duly acknowledged and referenced.

.....

Acklesh Prasad

ACKNOWLEDGEMENT

I would like to thank Associate Professor Arvind Patel for his supervision throughout the duration of this research project. Special thanks are also extended to Mr Umesh Sharma for valuable comments on the proposal and generosity in providing some published papers not available locally. The word of encouragement and suggestions for improvement from Professor Keith Houghton, the department external advisor, are much appreciated. I would also like to extend my appreciation to the Department of Accounting and Financial Management for the support in all ways possible and the School of Social and Economic Development photocopy assistants for assisting with photocopying, printing, and binding facilities.

Special thanks to the executives of the firms that filled and returned the questionnaires and also to executives of firms for providing their annual financial reports.

Many thanks to the following interviewees for their time and valuable comments:

Mr. Sam Fonua - Director - Information Technology Services, USP. Laucala Campus
Mr. Sakeasi Seru - General Manager Networks, Telecom Fiji
Mr. Grant Willis - Chief Financial Officer, Colonial Fiji Limited
Mr. Esala Masitabua - Chief Manager Corporate & Currency Services, Reserve Bank of Fiji
Mr. Andrew Robertson - General Manager IT Fiji Islands Revenue and Customs Authority
Mr. Robert Hemi - Manager, USP Book Centre
Mr. Jonathon Stevens - Manager Collections, Colonial National Bank
Mr. Uday Sen - General Manager, Credit Corporation Fiji Limited
Mr. Bimal Sharma - Head of IT and MIS -Financial Operations, Fiji Development Bank
Mr. Aman Chandra - Business Relationship Manager, Home Finance Company Limited
Mr. Nischal Kush - IT Specialist, Fiji Electricity Authority
Mr. Gautum Sharma - Sales Manager National, Standard Concrete Industries
Mrs. Seema Vandhana - MIS Operations Officer, Colonial Fiji Limited
Mr. Ilaitia Tuinamoala - Manager Systems, Colonial Fiji Limited
Mr. Pradeep Lal - General Manager Finance, Vodafone Fiji Limited
Mr. Kamal Gounder - Manager Information Technology, Carpenters Fiji Limited
Mr. Sanjeev Rajappa - Manager Treasury, Colonial Fiji Limited

Ms. Preetika Latchman - Business Analyst, Fiji Development Bank
Ms. Sajhneeta Singh - Audit Senior, PriceWaterHouseCoopers - Suva
Mrs. Neelam Prasad - Credit Accountant, Colonial Fiji Limited
Mrs. Reanu Ramani - Manager Information Technology, Reserve Bank of Fiji
Mrs. Vandhana Sharma - Relationship Manager, ANZ Banking Group Limited
Mr. Shiu Nadan - Manager Procurement, Vodafone Fiji Limited
Mr. Vikash Goundar - Programmer/ Webmaster, ITS, USP Suva
Mr. Saula Tuilevuka - Manager Marketing, FijiCare Insurance Limited

Finally, I would like to thank all those who assisted in the completion of this thesis in some way.

ABSTRACT

There have been many attempts in the past to measure the impact of information technology investments on firm performance. These studies yielded mixed results. There have been calls for more research in this area, especially international studies to better understand how information technology impacts firm performance. This study provides a developing country perspective on how information technology impacts performance. This study believes that information technology investments first impact on the firm processes and these processes then impact on firm performance. Further, this study also proposes that a combination of different sections of information technology will lead to improvement in a number of business processes and that these processes then impact on a set of firm performance measures. It is also believed that the contextual factors, in a similar arrangement, will impact firm processes and performance. To evaluate this proposition, a two-stage model was developed and a canonical correlation analysis was undertaken.

The findings of the research support that information technology investments have both tangible and intangible benefits in developing economies like Fiji. There is also very strong evidence to support the proposition that information technology investment first impacts on business processes and these improved business processes then impact on firm performance. Contextual factors like size of firms, number of years of information technology investment and separate information technology department have an impact of how information technology is utilised in firms. The study on the intangible benefits of information technology investments suggested that apart from tangible benefits, information technology investments provide huge intangible benefits. These include, enhancing internal-external relationships, improvement of corporate image, efficiency and effectiveness improvements, strengthening accounting controls and appreciation of the need to continue investment into information technology.

The results of this study support the view that information technology investments do bring both tangible and intangible benefits to firms. The framework developed in this study would help firms in developing economies to assess their information technology investments and will provide directions for better management of information technology to derive maximum benefits both tangibly and intangibly. Finally, this study reaffirms the view shared by many that the importance of information technology to businesses is no longer questionable, as it is a very important contributor to a firm's performance.

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LIST OF ACRONYMS

AARN	Australian Academic Research Network
B2B	Business to Business
B2C	Business to Customer
BVC	Business Value Complimentarily
C2C	Customer to Customer
CCA	Canonical Correlation Analysis
COMPAC	Communications Pacific
CPI	Consumer Price Index
CRM	Customer Relationship Management
CTV	Community Television
DSS	Decision Support System
EDP	Electronic Data Processing
ERP	Enterprise Resource Planning
FBC	Fiji Broadcasting Corporation
FEA	Fiji Electricity Authority
FIBS	Fiji Islands Bureau of Statistics
FINTEL	Fiji International Telecommunications Limited
FM	Frequency Modulation
GLM	General Linear Model
ICT	Information and Communication Technology
IT	Information Technology
IBM	International Business Machines
ISP	Internet Service Provider
JICA	Japan International Cooperation Agency
KDS	Key Disclosure Statements
NITAC	National Advisory Committee Advisory Council
PC	Personal Computer
PEACESAT	Pan Pacific Educational Communication Experiment by Satellite
RBF	Reserve Bank of Fiji
ROA	Return on Assets
ROE	Return of Equity
ROS	Return on Sales

SCADA	Supervisory Control And Data Acquisition
UNIVAC	Universal Automatic Computer
USP	University of the South Pacific
WWW	World Wide Web

CHAPTER 1

INTRODUCTION

1.1 Background Review

The process of increasing economic and technological globalisation is affecting many developing countries in unprecedented ways. Countries can leap forward if they are able to adapt to new technologies and innovation in production and distribution of goods and services. The importance of Information Technology (IT) to business, therefore, can no longer be questioned.

For the purpose of this research, information technology is defined as "all forms of technology used to create, store, exchange and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations and other forms, including those not yet conceived)." It is a convenient term for a rapidly expanding range of equipment, applications services and basic technologies that process information. The elements of IT fall into three principal categories: computers, telecommunications and multimedia data, and many combinations of the building blocks that may be used to create the IT resource across an organization (Keen, 1995).

For many companies, information technology has become the tool to manage change in business strategies and internal corporate processes (Vlosky, 1999). Gates (1997) considers IT to be the nervous system of a company, and its excellence to determine a company's competitiveness. Companies using IT are able to learn about the market, the competition, the internal and external customers, leveraging them for competitive advantage to increase market share and profits (Mahmood and Soon, 1991). Information technology is used to speed communications between trading partners, shorten product life cycle, establish better relationships with customers, suppliers and partners and reduce expenditures (Franklin,

1997) as shown in business-to-business (B2B) and business-to-consumer (B2C) transactions.

Advances in electronic technology have meant that computers are becoming exponentially more powerful and yet less costly and this presents developing countries with opportunities and challenges to use IT to enhance their operational efficiencies and improve their competitive advantage. The increased use of information technology in Fiji has the potential to boost efficiency, productivity and employment, resulting in contribution towards economic growth.

Investment in information technology is, therefore, necessary for developing countries if they want to compete in an international market. In Fiji, the national Government has identified information technology as a priority area for development. The Government formed a National Information Technology Advisory Council (NITAC), comprising public and private sector representatives of the industry. A Government stakeholder committee on information technology also exists and amongst other things, deals with developing resource considerations for budgetary purposes.

The Fiji Government, recognising the importance of information technology investments has introduced a number of initiatives that seek to encourage increased information technology acquisition, bring efficiency, and develop IT solutions. These incentives include:

- 0% duty on all IT equipment; and
- An investment allowance of 40% to business providing service specifically based on utilising information technology and making use of open networks and telecommunications including:
    - call Centres;
    - ordering and reservation services;

- database records and list management;
- data entry and processing;
- website development and management;
- software programming and design;
- tele-medicine; and
- internet service provision. (Government of Fiji, 2004)

Investment in Information Technology, however, is not synonymous with improvement in productivity and performance. It is important for organisations to understand the impact of information technology investment on productivity and performance in order for them to direct resources to appropriate areas of development. This is especially pertinent in developing countries, where local investment resources are limited or investment is through assistance from donor agencies and non-governmental organisations.

A large and growing body of information systems research investigates the return on investment on information technology. In the early 1990s research found a "productivity paradox"[1] concerning IT investment (Dehning and Richardson, 2002). This paradox showed investments with negative or zero returns. The Productivity Paradox was observed at two levels, the first at industry-wide level. In 1987, the Nobel prize-winning economist Robert Solow wrote:

> *"We see the computer age everywhere except in productivity statistics."*[2]

[1] Productivity Paradox is discussed in detail in Chapter 2.
[2] Cited in Brynjolfsson (1993).

The second productivity paradox was observed at the company level, where there was no correlation between expenditure for information technologies and any known measure of profitability (Dehning and Richardson, 2002).

In late 1990s, however, several studies (see for example Brynjolfsson and Hitt, 1995, 1996; Dewan and Min, 1997; Lichtenberg, 1995; Startopoulous and Dehning, 2000; Mahmood and Mann, 1993 and Sircar et al. 2000) found positive payoffs from investment in information technology. The focus then changed from "is there a payoff" to "when and where there is a payoff?" Due to contingencies in payoffs from information technology, Brynjolfsson and Hitt, (1998) call for more research in what determines success. Sircar *et. al.* (2000) and Mahmood and Mann (1993) echoed similar sentiments. According to Dehning and Richardson (2002), this is the area where accounting researchers can leverage their knowledge and skills to make a significant contribution to our understanding of the benefits of information technology investments.

In a framework for evaluating research on the benefits of information technology investments by Dehning and Richardson (2002), researchers have generally considered the impact in information technology investment on firm performance (see for example, Hitt and Brynjolfsson, 1996; Tam, 1998; Barua et. al. 1995; Mitra and Chaya, 1996; Shin, 1997; Strassmann, 1997 and Sircar et al.2000), bypassing the underlying business processes. According to Dehning and Richardson (2002), with an understanding of how information technology affects intermediate business processes, and in turn how those processes impact firm performance, critical contributions can be made to understanding better the relation between information technology investment and performance.

Secondly, despite the fact that productivity paradox is an international phenomenon, most of the research on the impact of information technology investment has been conducted in the United States using United States firms (Mahmood and Mann; 2000 and Dewan and

Kraemer, 1998). With the exception of Dewan and Kraemer (1998) and Tam (1998), no international-level study has previously been conducted. According to Mahmood and Mann (2000), it is important to add an international dimension to the matter of information technology investment and performance relationships. This study will provide a developing country's perspective into this issue.

Thirdly, as highlighted by Dehning and Richardson (2002), very few studies have used contextual factors in their studies. Strassmann (1997) and Tam (1998) were two studies that used contextual factors in their study. This study will also consider the contextual factors in studying the impact of information technology investments on firm processes and performance.

Finally, almost all the studies have looked at the tangible measures while addressing the impact of information technology investment. In today's competitive business environment, increasing customer value and achieving a competitive advantage are important prerequisites for business success (Kaplan and Norton, 1997 and O'Brien, 2002). While information technology investment may not show positive outcome on a tangible basis, it may have a huge positive impact on the improvement in process efficiencies, resulting in greater customer value that would eventually lead to better financial performance in tangible. This study, therefore, also considers intangible impacts of information technology investment by entities in Fiji by gathering and analyzing the views of the managers of technology infrastructures and managers of the business units who are heavily dependent on information technology.

1.4 Research Problem

Understanding the impact of information technology investment on business process and performance in Fiji is vital for attracting local and foreign investment. Thus, it becomes important to identify the areas of information technology investment, which would lead to

improvement in the business processes, which ultimately would lead to improvement in business performance.

For investment assistance to continue, current investment should provide an ideal foundation in terms of the returns it provides. In order to understand further the relationship between information technology investment and performance, other similar studies in other developing economies are pertinent. Thus, there is a need for a framework representing the relationship between information technology investment, process improvement and performance. To address these issues, the research question, and the aims and objectives need to be stipulated at the outset.

1.5 Research Question

"Does Information technology investment improve the business processes and do these processes then lead to improvement in business performance in firms in Fiji?"

1.4 Aim

The aim of this research is to study the impact of different measures of information technology investment on business processes and the impact of these business processes on business performance of firms in Fiji. The impact of the relevant contextual factors will also be considered at each stage of the study. This analysis will then be used to suggest a framework for further studies in this area in developing countries.

For the purpose of this research, "firms" is defined as all profit making entities (including listed companies, statutory companies, private companies, partnerships and sole traders) that have made investment into information technology for the purpose identified in the definition of information technology earlier.

1.5 Objectives

The objectives of the study are as follows:

- To identify the measures of information technology investments, process efficiency measures, performance measures and contextual factors for the proposed study.
- To study the impact of information technology investments on business processes in Fiji.
- To study the impact of business processes on business performance in relation to information technology investment in Fiji.
- To study the impact of the contextual factors on the business processes and business performance.
- To suggest a framework for further studying and measuring the relationship between information technology investment and contextual factors and business process improvement and performance in developing economies.

1.6 Contribution of the Study

Investment in information technology is necessary for the prosperity of developing economies. It is also important that investment especially in information technology provide positive results. This is largely to encourage both local and foreign investment. It is anticipated that this study will make the following contribution towards understanding the impact of information technology investment on business processes and performance in entities in Fiji:

- This study answers the call for providing a wider perspective by providing a developing countries perspective in understanding the impact of information technology investment.[3]
- This study also looks at the impact of information technology investment in two stages, looking first at the impact of information technology investment on business

processes, and second how or which processes then lead to improvement in business performance. It is envisaged that studying the impact of information technology investment on business processes first will provide a better understanding of the specific areas in which to invest. This would then lead to a better understanding of what actually causes improvement in business performance.

- This study also considers the impact of information technology investment on process efficiencies that can not be measured tangibly. Investment in information technology at times has an immediate effect on procedural efficiencies, which after a period, would lead to a positive impact on the financial performance of businesses. It, therefore, becomes important to consider these factors to determine the true impact of information technology investment.
- The impact of the contextual factors is also considered, as they are likely to explain differences in the impact of investments on process and performance in developing economies. As stated earlier, very few studies have incorporated these factors in their study.

Finally, this research would contribute towards suggesting a framework that could be used to study and measure the impact of information technology investment in other developing countries. It is envisaged that the suggested framework would provide assistance to developing economies in terms of channeling the information technology investments towards areas that would have a greater impact on process improvement and efficiency, which would ultimately lead to performance improvement.

All this will contribute to the current literature in understanding in the areas of information technology investment that provide benefits to firms. This research, therefore, will help in

[3] Refer to Chapter 2 for discussion on the call for wider perspective on research on the Impact of information technology investments.

contributing to the current literature in answering the question: "When and where there is a payoff?" in information technology investments, from a developing country perspective.

1.7 Summary and Organisation of the Thesis

This chapter has discussed the importance of information technology investments, especially in developing countries. It further emphasises that we can no longer question the importance of information technology but should focus on ways in which we could achieve the best from information technology investment. Further, the intention of the research is discussed in light of the call for further research in understanding how information technology investments affect business processes and performance. The chapter strongly emphasises that information technology investment is sure to bring benefits to entities provided they know the areas in which investment has the greatest impact.

The next chapter provides an overview of previous studies on information technology investment returns from the early days of productivity paradox of "is there a payoff?" to recent studies of "when and where there is payoff". The third chapter highlights the methodological considerations of this study, and the associated research methods. This will lead to an overview of the past, present and future of information technology usage and investment in Fiji in Chapter 4. This includes prediction on the likely impact of information technology investments in Fiji in light of its past and the cultural values. Chapters 5 and 6 will present the results concerning the tangible and intangible impact of information technology investment respectively. This will be followed by an extensive discussion of the results. Chapter 8 will discuss the development of a conceptual framework, which could be utilised by firms in developing countries to evaluate their information technology investments. The final chapter of this thesis will look at the implications of this research and the appropriate recommendations and directions for further study.

CHAPTER 2

THE IMPACT OF INFORMATION TECHNOLOGY INVESTMENT ON BUSINESS PROCESSES AND PERFORMANCE - AN OVERVIEW

2.1 The Use of Information Technology in Business

Although information technology has been a relatively new aspect of the business world, it has received increasing and substantial attention in the last five decades (Suwardy et al. 2003). The first commercial application of computers in business was by General Electric Company when they installed UNIVAC in 1954. This was to automate their payroll processing system. This then led to further computerisation of other accounting systems (Turban et al. 1996) and later to other information processing functions (Jones and McNamara, 1998). Accounting functions were initially seen as ideal targets due to their structured processes, but lately computers have extended their role and now have reached all aspects of business, from sales and marketing to logistics and operations, and across all levels of the organisation.

The early impetus for adoption of information technology was to speed up the existing manual processes. This has given way to such ideas as using information technology as an enabling technology to change fundamentally the way businesses operate (Porter and Milller, 1985), as a strategic weapon in an increasingly competitive world (McFarlan, 1984) and as a means to improve interaction with customers (Notowidigdo, 1984). This means that management of a firm's information technology is becoming ever more important and today it consumes an increasing portion of management resources (Gregory, 1991).

Organisations invest in information technology for a number of reasons. For example, Wang (1994) suggested gaining competitive advantage, strategic planning, goal alignment, and management support and information architecture as reasons for undertaking information technology projects. Moad (1994) suggested improving productivity, quality and competitiveness as the driving force behind information technology investments. Connors (1996) added that information technology investment might be driven by a need to meet customer expectation, typically because other competitors have offered products, services, or facilities that raise overall customers' level of expectations. According to Byrd and Turner (2000), the establishment of an appropriate information technology infrastructure provides an organisation with the flexibility and responsiveness to adapt to changing business environments.

2.2 The Productivity Paradox – "Is there a Payoff?"

An important issue that has been debated for more than a decade is whether investment in information technology contributes to productivity growth. Some claim that productivity is not everything, but it does play an important role towards improving a country's standard of living and contributes towards the wealth of nations. In today's dynamic business environment, the ability for a firm to survive depends upon to what extent it can create customer value without putting any additional burden on consumers. This is more pertinent in a global e-business environment. Productivity growth, therefore, comes from working smarter (Brynjolfsson and Hitt, 1998).

A question often asked in the early 1980s in relation to investment in information technology was: "Does information technology pay-off?" This was probably due to the "productivity paradox". The issue of productivity paradox first came into the picture after a study by Steven Roach where he attempted to explain why the measured productivity growth in the United States economy has slowed substantially since 1973. He observed that the

computing power to a white-collar worker increased dramatically in the 1980s, whereas the productivity of the sector was flat (Roach, 1989). He, therefore, made a conclusion that computerisation has little impact on economic performance. Until the 1980's, this was the conventional wisdom (Brynjolfsson and Hitt, 1988). In 1987, Robert Solow in the New York Times Book Review stated:

> *"We see the computer age everywhere except in the productivity statistics" (Cited in Brynjolfsson and Hitt, 1988).*

In the 1980s and early 1990s, disappointment in information technology investment has been articulated in various articles, discovering negative correlation with productivity in economic-wide sectors (see for e.g. Osterman, 1986; Baily and Chakrabarti, 1988 and Roach, 1989), in manufacturing sector (see for example, Loveman; 1988, Weill, 1990; Morrison and Berndt, 1990; Barua et al.1995 and Siegel and Griliches, 1991) and in the service sector (see for e.g. Cron and Sobol, 1983; Strassmann, 1990; Baily, 1986; Franke, 1987; Harris and Katz, 1989; Alpar and Kim, 1990; Parson et. al 1990; Noyelle, 1990 and Roach, 1991).

Loveman (1988) found that while firms were demonstrating willingness for rapidly improving technology, measures of productivity gain were insignificant. Barua et al. (1995) studied information technology's effect on capacity utilisation, inventory turnover and quality. They found that information technology was positively correlated with some of the factors but the magnitude of the effect was generally too small to measure any effect on return on investment or market share. Weill (1990) found that significant productivity could be attributed to transactional types of information technology (example data processing, order processing), but was unable to identify gains associated with strategic systems or information instrument. Morrison and Berndt (1990) found that every dollar spent on information technology delivered on average only about $0.80 of value on margin. This indicates a general over-investment in information technology.

Studies in information technology revealed that most of the productivity slowdown was concentrated in the service sector (Roach 1991). Cron and Sobol (1983) studied information technology investment in medical supply wholesalers and found that on average, the impact of information technology was not significant, but seemed to be associated with very high or very low performers. This study revealed that information technology tends to help well-organised firms succeed, while further confusing managers who have poorly structured production in the first place. Strassmann (1990) concluded, "there is no relation between computers, profits and productivity".

Roach (1991, 1989) studied white-collar productivity, especially in the service sector. He argued that information technology has been paradoxically correlated with expanding white-collar employment in services, especially in finance. Parson et al. (1990) studied the banking services in Canada and found out that the impact of information technology on productivity was quite low between 1974 and 1987. However, as with Franke (1987), Parson et al. (1990) remained optimistic about the potential of information technology. Harris and Katz (1989) and Alpar and Kim (1990) found weak correlations between information technology investment and productivity.

According to Brynjolfsson (1993), the productivity paradox was an indication of one's inability to document any contribution unequivocally after so much effort. Brynjolfsson (1993) groups the explanation for this into four categories:

- Mismeasurement of outputs and inputs;
- Lags due to learning and adjustment;
- Redistribution and dissipation of profits; and
- Mismanagement of information and technology.

Brynjolfsson (1993) attributes the first two categories of explanations to shortcomings in research and not practice as the root of the productivity paradox. One of the pertinent things to realise is that investment into information technology may come to age with time. According to Brynjolfsson (1993), traditional measures of relationship between input and output fail to account for non-traditional sources of value. Secondly, Brynjolfsson (1993) suggests that if a significant lapse between cost and benefit exists, then short term results look poor but ultimately the pay-off will be proportionately longer. This would be the case if extensive learning were needed to exploit information technology.

The other categories (redistribution and dissipation of profit and mismanagement of information and technology) seek to explain why managers would systematically continue to invest in information technology despite the fact that there are no major benefits now or in the future. Brynjolfsson (1993) suggests that those investing in the technology benefit privately but at the expense of others, therefore there are no benefits at the aggregate level. As for the mismanagement of information and technology, Brynjolfsson (1993) suggests, "that there is something in its nature that leads firms and industries to invest in it when they should not". This creates slack instead of productivity.

The above discussion reveals that research on information technology and productivity has been disappointing in the1980s and early 1990s because it raised frustrating concerns about the measures and methods commonly used for productivity assessment. Therefore, understanding the causes of the productivity paradox was the best way to identify and remove the obstacles to higher productivity growth.

In the early 1990s, the availability of new data allowed a re-examination of some of the early results on information technology productivity. The increase in sample size enables much more precise estimation of computers' contribution, improving the chance of identifying the needle in the haystack (Brynjolfsson and Hitt, 1998). Firm-level studies in the 1990s found

that a dollar of information technology capital was associated with increase in revenue each year (Brynjolfsson and Hitt, 1995, 1996, 1997; Malone, 1997 and Dewan and Min, 1997). All these studies found that information technology has positive impact on firm output, contradicting claims of a productivity paradox. The question then changed from "Does information technology pay" to "How can we best use computers."

These results left much room for further studies to clarify understanding of the relationship between the investment in information technology and productivity, leading to better understanding of the reasons for existence of "productivity paradox."

2.3 The Productivity Paradox and Beyond – "When and Where There is a Payoff?"

2.3.1 Information Technology Spending and Returns

Dos Santos et al. (1993) was one of the first studies on market reaction to information technology investment announcements. They looked at 97 information technology investments from 1981 to1988 and found no abnormal returns. The authors however, found a positive stock market reaction to "innovative"[4] information technology investments. The likely suggestion provided by this is that shareholders carefully consider the nature of information technology announcement and the likely impact on firm cash flows before making an investment decision. Chatterjee et al. (2001) studied the impact on the stock market of information technology infrastructure investment vs. information technology applications investment. They found that information technology investment in infrastructure provides a better competitive advantage than investment in information technology applications.

Studies by Brynjolfsson (1994) and Im et al. (2001) suggest that company size has an impact on information technology investment. Richardson and Zmud (2001) extend on work

[4] Innovative information technology investment is defined as a first use of technology, product or service or new information technology application within a society.

done by Im et al. (2001) and look at the role of strategic information technology within an industry. Their results suggested that firms in industries with high information technology driven transformation have higher stock market returns than those with a lower level of information technology driven transformation. Oh and Kim (2001) found similar relationships. Hitt and Brynjolfsson (1996) and Tam (1998) focused on market-based performance measures by examining the relation between value of company's information technology and one-year market return. Both studies found very few significant relations between IT and annual returns. This, however, does not seem to be surprising as this is a test of two hypotheses. In order to understand the relationship, one needs to consider the relation between information technology and firm performance and the market's knowledge of the relation between the two.

Bharadwaj et al. (1999), Brynjolfsson (2000), Brynjolfsson and Yang (1999), Krishnan and Sriram (2000) and Anderson et. al (2001) used market value of the firm to measure performance. All the studies found a positive relation between information technology investing and market value. One of the most intriguing results on the relation between information technology spending and market valuation is the large coefficient on information technology spending, specifically, market values increase by 5 to 20 times the amount spent on information technology. Anderson et al. (2001) called this the "new information technology paradox". There is, however, need for further investigation.

A number of studies used accounting performance measures to study impact of information technology investment (see for example Hitt and Brynjolfsson, 1996; Tam 1998; Barua et al.1995; Mitra and Chaya, 1996; Shin 1997; Rai et al. 1997; Strassmann, 1997 and Sircar et al. 2000). Except for Tam (1998), all other studies used data available from agencies in the United States. Hitt and Brynjolfsson (1996) and Tam (1998) looked at the relationship between information technology investment and firm performance. Hitt and Brynjolfsson (1996) found some positive relation between information technology stock and return on

asset but no relation between information technology stock and return on equity. Tam (1998) used data from Hong Kong, Malaysia, Singapore and Taiwan and finds mixed results between computer capital and return on asset, return on equity and return on stock. This poses the question of why researchers are unable to find a strong correlation between information technology stock and performance despite increasing information technology investment.

Mitra and Chaya (1996), Rai et al. (1997) and Strassmann (1997) attempted to look at this by measuring the impact of information technology investment and firm process and performance. This, however, is done indirectly by studying the relation between information technology investment, firm process performance and overall firm performance and making inferences about the impact of improvement in processes on overall firm performance without directly testing this. Strassmann (1997) conducted an extensive study by using 539 U. S. European and Canadian companies. Using data from a single year (1994) he found no correlation between information technology spending per employee and return on investment. Breaking down the data into 54 industries also provided no significant correlation. Dehning and Richardson (2002) suggest that this result must be interpreted cautiously, as the data collection methods are unspecified and the research appears in a non-peer reviewed journal. Sircar et al. (2000), in an exploratory study used Canonical Correlation Analysis to measure relation between various information technology spending measures, various business process measures and overall firm performance measures. They found correlation between information technology investment measures and firm performance measures but are unable to determine the cause.

Barua et al. (1995) in a seminal study identified the relationship between the various information technology and non-information technology inputs and business processes, and the relation between these business processes on the overall firm performance. The results

showed a positive impact of information technology on business processes and that certain business processes relate positively to overall business processes.

2.3.2 Information Technology Strategy and Returns

A number of studies have considered stock market reaction to strategic information technology investment, by considering specific information technology investments that affect a firm's overall information technology strategy. Subramani and Waldan (2001) looked at the firms that invest in e-commerce initiatives and found that e-commerce initiatives lead to positive excess returns for firms' shareholders. This study reaffirms anticipations of significant future benefits to firms diversifying into e-commerce initiatives. Ettredge and Richardson (2001) also focus on e-commerce but look at whether it imposes additional risk or costs on the firm. They use hacking and distributed denial of service as risk factors. Their result suggests that shareholders value strategic information technology investments, and that these investments impose additional costs or risks on the firm.

Hayes et al. (2000, 2001) study the impact of information systems outsourcing announcements on the market value of firms and the stock market reaction Enterprise Resource Planning (ERP) implementation announcements respectively. They find positive market value gains from information systems outsourcing and positive reaction to initial enterprise resource planning implementation announcements.

Studies have also looked at relation between strategy, information technology and financial performance (see for example Floyd and Wooldridge, 1990; Kettinger et al. 1994 and Poston and Grabski, 2000). These studies, however, provide little insight into why some firms are able to leverage in information technology into competitive advantage while others are not. For example, Floyd and Wooldridge (1990) show some interaction between information technology and spending limited to a single industry. Poston and Grabski (2000) find little

benefit from ERP systems, despite their increasing use by companies and a positive market reaction to the implementation announcement (Hayes et al. 2001).

2.3.3 Information Technology Management and Returns

Management of information technology is also an important determinant in evaluating the performance of information technology investment. A number of studies have been undertaken to identify the impact of managerial information technology knowledge as a means of gaining competitive advantage. Chatterjee et al. (2001) and Richardson and Zmud (2001) are studies done in this area through an event study in terms of the market effects of investment in information technology management. These studies found that there is a positive market reaction to investment in information technology management capability. Chatterjee et al. (2001) emphasised that strategic importance of an entity's information technology is prompting companies to appoint Chief Information Officers. This is an indication of the changing perceptions of managers towards the importance of information technology investment management. In another study, Richardson and Zmud (2001) found that experience and abilities of new board members had an impact on the market, therefore, suggesting that investment in information technology management is value-driven.

Various studies (see for example Strassmann 1997; Stratopoulos and Dehning, 2000; Bharadwaj, 2000) assert that more prominence is placed on how information technology is managed than how much is invested in information technology. These studies generally found that firms that manage and use their information technology well achieve higher profitability, better return on sales and return on assets. It is, therefore, pertinent to have managers that are able to manage IT as a resource well. These studies may help to explain the reason behind the favorable reaction to announcements on appointments of information technology executives.

2.4 SUMMARY

This chapter highlights that the business community has paid increasing attention to information technology in the last five decades as computers have reached into all aspects of business, from sales and marketing to logistics and operations, and across all levels of organisations.

An important issue that was debated for more than a decade was whether investment in information technology contributes to productivity growth. The existence of a productivity paradox was strongly debated. Steven Roach, while studying the U. S. market concluded that computerisation has little impact on economic performance. This was the conventional wisdom until the 1980s. According to Brynjolfsson (1993), the productivity paradox was an indication of one's inability to document any contribution unequivocally after so much effort. Brynjolfsson (1993) groups the explanation for this into four categories:

- mismeasurement of outputs and inputs;
- lags due to learning and adjustment;
- redistribution and dissipation of profits; and
- mismanagement of information and technology.

Brynjolfsson (1993) attributes the first two categories of explanation to shortcomings in research and not practice as the root to productivity paradox. One of the pertinent things to realise is the time impact of information technology investment. According to Brynjolfsson (1993), traditional measures of relationship between input and output fail to account for non-traditional sources of value. Secondly, Brynjolfsson (1993) suggest that if significant lapse between cost and benefit exists, then short term results look poor but ultimately the pay-off will be proportionately higher. This would be the case if extensive learning were needed to exploit information technology fully.

In the mid and late 1990s, however, the focus moved to answering the question of "when and where there is a payoff". Studies concentrated on information technology spending and returns, information technology strategy and returns and information technology management and returns. Prior research in these areas showed some positive impacts of information technology investment on returns but the results are still not very conclusive.

It is the intention of this study, therefore, to contribute to the current literature by providing a developing country perspective on the information technology investment returns, to better understand "when and where there is a payoff". This would be achieved by looking at both the tangible and intangible benefits of information technology investment. This study also highlights that in order to understand better and perhaps contribute positively to answering the "when and where there is a payoff" question, there is a need to consider the impact of information technology investment at the intermediate (process) level and then how these processes impact the final (performance) outcome.

Having looked at the findings of prior research in information technology investment and echoes for further studies with differing methodologies, the next section discusses the methodology adopted in this study. This includes discussion of the research design, determination of independent and dependent variables, research model and data gathering and analysis techniques.

CHAPTER 3

METHODOLOGICAL CONSIDERATIONS

3.2 Philosophical Assumptions

Theories in all disciplines are subject to underlying philosophical assumptions, which mould and determine their nature. All research has some element of personal beliefs embodied in them, as there is no such thing as totally objective and value free research. The assumptions of ontology and epistemology (Burrell and Morgan, 1979) have direct implications on the methodological nature. According to Morgan and Smircich (1980), ontological, epistemological and human nature assumptions have some bearing on the research methodology adopted.

Morgan and Smircich (1980) have divided these assumptions into six categories ranging from extreme objectivity to extreme subjectivity. This has enabled researchers to adopt a "middle ground" approach to research methodology and not be restricted to the extreme ends of objectivity and subjectivity. Using the Morgan and Smircich (1980) framework, this research sees reality as a concrete process, seeing the world as expressing itself in terms of general and contingent relationships between its more stable and clear-cut elements. Success in information technology investment depends upon how one makes use of the available resources and how one move towards achieving the desired result of attaining a competitive advantage from use of information technology.

Humans are considered as adaptive agents, existing in an interactive relationship with their world. They are influenced by their context and environment. As such, the success of information technology investment really depends upon how the employees are trained and utilised in a changing environment. The relationship between individuals and environment

expresses a pattern of activity necessary for the survival and well-being of the individual. The epistemological stance taken is one that needs to understand the process and change.

3.2 Methodology

Science may be said to progress in its method. The production of knowledge depends very much on the techniques for collecting, analysing and interpreting data and on the way they are applied (Simon, 1980). The same could be said for information systems. Study in any area relies very much on the methods used to answer research questions and test research hypotheses and on careful application of these methods.

This study uses a triangulation of research methods to gather data, which then would be evaluated empirically to establish the impact of information technology investment on business processes, and the impact of these processes on performance of firms in Fiji. An analysis of annual reports from 1999 to 2004 was undertaken to collect all the publicly available financial data.[5] A structured questionnaire was then used to collect information technology investment related data and contextual factors data that were not disclosed in the annual reports. For firms that did not publish annual reports, a structured questionnaire was used to gather financial information, information technology investment information and the contextual information. Semi-structured interviews were held with information technology managers, information technology strategic investment planners, information technology administrators and accountants to obtain information on whether and how information technology investment impacts their firms intangibly. A survey research methodology is adopted for this study because:

- It proposes to produce quantitative descriptions of the impact of information technology investment;

[5] This was done mostly for public companies, statutory organisations and entities under regulation, e.g. banks and credit institutions and insurance companies.

- It deals with "what is happening" and "how and why it is happening" as central questions of interest about a phenomenon;
- The independent and dependent variables are not controlled;
- The phenomenon of interest is studied in its natural settings;
- The phenomenon of interest occurs in the current time or the recent past;
- It is primarily concerned with understanding the relation between information technology investment and improvement in processes and performance.
- It deals with structured and predefined questions; and
- The information would be collected about only a fraction of the population but would be collected in such a way as to be able to generalise the findings to the population.

Survey research methodology is useful in this study because it involves examination of a phenomenon in a wide variety of natural settings. For the structured survey, the independent and dependent variables are well defined and a specific model would be used to test relations by making observations of the phenomenon. Data from the semi-structured survey would be analysed to outline the intangible advantages of information technology investments.

Further, this study is exploratory in nature and, therefore, a survey research methodology is appropriate as it helps the researcher become familiar with a topic and to try out preliminary concepts about it. The survey research methodology would help discover the range of impacts of information technology investment on business processes and performance and refine the measurement of concepts. This study primarily focuses on determining what processes and performance to measure and how best to measure them.

3.3 Research Nature

The purpose of this research is to advance understanding of the relationship between information technology investment, processes improvement, contextual factors and firm performance both tangibly and intangibly. In doing so, this research studies the impact of information technology investment in developing countries. The impact of information technology investment in developing countries has not been studied much.[6] Because investigation into information technology investment performance has provided mixed results[7] and a theoretical model of such a relationship does not exist for developing countries, the nature of this study is exploratory rather than hypothesis testing. It is expected that from this research, it would be possible to derive a model that establishes a framework for management evaluation of the information technology investment and economic performance relation that could establish the foundation for future testing of hypotheses, especially in the context of developing countries. This would help us better understand the reason for the existence of the "productivity paradox" (if any) and more importantly "when and where there is a payoff" from information technology investment in developing economies.

3.4 Research Design, Framework and a Model to Study the Impact of Information Technology Investment on Firm Process Efficiencies and Firm Performance

3.4.1 Research Design

A research design is the strategy for answering the question that stimulated the research in the first place. This research uses a cross-sectional design, as the data are collected at one point in time. If data were collected from a number of different years, they would be converted to established base year dollars as suggested by Brynjolfsson (1993). This would

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[6] A study by Pohjola (2001) showed no significant returns from information technology investment for developing countries.

[7] Refer to literature review on the productivity paradox in chapter 2.

enable a safe generalisation of the finding from the sample to the population at the point in time when the survey was conducted.

3.4.2 A Model to Study the Impact of Information Technology Investment on Firm Process Efficiencies and Firm Performance

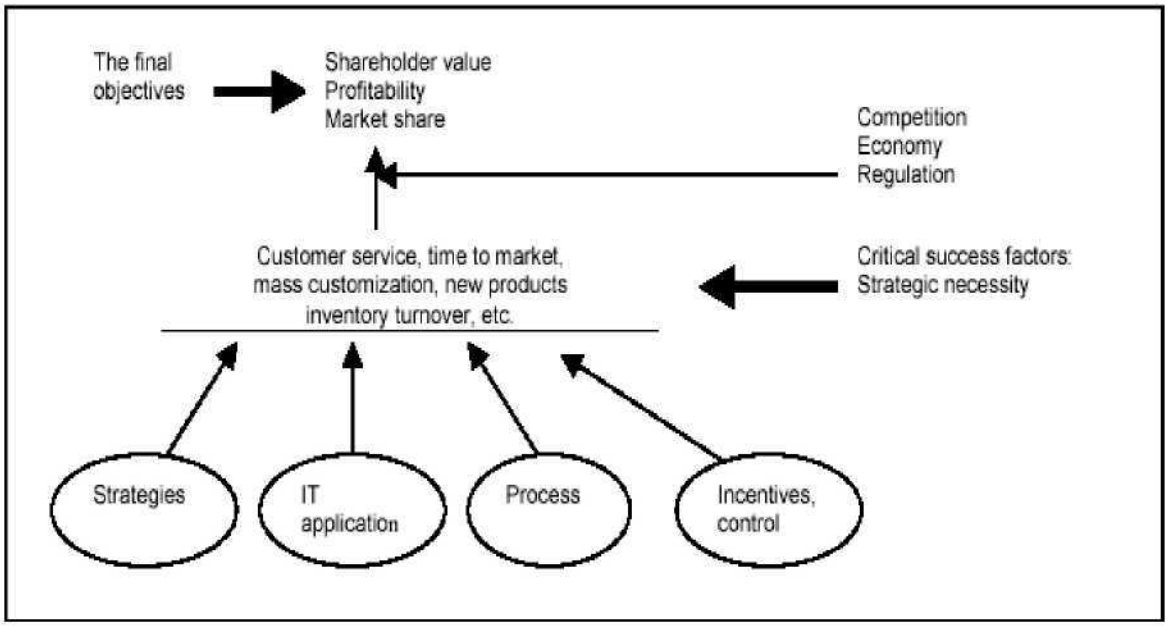
The production, retail or service processes could be illustrated by employing a paradigm of production function (Barua et al. 1995). These functions have input resources (factors) and output products (results). This theory provides the concepts of marginal product of input and marginal product of output. According to Kauffman and Kriebel (1988), by isolating economically and technologically distinct variables within an entity, one can identify the value added by the input to the individual product. Porter (1983), using the value chain framework, looked at how information technology affects different activities. Barua et al. (1995) looked at key variables where information technology may have significant impacts. Mahmood and Mann (1993) and Sircar et al. (2000) looked at different information technology investments at firm performance. The production function itself, however, tends to ignore the contribution of information technology to performance dimensions such as strategic flexibility and intangible value (Collier et al.*1997).* The production function approach, therefore, does not posses the explanatory power to recognize where and how information technology affects firm performance (Barua et al.*1995).*

With the apparent deficiencies in the Cobb-Douglas production function in terms of applicability in identifying information technology impacts on firm performance, an alternative model of measurement is necessary (Barua, 1989). Barua (1998) calls the model the Business Value Complementarily (BVC) approach (see Figure 3.1) to assess the impact the information technology investment on firm performance. More specifically, the bottom tier of the BVC model includes the information technology-related complementary factors (information technology investments in this study). The second level represents the intermediate performance measures (internal cost and process efficiency) and the third and

highest level represents overall firm performance measures (ROA, ROE etc.). According to Barua et al. (2000), if the intermediate level design variables are strongly complementary with design variables, overall complementarity in the business value model is ensured. It, however, could be likely that the top level is not complementary with the lowest level variables; even of complementarity is visible in each step.

FIGURE 3.1

BUSINESS VALUE COMPLEMENTARITY (BVC) MODEL



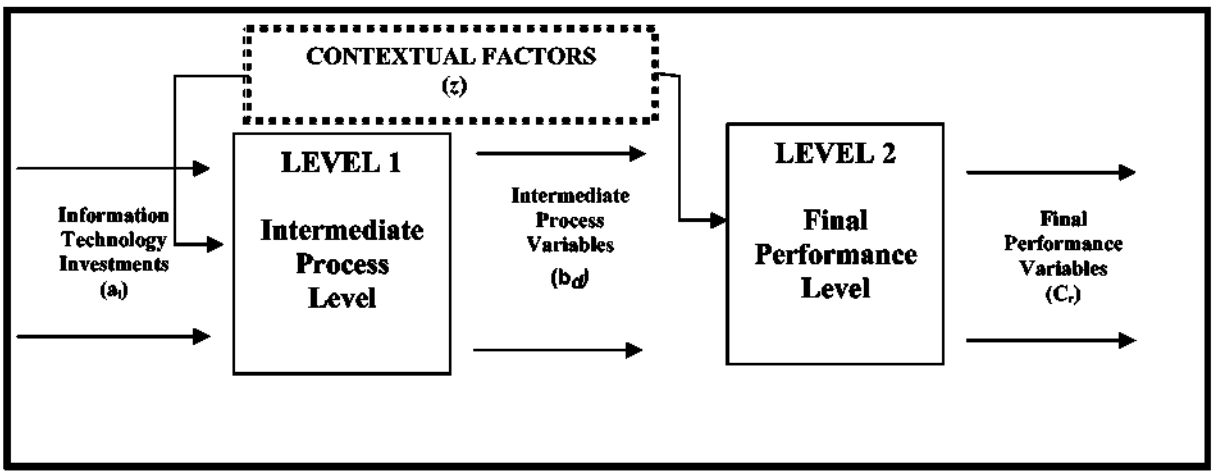
Adopted from Barua et al. **(2000)**

The research uses the concept illustrated in the model above and has incorporated the contextual factors to develop a research model for this study.

In this study, as suggested earlier, it is believed that information technology investment will have two-level impact on the firm. The first stage of information technology investment in specific areas will result in information technology-related value added activity with improvement in efficiencies in processes as information technology-produced intermediate measure (Wang et al.1997; Chen and Zhu, 2004). In the second stage, these information

technology related value added activities would lead to performance activities. Further, it is also expected that each stage will be impacted by the contextual variables. Figure 3.2, therefore, presents a general two-stage model incorporating ideas from Barua's BVC model for measuring the impact of information technology investment on business processes and performance. The first stage uses inputs a_l *(l = 1,....., m)* to produce b_d *(d= 1,.....,* p) and these b_d are used as inputs in the second stage to produce outputs c_r *(r = 1,....., s)*. The contextual variables (*z*) are expected to make some impact at each stage. The *a* inputs in this study represent the sectors of IT investment, *b* out of the first stage and inputs of the second stage are the process efficiency variables and the *c* outputs are the from performance variables.

FIGURE 3.2
GENERALISED TWO-STAGE PROCESS AND PERFORMANCE MEASUREMENT MODEL



3.4.3 Information Technology Investment Measures

One of the first and perhaps the most challenging tasks of this research is to determine how to measure information technology investment and how to relate it to existing theory. Previous research has used various measures to measure information technology investment. Bender (1986), and Harris and Katz (1989) use information technology expense as a percentage of total operating expense and information technology expense to income as measures. Most of the study on impact of information technology spending on market reaction has used information technology investment in totality rather than identifying the

components of information technology investment (see for example Dos Santos et. al 1993; Chatterjee et al. 2001; Richardson and Zmud, 2001; Brynjolfsson and Hitt 1996; Tam 1998; Brynjolfsson et al. 2000 and Oh and Kim, 2001).

Shin (1997), Strassmann (1997) and Rai et. al (1997) considered information technology spending. The methods adopted in all these studies were to study the direct relationship between information technology investments and performance. This, as indicated by Brynjolfsson (1993), could be one of the reasons for poor correlation between information technology investment and performance. This research proposes that to understand better the relationship between information technology investments and performance, it is important that the impact of information technology investment be looked at intermediate level (processes) first and then its impact on the performance.[8] This is because the move towards decentralisation and increased end-user computing means that such measures should be considered that have a direct impact on the performance of end-user computing (Mahmood and Mann, 1993 and Sircar et. al 2000). In such an environment, measuring information technology budget or expense would give a researcher an idea as to "who the big spenders are-not the most successful users" (Weill and Olson, 1989). This approach was adopted by Mahmood and Mann (1993) and later by Sircar et. al (2000). This study further proposes that, the impact of information technology investments in developing countries like Fiji would be best evaluated by looking at information technology spending on individual components that are relevant to developing economies rather than looking at it in totality.

Computerworld, in selecting its "Premier 100" list of effective information system users (Sullivan-Trainor, 1989), used the following measures of information technology investment:

- annual information technology budget as percentage of revenue;
- total information technology investment as compared to its competitors;
- staff and training investments; and
- total distribution of personal computers and terminals throughout the corporation.

[8]A similar concept was earlier used by Barua et al.(1995)

According to Mahmood and Mann (1993), annual information technology budget as a percentage of revenue shows how much an organisation is spending on information technology compared to its competitors. The information technology investment as a percentage of revenue indicates how current an organisation is maintaining its information technology. Information technology budget spending on staff and information technology budget spending on training indicate the willingness of an organisation to properly manage and train its information technology personnel and end users. The measure of number of PCs and terminals as a percentage of employees indicates the extent to which users have access to information technology.

The increase in end-user computing means that more investment needs to be made in terms of meeting end-user's requirements. This could be achieved through purchase of hardware and software, and support for training and consulting. It is, therefore, imperative that investment in personal computers be included, as part of total investment in information technology and personal computers and terminals to employees would appear to be a valid proxy for measures for investment in this area (Mahmood and Mann, 1993). [9]

In developing countries, at times it becomes necessary to seek the assistance of experts in more difficult applications. This is due to difficulty in retaining experienced information technology personnel due to migration or their reluctance to stay long in non-information technology specialist firms. Hiring well-trained staff may provide short-term benefits, but ensuring constant training and development of staff would result in continuous benefit to the organisation. Thus, information technology spending on staff training would be a good indicator of a firm's desire to have a well-trained information technology workforce.

In light of the above discussion, this research would use the following variables as information technology investment measures.[10] These make up the independent variables for the first stage of the two-stage research model.[11]

- information technology budget as a percentage of revenue (IT BUDGET/REVENUE);
- value of an organisation's information technology as a percentage of revenue (IT VALUE/REVENUE);
- percentage of information technology budget spent on staff (IT BUDGET ON STAFF);
- percentage of information technology budget spent on training of staff (IT BUDGET ON STAFF TRAINING); and
- number of personal computers and terminals as a percentage of employees (PC/EMPLOYEE).

3.4.4 Process Efficiency Measures

Determining the process efficiency is challenging and sometimes confusing because many combinations of social and economic measures can be adopted (Mahmood and Mann, 1993). Further, there have been very few studies that looked at the impact of information technology investment on process efficiency first (Richardson and Dehning, 2002). As stated earlier, most of the studies have studied the direct relation between information technology investment and firm performance. Process efficiency measures are, however, pertinent because according to Chakravarthy (1986), profitability or financial market measures alone are incapable of measuring organisation strategic and economic performance because they are concerned primarily with maximisation of shareholders' wealth and the interest of other stakeholders are ignored.

It is, however, pertinent that a conceptual framework be adopted before a concept of process efficiency and firm performance could be applied. Further, accurate measures that

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[9] This measure, however, was eliminated by Sircar et al. (2000) when trying to develop a framework for study in developed economies.

[10] Mahmood and Mann (1993) and Sircar et. al (2000) also use these measures in their studies.

[11] The research model is discussed in detail later in this chapter.

operationalise firm performance should also be identified. This research uses the Systems Resource Approach (Mahmood and Mann, 1993; Sircar, 2000 and Yuchtman and Seashore 1967). Under the systems resource approach, performance is measured using the key internal and external measures that are the basis of organisational survival.

Chakravarthy (1986) suggests sales revenue to employee and sales to total assets could be used to capture a firm's potential future performance. Other measures like gross margin, inventory turnover, customer service, improvement in quality and efficiency could also be considered. Some of these variables, however, are difficult to measure. Mitra and Chaya (1996) used operating expenses to sales, selling and general expenses to sales and labour to sales ratios to measure productivity and efficiency. Rai et al.(1997) used labour productivity and administrative productivity to measure efficiency. Poston and Grabski (2000) when looking at the effect of Enterprise Resource Planning on firm performance used some of the variables used by Mitra and Chaya (1996) and cost of goods sold to sales, number of employees to sales and residual income. Bharadwaj (2000) in studying the relation between information technology capability and firm performance looked at operating income to assets, operating income to sales, operating income to number of employees, cost of goods sold to sales and operating expenses to sales.

It is, however, important that when considering a cross-sectional study, only those variables that have wide applicability should be considered. In developing economies, labour productivity is important, as most tasks are labour intensive. This could be looked at in two ways. First, sales growth by employee and second, the cost of labour required to earn revenue should be considered. One of the aims of investment in any area is to improve on the status quo; therefore, operational cost needs to be controlled to benefit from investment. Cost control, however, should not come at the expense of sacrificing market share. Hence, sales growth is important. Investment in information technology should also bring about improvements in the way in which we deal with our customers. This means less resources

should be used in advertising to attract customers; rather, sales should grow with improving customer value, emphasising service quality.

In light of the above discussion, this research proposes to use the following variables to measure process efficiency. These would act as the dependent variables in the first stage of the proposed model and independent variables in the second stage of the model.

- sales revenue per employee (SALES REVENUE/EMPLOYEE);
- operating expenses to sales (OPERATING EXPENSE/SALES);
- labour cost to sales (LABOUR COST/SALES);
- selling and general expense to sales (SELL & GEN EXP/SALES); and
- sales to total assets (SALES/TOTAL ASSETS).

3.4.5 Firm Performance Measures

Return on Asset, return on equity, return on sales, market share, market capitalisation, return on shareholders, market value, and total asset turnover have been used extensively in prior studies to measure firm performance. for wider applicability, this research will use the following performance measures to evaluate the impact of information technology investment. these will act as the dependent variables in the second stage of the proposed model.

- return on asset (ROA);
- return on equity (ROE);
- return on sales (ROS); and
- total asset turnover (TOA).

3.4.6 Contextual Variables

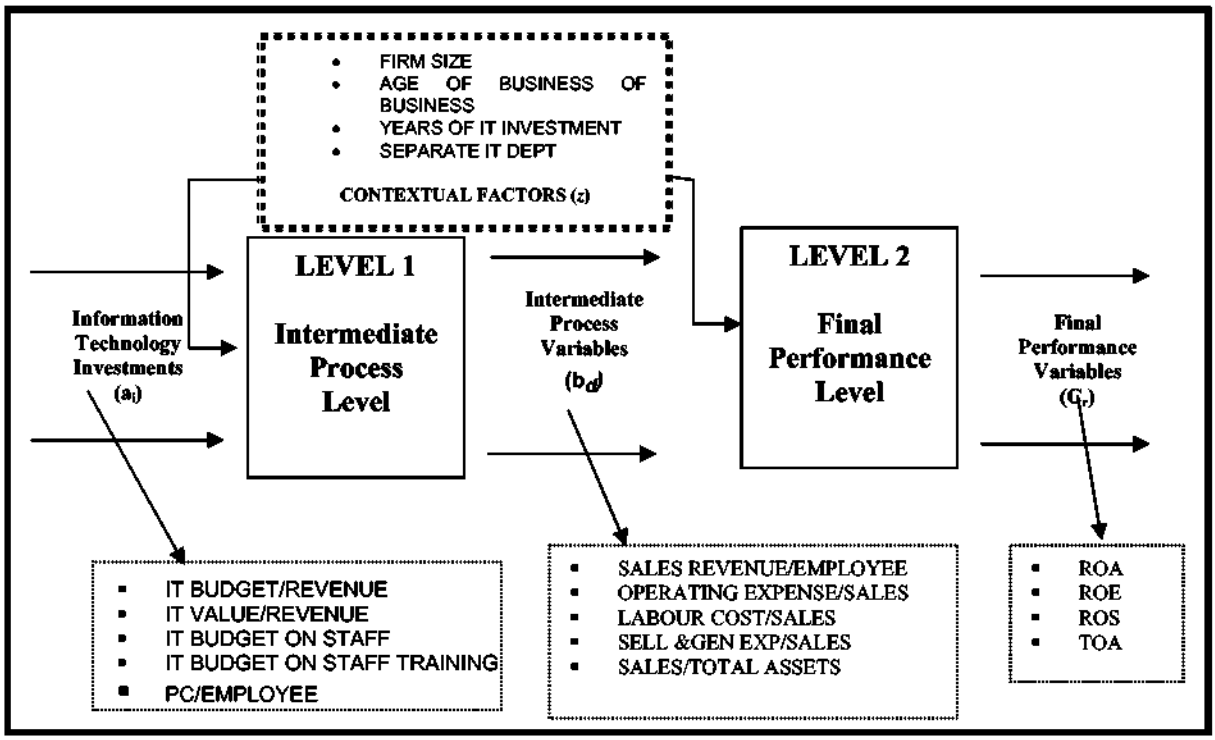
It is believed that information technology investments, process efficiencies and performance depend upon other factors. These are called contextual variables in this study. These contextual variables are expected to have an impact on how investments into information technology affect processes and how these processes affect performance. Very few studies have made use of these variables to explain the impact of information technology

investments on processes and performance. Studies have mainly used firm size (see for example Im et al.2001 and Tam 1998)) to explain their impact on performance. For the purpose of this study, the following contextual variables are used.

- number of years of information technology investment;
- age of the firm;
- separate information technology department; and
- size of the firm.

The proposed model, including the variables, is therefore, illustrated below.

FIGURE 3.3
GENERALISED TWO-STAGE PROCESS AND PERFORMANCE MEASUREMENT MODEL INCLUDING THE VARIABLES

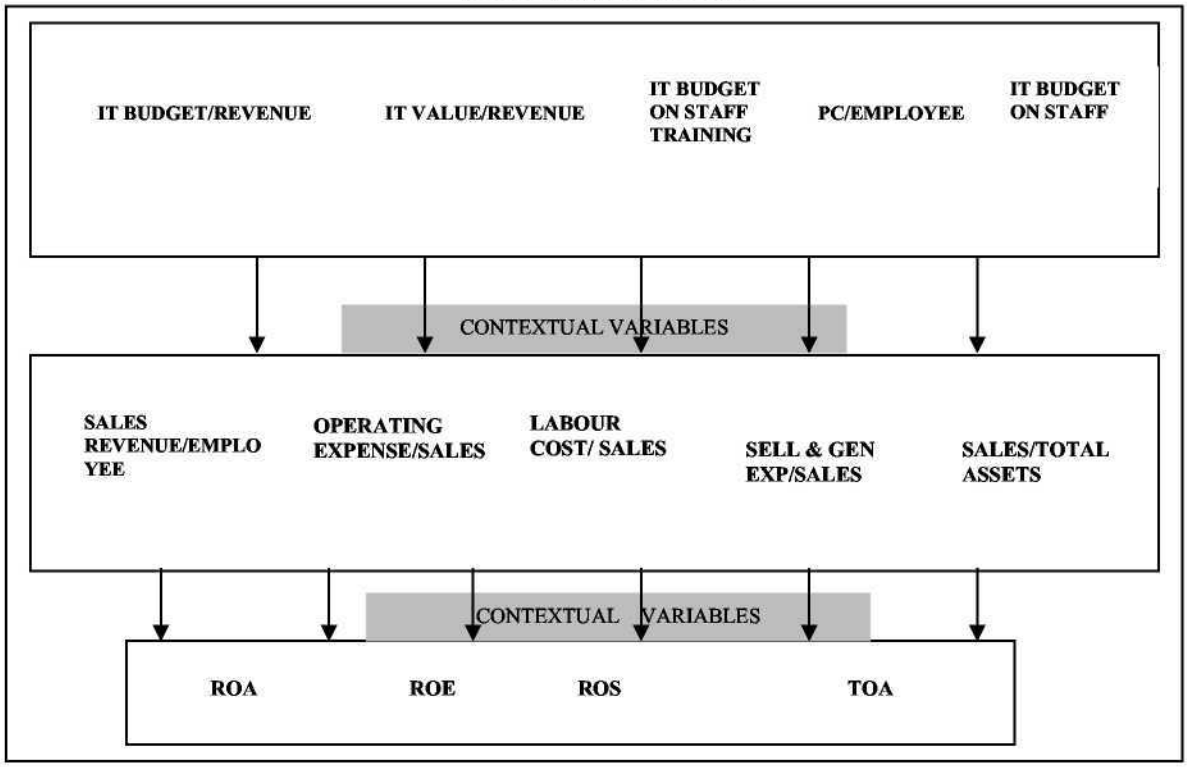


3.4.7 A Proposed Framework for Studying the Impact of Information Technology Investment in Developing Economies

In light of the above discussion on the research model and the relevant variables at each stage of the model, the following framework is proposed for studying the impact of information technology investment in firm processes and performance in developing economies.

FIGURE 3.4

A Proposed Framework for Studying the Impact of Information Technology Investment in Developing Economies



Definition of Variables

Input Level Variables (Independent Variables in Stage One)

IT BUDGET/REVENUE	-	*Information technology budget as a percentage of revenue*
IT VALUE/REVENUE	-	*Value of organisation's information technology as a percentage of the firm revenue*
IT BUDGET ON STAFF	-	*Percentage of information technology budget spent on staff*
IT BUDGET ON STAFF TRAINING	-	*Percentage of information technology budget spent On training of staff*
PC/EMPLOYEE	-	*Number of Personal Computers Per Employee*

Intermediate Process Level Variables (Dependent Variables in Stage One and Independent Variables in Stage Two

SALES REVENUE/EMPLOYEE	-	*Sales revenue per employee*
OPERATING EXPENSE/SALES	-	*Operating expense to sales*
LABOUR COST/SALES	-	*Labour cost to sales*
SELL & GEN EXP/SALES	-	*Selling and general expenses to sales*
SALES/TOTAL ASSETS	-	*Sales to total assets*

Final Performance Level Variables (Dependent Variables in Stage Two)		
ROA	-	*Return on asset*
ROE	-	*Return on equity*
ROS	-	*Return on sales*
TOA	-	*Sales to total assets*
Contextual Variables (Both levels)		
TOTAL ASSETS	-	*Total assets*
AGE OF BUSINESS	-	*Age of business*
YEARS OF IT INVESTMENT	-	*Number of years of information technology investment*
SEPARATE IT DEPT	-	*Separate information technology department*

While some sectional investments and contextual factors may have an impact on one process at the intermediate level, other processes may be driven by more than one sectional investment. Thus, it is expected that each of the sectional investment variables may affect a subset of intermediate level variables. The same could be said for final output level variables. Since this study is exploratory in nature, making hypothetical predictions is not the primary intention of the study. This study, however, provides some likely relationships that may be established from the stated research model.

Sales Revenue per Employee - it is expected that this variable will capture firms' potential future performance. This study predicts that the firm's potential future performance will depend upon the investment in all five sectors. Therefore:

SALES REVENUE/EMPLOYEE = f_1 (IT BUDGET/REVENUE, IT VALUE/REVENUE, IT BUDGET ON STAFF, IT BUDGET ON STAFF TRAINING, PC/EMPLOYEE)

Operating Expenses to Sales – It is expected that the more the entities focus on the use of information technology to re-engineer their processes, the more likely they will be refine their operations. Further, it is also expected that having an information technology adoption and

assessment plan will ensure that the entity is taking advantage of the best technology available at a particular time. Therefore:

OPERATING EXPENSE/SALES = f_2 (IT VALUE/REVENUE, IT BUDGET/REVENUE)

Labour Cost to Sales – Together with BPR and a proactive information technology investment plan, maintaining a well-qualified and trained work force is vital for ensuring process efficiencies. Investment into new technology, well-qualified staff and an active training program, therefore is necessary. Therefore:

LABOUR COST/SALES = f_3 (IT BUDGET ON STAFF, IT BUDGET ON STAFF TRAINING)

Selling and General Expense to Sales – Having a well-qualified trained work force is vital for improved customer service. Better quality service means increasing the customer value without incurring additional costs. One of the key issues in effective customer service is the mobility of service providers. An important precondition for improved mobility is to have a well defined network structure with wireless applications and remote access. Therefore:

SELL & GEN EXP/SALES = f_4 (IT BUDGET ON STAFF, IT BUDGET ON STAFF TRAINING, PC/EMPLOYEE)

Sales to Total Assets – Getting the best from your resources means utilising all the assets that an entity has. This includes hardware, software, other tangible assets and human resources. Therefore:

SALES/TOTAL ASSETS = f_5 (IT BUDGET/REVENUE, IT VALUE/REVENUE, IT BUDGET ON STAFF, IT BUDGET ON STAFF TRAINING, PC/EMPLOYEE)

Final Performance Variables – This study asserts that the sectional information technology investments will have an initial impact on the process (intermediate) level and the impact on

these processes would then bring about improvement in the entities' performance (end impact). What follows next is the development of models for the four performance measures selected for this study.

Return on Assets – This study predicts that improvement in sales through volume with improved customer service should bring about better return on assets. The core issue here is how efficiently an entity is able to utilise its resources in earning revenue. To do so, service efficiency is necessary. Therefore:

ROA = x_1 (SALES REVENUE/EMPLOYEE, OPERATING EXPENSE/SALES, LABOUR COST/SALES, SELL & GEN EXP/SALES, SALES/TOTAL ASSETS)

Return on Equity – Return on equity depends upon how well the entity's entire machinery functions. Therefore:

ROE = x_2 (SALES REVENUE/EMPLOYEE, OPERATING EXPENSE/SALES, LABOUR COST/SALES, SELL & GEN EXP/SALES, SALES/TOTAL ASSETS)

Return on Sales – The return on sales depends upon how efficiently the product is delivered to the customer. Customer retention, attracting new customers and understanding customer buying behaviour are important prerequisites to obtaining a desired level of return on sales. The role of the employees is important in achieving the desired result. Therefore:

ROS = x_3 (OPERATING EXPENSE/SALES, LABOUR COST/SALES, SELL & GEN EXP/SALES)

Total Asset Turnover – The total asset turnover provides information on how the assets of the business were utilised to earn revenue. The sales to total assets are an important determinant of the number of times the value of the assets is sales. Therefore:

TOA = x_4 (SALES REVENUE/EMPLOYEE, SALES/TOTAL ASSETS)

3.5 Units of Analysis

The unit under investigation is the entities, which have some form of investment in information technology.[12] A list of all the registered businesses was obtained from the Registrar of Companies (Fiji). Preliminary assessment on the extent of use of information technology was obtained from the organisations representing industries (e.g. Fiji Manufacture's Association, Fiji Hotel Association etc.).

3.6 Sampling Procedures

A sampling procedure should be able to draw entities in a population in such a way as to permit generalisations about the phenomenon of interest. In order to give equal representation of all industries from the sample frame, the initial intention was to use a stratified and random sample selection method. This sampling procedure was not always used, as there was a need to include all firms from some sectors.

3.7 Data Collection

Regardless of the unit of analysis, the unit for data collection in survey research is usually individuals. As such, this study would target one of the senior personnel in Accounting/Budgeting/Information Technology department of the entity.

Content analysis of annual reports was undertaken to gather all the publicly available information. A mailed questionnaire data collection method was utilised to gather data relating to firms' information technology investment and the contextual information. This is because the data to be collected is factual and this data is less sensitive and complex.[13] Since the data collected covered from 1999 to 2004, all financial data would be converted to a base year as suggested by Brynjolfsson (1993). This study will use the rate of inflation as

[12] This is as per the definition of firms provided in Chapter 1
[13] Some of the variables would be derived from the data gathered.

the basis for converting financial values to base year terms. The measurement of inflation varies from country to country; however, the most common measure of inflation is the Consumer Price Index (CPI). In Fiji, the CPI is calculated using surveys by the Fiji Islands Bureau of Statistics (FIBS). The FIBS measures inflation based on a CPI basket derived in 1993. In total, the basket contains around 330 items.

The calculated CPI inflation (also referred to as headline inflation) sometimes reflects large temporary shocks such as changes in weather conditions, taxes, subsidies, etc. (Reserve Bank of Fiji (RBF), 2004) that affects prices of goods and services. Central Banks, therefore, including RBF, focus on an underlying measure known as the underlying or core inflation. Under this measure, temporary price changes are excluded from the headline inflation to determine the actual trend in inflation. This is because the impact of these temporary changes is short lived. The resultant inflation rate is known as the "Trimmed Inflation Rate". The trimmed inflation rate is used in this study to convert financial data from respective years into base year terms.

In order to determine the intangible impact of information technology investments on businesses, semi-structured questionnaires were used to conduct interviews with personnel in organisation responsible for issues like customer relationship, quality management and process reengineering, information technology management, financial management and refinement issues.

3.8 Data Analysis

3.8.1 Initial Examination

Data collected would initially examine to ascertain distribution, linearity and variances. Normalisation would then be carried out to eliminate abnormalities. Following this, records with missing data and the ones that are inconsistent with rest of the majority of data would be identified. Two and three dimensional scatter plots would be used to identify these outliers and the final sample size would be determined.

3.8.2 Simple Correlation Analysis

A Spearman-Rank correlation matrix was prepared for the final working data set. This matrix would be analysed for relationships prevalent in the entities.

3.8.3 Canonical Correlation Analysis

The aim of Canonical Correlation Analysis (CCA) is to identify and quantify the relations between a *p*-dimensional random variable **X** and a *q*-dimensional random variable **Y**. Here we look for linear combinations $a^T\mathbf{X}$ and $b^T\mathbf{Y}$ of the original variables having maximal correlation. Expressed in mathematical terms, CCA seeks for vectors:

$$\alpha \in \mathbb{R}^p \text{ and } \beta \in \mathbb{R}^q$$

such that

$$(\alpha, \beta) = \underset{a,b}{\operatorname{argmax}} |\operatorname{Corr}(a^\top \boldsymbol{X}, b^\top \boldsymbol{Y})|.$$

(adopted from Dehon et al.*2005)*

There seems to be a general linear model (GLM) that governs most classical univariate (ANOVA, regression) and multivariate (MANOVA descriptive discriminant analysis) statistical methods (Sherry and Henson, 2005). This is because they have certain things in common, including:

- they are ultimately correlational in nature;
- yield r^2-type effect sizes;
- maximise shared variance between variables or between set of variables; and
- apply weights to observed variables to create synthetic variables that often become the focus of analysis (Bagozzi et, al., 1981; Cohen, 1968; Henson 2000; Knapp, 1978; Thompson, 1991 cf. Sheery and Henson 2005).

The GLM can also be looked at as a hierarchy family, with CCA serving as the parent analysis. This is because the CCA subsumes both univariate and multivariate methods (Fan,

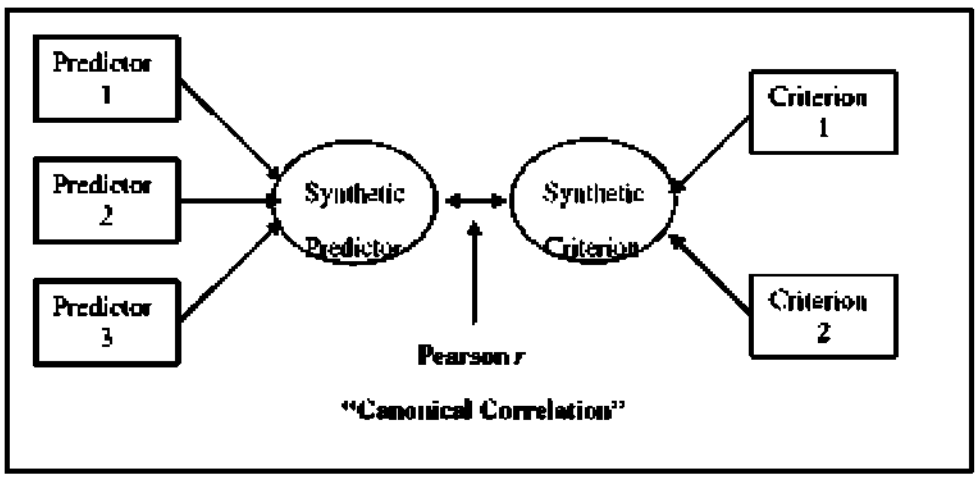
1996; Henson, 2000; Thompson, 2000; cf. Sherry and Henson, 2005).

The advantages of using CCA are that firstly, it limits the probability of committing type 1 error anywhere within the study (Thompson, 1991). Type 1 error is the risk of finding a statistically significant result when one should not have. The risk of this increases when too may tests are performed on the same variables in a data set. CCA minimises this because it allows for simultaneous comparisons amongst the variables rather than requiring different tests to be conducted.

The second advantage of CCA, especially in terms of this study, is that process and performance improvements are hardly determined by an individual variable. Rather, variables (information technology investments, process efficiencies and performance) have multiple causes and effects. Determining relationships amongst these variables would greatly distort the results. The choice of CCA, therefore, makes it theoretically consistent with the purpose of this research. FIGURE 3.5 illustrates the variables relationship between the "predator" and "criterion" variables.

FIGURE 3.5

ILLUSTRATION OF THE FIRST FUNCTION IN A CANONICAL CORRELATION ANALYSIS WITH THREE PREDICTORS AND TWO CRITERION VARIABLES. THE CANONICAL CORRELATION IS THE SIMPLE PEARSON *R* BETWEEN THE TWO SYNTHETIC VARIABLES, WHICH WERE LINEARLY COMBINED FROM THE OBSERVED **VARIABLES.**



Source: Sherry and Henson, 2005

In CCA the beta (β) weights are multiplied with observed scores (in Z score firm) and then summed to yield synthetic predicted scores ($Y' = \beta_1 X_1 + \beta_2 X_2$). CCA will then use standardized weights to create two linear equations. These two equations are generated to yield the largest possible correlation between the variables

Furthermore, CCA will produce as many canonical functions equal to the smaller of the two variable sets. The preceding function will create two more synthetic variables that are as strongly correlated as possible given the residual variance left over after the previous functions and given the condition that these new synthetic variables are perfectly uncorrelated with both of the synthetic variables in the first variable (Sherry and Henson, 2005). It is important, however, to note that only those functions that are able to explain a reasonable amount of relationship between the original variable sets are considered for interpretation. Canonical analysis has been used previously in information technology investments to determine whether two sets of variables are statistically independent of each other in a linear sense or conversely, to ascertain the magnitude of their multivariate relationship (see for example, Sircar et al.2000; Manhood and Mann, 1993).

3.9 Summary

This chapter discusses the methodology of this research, which includes philosophical assumptions, research nature, design and framework, the determination of information technology investment measures, contextual variables, process efficiency measures, and firm performance measures. A framework for studying impact of information technology investments is also illustrated together with discussion on the use of a two-stage model to be applied to the research. Data collection and analysis procedures are also discussed.

This study asserts that in order to understand the impact of information technology investments, both tangible and intangible benefits need to be considered. In order to achieve this, a triangulation of research methods is used to gather the necessary data. This includes archival data analysis to gather publicly available data, structured questionnaires to collect information technology investment related and other demographical data, and semi-structured questionnaires to conduct in interviews to get views from information technology professionals and financial managers in the intangible benefits of information technology investments.

This study also proposes that to understand the tangible impact of information technology investments, these needs to be looked at in two stages and therefore, a two-stage model is suggested. Further, this study proposes that all information technology investment benefits may not be visible and hence considers the intangible benefits of information technology investments.

Finally, the chapter proposes canonical correlation analysis would be the best method of analysing the data because the research intends to study the relationship between a set of independent and dependent variables. Now that the methodology for this research is established, the next chapter focuses on the local perspective by considering the past, present and future of information technology in Fiji

CHAPTER 4

INFORMATION TECHNOLOGY IN FIJI

4.1 Introduction

The Fiji Islands is a group of about 300 small islands in the South Pacific. It has a population of approximately 800,000 of which about 90% are the inhabitants of the two main islands of Viti Levu and Vanua Levu (Bureau of Statistics, 2003). The Fijian Government economic policies are targeted towards growth in exports. Sugar, garments, fish, gold and timber contribute to about 75% of exports in a year (Bureau of Statistics, 2003). The country's tourism industry is the major foreign exchange earner. Small and medium enterprises have a significant role in the Fijian economy. Fiji is a culture mosaic, with a blend of Melanesian, Polynesian, Micronesian, Indian, Chinese and European influences. In the nineteenth century, Fiji acted as a trade centre in the South Pacific until the British claimed it in 1874. Between 1879 and 1920, tens of thousands of indentured laborers were bought from India to work on the sugar plantations. In the South Pacific, Fiji is the most industrialised country with a per capita Gross National Income (GNI) of US$2160 in 2002. The World Bank classifies Fiji as a Lower Middle Income Economy. Its open economy is generally diversified with the service sector contributing about 67% of GDP and the rest coming from the primary and secondary sectors.

Information technology is the electronic means of capturing, processing, storing and communication of information as well as the products and services that produce and support such services. Fiji has progressively utilised the opportunities available through information technology. This chapter first looks at the history of information technology in Fiji, followed by the current initiatives taken to enhance the utilisation of information technology in Fiji and

what the future holds for information technology utilisation in Fiji. This follows the implications and the impacts of the information technology development in Fiji, the implications of information technology application and production in Fiji, the implications of culture on information technology investment in Fiji, with the final section looking at the implications of information technology investment in Fiji.

4.2 The History of Information Technology in Fiji

The 1950s and 1960s saw increased use of radio links with step-by-step exchanges. An important event at this time was the establishment of the Fiji Broadcasting Services (FBC) in 1954. There were also single channel radio links (analog) for commercial users in remote areas. The year 1967 saw the first introduction of computers in Fiji. Then, in 1976, the COMPAC cable was completed and the first satellite services were available in Fiji in the early 1980s. The first International Business Machines (IBM) personal computer became available in Fiji in 1982. The Fiji Electricity Authority (FEA) introduced a number of new technologies in Fiji in mid-1980's. This included the SCADA system on radio and the planning for a digital microwave. This period also saw the introduction of the first private FM radio and the introduction of telex services.

In the mid- and late 1980s, the Fiji Government took initiatives to take advantage of information technology in day-to-day management of the country. The mainframe computers were utilised for Electronic Data Processing (EDP) in its major departments, together with the proliferation of personal computers and the establishment of Wide Area Networks (WANS) for most of its systems. At this stage, computers were also introduced in secondary schools. In 1989, the Fiji Post and Telecommunication Decree was promulgated and that followed the digitisation of the Telecom networks (ADB, 2002).

It was in the early 1990s that the University of the South Pacific (USP) used a dial-up store-and-forward e-mail system and made this service available to faculty and graduate students

on campus. Later, the USP established the first internet connection through Australia by leasing a low-speed 2.4 kilobit per second dedicated line to connect to its first ISP, the Australian Academic and Research Network (AARN). In addition, the University of Hawaii had operated the Pan Pacific Educational and Communication Experiment programs by Satellite programs (PEACESAT), using a retired NASA AT6-1 satellite. The PEACESAT system is connected to a number of earth stations in all Pacific Island countries and Hawaii, and is used mainly for educational purposes.

The first half of the 1990s saw the continued development and use of information technology in Fiji. In 1991, Television New Zealand (TVNZ) commenced providing broadcast services to Suva, Lautoka and Nadi. This then led to the formation of Fiji Television (Fiji TV) in 1994, which provided services to main centres in Viti Levu, Labasa and Savusavu. Within the education sector, the USP produced its first set of Computer Science graduates and computer studies became an examinable subject in the secondary schools. It is in this period that the monopoly licenses were issued to Telecom Fiji and Fiji International Telecommunications Limited (FINTEL). The mobile phones were also introduced in Suva around 1995.

Internet connectivity started to take hold in the South Pacific including Fiji in 1995 when the Forum Secretariat convinced the then New Zealand Telecom to install a free 64 kilobit per second circuit and used it to demonstrate the first fast internet connection during an information technology conference. This created a substantial amount of interest, which led to the Telecom Fiji to establish Internet Service Provider (ISP) and this caught on in other South Pacific countries.

The second half of the 1990s saw the introduction of Community Television (CTV) in Nadi. The telecommunications infrastructure went through a facelift with the digitisation process and the radio links and exchanges were digitised. The Southern Cross cable was also

completed in 2000. This period also saw the increased involvement of Government in promoting information technology with the development of information technology policy, introduction of more LANS and the facilitation of National Information and Communication Technology (ICT) strategy workshops. The public received greater access to internet with the opening of small internet kiosks and the introduction of free internet services to students in public libraries.

The progress on the uptake was enormously affected when many information technology skilled personnel left the country for overseas during this time (Bureau of Statistics, 2004).

4.3 The Present Status of information technology in Fiji

The main islands of Fiji currently enjoy full internet service. This, however, does not extend to smaller outer islands, which still use radio and telephone for voice communication. Data infrastructure in Fiji is still not developed well because the distance and low population density is unable to offset the cost of setting up and maintaining a data communication infrastructure.

There is now an extensive use of information technology by businesses today. The use of internet and e-mail is very common. A large number of entities in Fiji have some form of presence on the internet through either their own or public websites hosted by website hosting companies. Large entities have taken advantage of Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems to enhance collaboration within themselves and their day to day customers and strategic partners. A number of entities use e-mail to conduct business with their overseas suppliers. Online sales services are also provided for the export market with a number of entities in the tourism sector with international customers utilising the benefits of e-commerce.

The retail sector has also invested significantly in information technology that is targeted

towards improving the efficiency of their operations. Modern checkout terminals and cashless transaction facilities are widely available in this sector. The manufacturing sector has also taken advantage of modern facilities available, leading to reduction in production costs.

The tourism industry in Fiji is a champion in information and communication technology (ICT) utilisation. More than 80% of the operators in the hotel industry have their own websites and most of them cater for online booking. The use of information technology has also enabled the stakeholders in the industry to strengthen ties with their partners offshore and within Fiji to facilitate the provision of package services.

The use of technology within Government developed gradually but without an overall guiding strategy. The Information Technology and Computing Services (ITC) arm of the Government has connected most ministries and departments in Suva to the internet through the Government network GOVNET. ITC is responsible for training, application development, customer support and database development and maintenance, which is the most frequently, used Government application. The ICT sees high-leased line cost and lack of qualified staff as their major constraints into expanding its services to the Government departments.

The USP has been at the forefront of the use of ICT in education. The USP has used the PEACESAT system for voice-based education for years. The USP's internet-based network connects campuses in the Fiji Islands, Samoa and Vanuatu. The USP also provides courses in online mode. With the association of Japan International Corporation Agency (JICA), the USP is actively involved in enhancing the role of ICT in the South Pacific.

In February 2005, USP made a direct internet connection with the Australian Academic Research Network (AARNet). The new link provides direct access to research and education networks in Australia, North America and Japan via AARNet's interconnection points in Sydney, Hawaii, Seattle and now in Suva and from these to the global research and education community worldwide. Through this, the USP's bandwidth increased from 1mbps to 155mbps. This network greatly increases USP's capacity to support the work of academics. Through this connection, Fiji becomes only the second country behind Australia forming "Oceania" Net group for Asia Pacific Advanced Network (APAN) consortium.

4.4 The Future - Information Technology Investment and Adoption Issues in Fiji

It is expected that the any e-government initiatives in Fiji would lead to lower transaction costs and in some cases vast improvement in services through business process re-engineering (BPR). This is because most of the processes in the Government sector have been there for a long time. While this would lead to replacement of outdated manual processes, the following needs to be considered for future information technology investment initiatives to be successful:

- BPR – it is important to assess the existing manual procedures in order to understand what type of transformation is necessary. In some cases, BPR would be the viable option in order to bring about improvement, but with some total quality management (TQM) would suffice.[14]
- Any e-government or e-business initiative should always consider the need for new skills. At this stage, it becomes important to identify the human resource requirement in order for implementations to be successful. This human resource in information technology is a pertinent issue in Fiji because of massive emigration and migration of qualified IT professionals.

[14] This is because for some processes, it may not be viable to make them technology oriented.

- An initiative that is lacking in developing countries like Fiji is recognising the importance of proper information assembly for decision making. The use of Decision Support Systems (DSS), therefore, is a necessity. In order to facilitate this, policies, applications and infrastructure must be in place to allow data to move from its source to its destination.
- There is also an acute need to re-look computer networking, as this is a precondition to exchanging digital data between departments and with external parties. These could come in very handy in tax collection, and foreign human resource management.

There is a huge potential in on-line education in Fiji. This is necessary to more opportunities to rural dwellers to avoid massive migration to urban centres. This would greatly reduce the education costs. The USP has already proven that there are major benefits of on-line education. There is, however, a need for basic ICT usage education for the target market to appreciate these opportunities. As a precondition, there is a pressing need to deregulate the telecommunications sector, together with creating a safe cyber-space through appropriate legislation.

In order for information technology usage and availability to grow in Fiji the finance sector should play a proactive role and should strongly appreciate the importance of investment in e-initiatives. There is an urgent need to establish priorities and perhaps the establishment of an informal financial sector, which can take on board greater risks, is the way forward to achieve the desired.

The increased usage of e-commerce in future may result in lower costs of doing business and availability of increasing markets. In order to take full advantage of e-commerce initiatives, there is a need to expand the market externally. This would ultimately lead to greater employment opportunities, prosperity in the community and new investment opportunities. While the urge to take full advantage of e-business initiatives will always be

present, it is important, however, that we cater to the needs of minorities and preserve our unique culture and cultural mix.

Another precondition for success of information technology initiatives in Fiji is perhaps through increasing local content on the World Wide Web (WWW). Quality controls need to be implemented, including the authentication and validation of contents. It is also important to have content in vernaculars, especially in the Fijian and Hindi languages. This, to some extent, could be facilitated through benchmarking. We need to establish what is important for Fiji, what our people want and what sort of leadership is necessary. This calls for a good system of data collection and monitoring of statistics.

On the economic front, the utilisation of information technology in future could lead to high-speed business operations and transactions at the micro level, resulting in high efficiency and productivity, cost reduction, quality improvement, speedier delivery, management modernisation, an entrepreneurship explosion, and enterprise and industrial restructuring. This will all be in favour of higher value added products and services, e-commerce, more job openings particularly for skilled workers and increased transparency in Government procurement processes.

An initiative into the production of information technology hardware and software in future would lead to technological advances, manufacturing and service export growth, employment expansion, higher standard of living and economic growth and further economic integration into the rest of the world. The benefits of economic input of information technology and production are innumerable in other developing countries, especially in terms of enormous reductions in long distance domestic and international telephone charges, (for example Australia, New Zealand, UK, USA and Canada) speedier more accurate and convenient airline seat and hotel room reservation, electronic shopping and banking, point-of-sale (POS) inventory management and online business search and

acquisitions. Similarly, there is a huge potential in increased and appropriate usage of information technology in Fiji, especially within the tourism industry.

Considering the benefits of maintaining an environmentally friendly country, using information technology applications in Fiji in the future, human and physical damage of natural disasters and sudden climate changes could be prevented through early warning systems. Information technology applications could assist in protection of endangered animals and prevention of wild life pouching. Information technology applications could also be used in prevention of automobile accidents and traffic congestion, and contributing instead to safe and comfortable auto travel. The benefits of this to Fiji's economy would be enormous.

The future usage of information technology at a national level also has promising benefits. Coupled with national legislation on public information disclosure, we could achieve wide and instantaneous dissemination through access to internet services. Information technology applications could also encourage larger segments of the population to participate in national and local political decision making processes, decentralising administration and taxation authority to local Government and democratising political and social institutions. Information technology applications would also provide popular respect of human rights, particularly of woman and children, as well as local cultural values, customs and traditions. These are necessary for nation building and its benefits would definitely flow onto at the micro-level.

Finally, on the issue of globalisation, for future information technology usage to be viable, there is a need to adopt our own national standards. A good set of rules and regulations should be in place within the appropriate regulatory framework. Adoption of ISO standards will also help as this would mean having the ability to produce goods and services that would be able to sustain competition from players in the global market.

An issue that needs to be highlighted here is that as stated earlier, information technology usage is not always synonymous with positive results. To achieve the desired, appropriate strategy for information technology investment, understanding the impact and appropriate basis for measuring the benefits is necessary. Information technology investment without an appropriate framework is not likely to bring the desired success.[15] Having discussed how information technology usage and adoption would benefit Fiji in future, the next section considers whether culture would have a role to play in achieving the desired goal. This is because the societal and organisational culture plays a huge role in developing economies in the decisions we make regarding our future.

4.5 Information Technology Investments and Cultural Values – An Evaluation

It is difficult to provide a precise definition of culture because cultural values are something that are perceived and felt. According to Bodley (1994), culture could be used to refer collectively to a society and its way of life. He suggests that culture must involve at least three things: what people think, what they do and the material products they produce. Thus, mental processes, beliefs, knowledge and values are parts of culture. Hofstede (1980) defines culture as:

> *the collective programming of mind, which distinguishes the members of one human group from another. (p. 25)*

It is strongly believed that adoption and usage of information technology has a positive effect on the development of any country but the cultural implications of this usage are not significantly considered. Clemons and Wilkinson (1996), share sentiments stated above and make assertions that there lies a considerable uncertainty with the rapid introduction of information technology. The following pertinent questions need consideration:

[15] These issues, to some extent, contributed to the productivity paradox experienced in early 1990s.

- what if the rate of adoption exceeds the societies and individuals ability to adopt?
- what if the economic benefits distributed are socially destabilising; and
- what will be the impact on income distribution; will it be skewed further?

It should be noted that culture and subculture are distinguished, where the former is reserved for societies as a whole and the latter despite existing within the former, is used for the level of an organization, profession or family (Hofstede, 1980). The cultural dimension is an essential element in the framework for understanding how social systems change as culture influences the norms and values of such systems, and these cultural dimensions explains and predicts the behaviour of groups in their interactions within and across these systems (Harrison and Mckinnon, 1986).

Schein (1986) provide a framework within which we can understand culture. He groups cultures into Culture A and Culture B. Culture A is where ideas come ultimately from individuals through debating issues in a group. People are responsible, motivated and capable of governing themselves. Under culture A, people involve in intense conversation and arguments and there is a general air of informality. These characteristics very largely describe western cultures.

He also characterises another culture as Culture B where truth comes ultimately from older, wiser and higher-status members. In this group, people are capable of loyalty and discipline in carrying out directions and the relationships are linear and vertical. People have a niche in society and would do anything to ward-off any invasions. Societies with these cultural values will have people of different ranks and there will be deference and obedience. An air of formality permeates everything. These values largely resemble Pacific cultures where rituals, customs and traditions are the order of the day. At this stage, however, it is important to assert that this distinction is no longer definitive, perhaps because of the greater influence of western cultures.

Hofstede's four dimensions of cultures can also be used to examine cultures. Hofstede (1980) proposed that cultural values can be discussed in four dimensions: power distance, individualism/collectivism, masculinity/femininity and uncertainty avoidance.

The essential issue in question in the individualism versus collectivism dimension is the relation between an individual and his or her fellow individuals. At one end of the scale, we find societies in which ties between individuals are loose. Everyone is supposedly intent on looking after his or her own interest and maybe the interest of his or her immediate family. Thus, individualism represents a loosely knit social framework in society wherein individuals are expected to take care of themselves and their immediate families only. Its opposite, collectivism, denotes a preference for a tightly knit social framework in which individuals can expect their relatives or other in-group to look after them in exchange for unquestioning loyalty. Here, "people are born into collectivities or in-groups which may be their extended family (including grandparents, uncles, aunts, and so on), their tribe or their village" (Hofstede, 1983, p.79). Everybody is expected to look after the interest of his or her in-group and to have no other opinions and beliefs than the opinions and beliefs of their in-group. In return, the in-groups will protect them when they are in trouble. Hofstede concludes that the degree of individualism in a country is statistically related to that country's wealth. As a consequence, wealthy countries are deemed to be more individualistically oriented, whilst the poor countries like Fiji tend to be more collectivistically oriented.

By and large, the Ethnic Fijians are devoted to their communal social structures and are obedient to their chiefs (Achary, 1998). The chiefs take the responsibility for making decisions on the behalf of the people, as a right as well as a duty, and in return, receive strict loyalty and obedience to their authority from the people (Lawson, 1990). The traditional Fijian socio-economic system, therefore, largely, remains cooperative, communal and village oriented, where the relationship between chiefs and commoners, although acknowledged as authoritarian, is portrayed as a two-way arrangement (Lloyd, 1982). This analysis shows

that the Indigenous Fijians have a strongly bonded social framework in which one can expect their relatives, clan, or other in-group to look after them in exchange for unquestioning loyalty (Chand, 2003).

The Indo-Fijian community, on the other hand, comprises Hindu, Muslim, Sikh and Christian religious associations and North, South Indian, Gujarati and other minor linguistic/cultural groupings (Grieco, 1998). According to Kelly (1988) and Chand, (2003), after the end of the indenture system, the Indo-Fijians became stereotyped as an 'individualistic', 'materialistic', capitalist-oriented 'race' in Fiji. Further, this is supported by Ali (1980) as he stated that:

> *For Indians girmit provided a lesson and an ethos: to survive one had to make sacrifices and live a life of industry in an intensely competitive capitalist system . . . It provided them with the incentive, determination, orientation, acquisitiveness and individualism for success in a capitalist system. (pp. 12, 14-15)*

Kelly (1988) further states that the indenture destroyed their original settings. The Indo-Fijians thus organized their community on principles of egalitarian devotionalism. Reflections of social hierarchy, therefore, are attended by great tension, and open or competitive assertions of superiority are generally out of the question (Chand, 2003). Hence, there is recognition that all are equal in relation to God and this forms a basic part of good character to the Indo-Fijians (Kelly, 1988).

The above discussion depicts that there are some differences amongst communities in a society. The Indo-Fijian society has a loose knit social framework when compared with that of the Fijians (Chand, 2003). They are, however, still devoted to their ancestral and customary practices to support their immediate family members (see Jayawardena, 1975 and Ali, 1980).

The second dimension is labelled "Power Distance." The critical issue here is how society deals with the fact that people are unequal. All societies are unequal but some are more unequal than others (Hofstede, 1983). Societies in which power seems to be distributed inequitably can remain so as long as this satisfies the psychological need for dependence of the people without power. Large power distance societies accept a hierarchical order in which everybody has a place, which requires no further justification, whereas people in small power distance societies strive for power equalisation and demand justification for power inequalities. The critical issue in this dimension is how well a society handles inequalities among people when they occur (Gray, 1988). In large power distance societies, people tend to accept hierarchical order in which everybody has a place which needs no further justification. Hofstede (1980) identified a global relationship between power distance and collectivism. Collectivist countries show large power distance, though individualist countries may not always show small power distance.

The Indo-Fijians leased some of the Fijian land after the end of the indenture system (Chand, 2003). This was because the then CSR preferred a smallholder system of cultivation, as it was found to be more efficient than continuing to employ labourers on plantations (Chand, 2003). This resulted in the formation of small Indo-Fijian communities pooling their labour to harvest the cane and cooperating to build and manage local temples and schools (Norton, 1981).

The then Governor and Ratu Sukuna, the outstanding Fijian administrator at that time, rejected the colonial philosophy of individualism favoured in the 1930s and reaffirmed the original policy of preserving village society in a separate system of local government (Chand, 2003). This resulted in the chiefs being granted more power than their forebears had enjoyed in the earlier years of colonial rule. They were reinstated as the heads of most

provinces and subordinate officials were appointed to represent them at district level and in the villages.

The centralization of authority over land accompanied these changes with the setting up of the Native Land Trust Board (NLTB) in 1941, which became both a symbol of Fijian identity and security, and the authority encouraging the Fijians to share their estates with the immigrants (Chand, 2003). This encouraged the unity and conservative loyalty of the chiefs by granting them the power and status they aspired to and the lack of which had prompted them to make common cause with Indian leaders (Norton, 1981). Thus, the institutional structures served to create power distance in Fijian society.

Amongst the Indo-Fijians, the caste system is now virtually non-existent (Chand, 2003). Furthermore, there are no hereditary Indian leaders and Indian organizations operate on, at least ostensibly, democratic processes (Chand, 2003). In the light of this analysis, it could be argued that Fiji has a large power distance society that accepts a hierarchical order in which everybody has a place, which requires no further justification. In the case of Indo-Fijians, the power distance is low when compared to that of the Fijians (see Kapferer, 1962, Jayawardena, 1975; Lal, 1992 and Chand, 2003).

The third dimension is referred as "Uncertainty Avoidance." Mostly, the future is unknown and one has to live with uncertainty. Thus, this dimension is the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. Strong uncertainty avoidance societies maintain rigid codes of belief and behaviour and members are intolerant towards deviant persons and ideas (Chand, 2003). In such societies, institutions tend to exist to try to create security and avoid risk. An essential means of creating security is through law and other formal rules, whereby protection is provided against the unpredictability of human behaviour. Apparently, religion may be another avenue to create

in the minds of people an expectation of something that is certain. Some societies may socialise their members into accepting this uncertainty and not becoming upset by it. Hofstede (1983) notes that people in such societies will tend to accept each day as it comes. They may be relatively tolerant of behaviour and opinions different from them as they do not feel threatened by them. Such societies can be called "weak uncertainty avoidance" societies. Weak uncertainty avoidance societies have a more relaxed atmosphere where practice overrides principles and deviance is more easily tolerated. Here, people have a natural tendency to feel relatively secure. The imminent issue here is how the society tries to prepare for the future, that is, to control the future or let it happen (see Gray, 1988). Societies in developing economies are deemed to be strong uncertainty avoiders.

In the case of Fiji, the ethnic Fijian conservatism is attributed to the fear of being dominated by the Indo-Fijian community (see for example Mayer, 1963; Fisk, 1970; Ali, 1977 & 1980; Mamak, 1978; Premdas, 1978; Milne, 1981; Norton, 1990 and Mausio, 1998). As articulated by Mausio (1998), conservatism operates against forces of change, where conservatism in less developed nations highlights the 'opposition to change' or anti-modernization element but is defined as either 'nativism' or 'traditionalism'.

Furthermore, Spate (1959), Burns et al. (1960), Belshaw (1964) and Nayacakalou (1961 & 1975) discuss the contradictions between the conservative 'traditional' ethos sustained by the Fijian Administration and indigenous economic development. From Nayacakalou (1975), it could be ascertained that conservatism within the Fijian community, generates a stable environment, one that limits uncertainty.

Within the Indo-Fijian community, sound household structure is core to establishing relations and maintaining order. According to Jayawardena (1975), in the Indo-Fijian society it is the cooperation in maintaining a household that gives form and meaning to the family. In such a

case, as Kapferer (1962) has observed, an Indian who lives within the bounds of a settlement need not necessarily be regarded as a settlement member.

This suggests that Fiji has strong uncertainty avoidance societies, where rigid codes of belief and behaviour are maintained (Chand, 2003). The Indo–Fijian community has also demonstrated their unity and solidarity (Chand, 2003).

The fourth dimension is labelled "Masculinity versus Femininity." Hofstede calls those societies with a maximised social sex role division "Masculine," and those with a relatively small social role division "Feminine." Masculinity stands for a preference in society for achievement, heroism, assertiveness, and material success. In Masculine societies, the traditional masculine social values permeate the society. These values embody the importance of showing off, of performing, of achieving something visible, of making money, of "big is beautiful" (Hofstede, 1983, p.85).

Femininity, on the other hand, stands for a preference for relationships, modesty, caring for the weak and quality of life. The pertinent issue in this dimension is the way in which a society allocates social roles to the sexes (e.g. Gray, 1988). "In more feminine societies, the dominant values, for both men and women, are those more traditionally associated with the feminine role: not showing off, putting relationships with people before money, minding the quality of life and the preservation of environment, helping others, in particular the weak" (ibid, p.85). Developing economies societies display feminist qualities.

The Indo-Fijian entrepreneurs dominate several sectors of the Fiji economy, such as transport and wholesale and retail trade. Further, all Indo-Fijians live by means of some kind of money income, in sharp distinction to a large percentage of the indigenous Fijian community, who provide for their own subsistence in 'traditional' villages on lands legally

reserved for them in perpetuity (Chand, 2003). Kelly (1988), however, noted that regardless of their success in business, few Indo-Fijians are materialistic in the ontological sense. According to Ali (1977), the history of indenture reincarnated the Indo-Fijians. By learning individualism and acquisitiveness, the need to survive first, the Indo-Fijians have not only accommodated to capitalism, they have also gained a chance, the grand historical breakthrough, away from predetermined social compartments, and into an orientation by which they can utilize opportunities and succeed (Ali, 1977).

Thus, in Fiji there is preference in society for relationships, modesty, caring for the weak, and the quality of life. In the case of Indo-Fijians, even though this attitude of 'care' is fast diminishing (especially in the urban society), it is still evident amongst the rural dwellers (see Kapferer, 1962, Jayawardena, 1975 and Lal, 1992).

The essence of understanding the cultural values of Fiji's society is that it provides a framework within which adaptability of information technology could be understood. Acquiring information technology to support business is an important prerequisite to understanding the potential of information technology. However, as Agarwal (1999) asserts, this is a necessary but not a sufficient condition for utilising it effectively. True value of any information technology would derive only through appropriate acceptability of it by target user groups.

While the earlier discussion on culture has identified societal values of developing societies exclusively, as stated earlier, it is important to note that these perceptions have slowly changed over the years (Olutimayin, 2002). Due to globalisation, societies in developing economies, including Fiji, have been greatly influenced by western cultures. The importance of the role of information technology in improving society's standard of living is greatly appreciated. On the other hand, it also argued that while information technology has brought

great progress in many ways, it has also raised the question of technological influences on ethics, privacy, values, morals and psychology (Olutimayin, 2002).

As discussed earlier, in an attempt to understand the impact of information technology on firm performance, the adaptability of information technology is important. The values of a society, therefore, are an important determinant of the level of adaptability. While it is agreed that societal values may differ from workplace values, the latter are greatly influenced by the former.

It is expected that societal culture will have a trickle down effect on the organisational culture. One common thread that greatly affects many organisations that enhance performance and increase productivity is widely shared and strongly held values that underlie and define organisations culture (Poku and Vlosky, 2002). According to Despandé and Webster (1989), corporate culture is the pattern of shared values and beliefs that helps individuals understand organisational functioning and thus provides them with norms for behaviour in the organisation. Corporate culture is an important predictor of organisational capabilities and outcomes such as customer orientation (Despandé et al.1993) and new product development (Moorman, 1995). It has also been argued that success of an organisation's strategy depends, to a significant extent, on the culture of the organisation (Yip, 1995). In considering culture at strategic management issues, Barney (1986), argued that for an organisation's culture to provide sustained competitive advantage, it must add value. It must be rare or unique and be difficult to imitate by competitors.

Based on the values identified earlier and the fact that Fijian societal cultural values are being influenced by western values and the cultural values amongst the two major ethnic groups in Fiji differ to some extent, it is envisaged that people in Fiji appreciate the importance of information technology, especially in the workforce. This is strongly evident

right up to the national level with the Fiji government actively involved in developing and implementing national information technology strategies. With the ultimate intention of a large number of working class families in Fiji to migrate to greener pastures offshore, any introduction of new technology by firms would be greatly welcomed as this prepares them well for such a scenario. A positive attitude, therefore, ensures better utilisation of these technologies, which will ultimately lead to better firm performance.

This view seems to be prevalent in most sectors including education, communication, entertainment, industrial and retail. Fiji has not had the problems of worker dissatisfaction due to an entity's decision to introduce new technologies. With reference to Schein's (1986) and Hofstede's (1983) cultural values, it could be concluded that even though developing economies societies are different from western societies, the importance of the role of information technology is greatly recognised. Some degree of cautiousness, however, is to be expected.

4.6 The Implications of Information technology Investments

This section discusses the implications of information technology investments in Fiji in order to make some predictions. This is done in relation to the history, current trend, challenges and opportunities and cultural values discussed earlier.

One of the important characteristics of information technology investments in Fiji is that most of the investments are made in "tested technology". It is largely agreed that developing countries are a few years behind when it comes to adopting modern technologies, but in doing so they take advantage of being a latecomer (Kagamin and Tsuji, 2001). These may, in part be attributed to the fact that our society is characterised as collectivist and strong on uncertainly avoidance. By becoming the latecomer, developing countries adopt technology that is error free and a refined so that well-tested product is available to the market. While it is true that latecomer adoption may not be viable in a highly competitive market, its

implications will be marginal in developing economies like Fiji. While investments into information technology are aimed at achieving the much needed competitive advantage, information technology investments in developing economies including Fiji are primarily targeted towards improving the operational efficiency. As such, it is envisaged that businesses would not engage in hasty decision making. The monopolistic and the near monopolistic nature of most of the essential industries in Fiji also contribute towards adoption of tested technologies. In light of the above discussion, it is expected that:

> ***"Investments into information technology by firms in Fiji would bring about improvement in process efficiencies that would ultimately lead to improvement in business performance."***

As advocated by Agarwal (1999), investment in information technology is not the only pre-requisite for success. Its acceptance by the people who are going to be affected is vital. Understanding how users form perceptions of an information technology innovation would help designers, implementers and users in their evaluation, selection, implementation and on-going use of information technology. The dissemination of technical information and know-how and the subsequent adoption of new technologies and techniques by users (Information Technology Diffusion) and the scope and the timing of implementation and adoption of new technologies (Information Technology Infusion) is influenced by factors such as perceived characteristics of the innovation, subjective norms, and stages of adoption, user competencies, implementation processes and organisational factors (Chiasson and Lovato, 2001). These discussions, therefore, suggest that it is the ultimate intention of the workers that would ensure that modern technology is made to the best use. When this is done, the firms will always benefit. Considering the individualistic nature of the Indo-Fijian community in Fiji, this is prevalent.

Another pre-requisite for success in information technology investment is having a well-educated and trained workforce. The USP plays an active role in producing quality Information Technology (IT) /Information Systems (IS) and Accounting Information Systems (AIS) graduates ready to accept challenges in the real world. In addition to this, there are a large number of vocational institutions actively involved in preparing the youths and retraining the workforce to appreciate the appropriate value of modern information technologies. A number of organisations also provide regular in-house training facilitated by both local and international consultants. These training programs prepare the workforce well to adapt to challenges of modern technology. A number of entities also allow its workforce to participate in international training programs and attachments with similar institutions in the Pacific region. The intention here is to bring back vital values in terms of understanding better how to utilise modern information technology. All these programs are important for ensuring efficiency in the important business processes and eventually on the business performance. From the above, it could be proposed that:

"Firms that invest in staff training would see better improvement in business processes leading to improvement in business performance."

In addition to ensuring that the workforce is well trained and educated, it is also vital that employees with important skills are retained in the business. With the massive brain drain of qualified professionals, this is a problem in Fiji. Opportunities available in countries like Australia and New Zealand mean that many well-qualified and experienced information technology professionals leave Fiji for these countries each year. The strong uncertainty avoidance nature of the communities in Fiji, together with the unstable political conditions, contributes to this. Providing an appropriate level of remuneration to some extent would provide some remedies to this acute problem. This could be a problem in some sectors of the industry. Entities that could afford to provide the desired level remuneration do so, because the value of an experienced workforce is a well known fact. Few entities secure

services of expatriates to ensure maximum utilisation of the introduced information technology. In light of the above discussion, it is, therefore, expected that:

> ***"Firms that invest on staff retention programs are likely to see improvement efficiencies in business processes, resulting in improvement in the value of the entity"***

In addition to acquiring the modern information technology, providing access is also important. This is to ensure that the technology is utilised to its maximum. LANs, WANs, intranet, extranet and internet are all important structures within an organisation. The onus lies on the entities to adopt a suitable structure that will ensure that the workforce has regular access to the acquired technology. One of the common indicators of the accessibility of acquired technology is the number of PCs and terminals with a specified infrastructure setup. It is, therefore, expected that:

> ***"Firms that provide greater accessibility of the information technology would have improved efficiency in business processes leading to improvement in business performance..."***

Another important issue in information technology investment is recognising the fact that investment into information technology is an on-going process. Firms that are always on the move to ensure that the value of their information technology investment is always enhanced would enjoy better benefits from the investment. As stated earlier, the perceived intention of developing economies in investment in information technology is to redefine their business processes to bring about efficiency. It is therefore expected that:

"Firms that continuously improve the value of information technology would see greater benefits from information technology investments in terms of improving the business process and performance."

4.7 Summary

This chapter has discussed the way in which Fiji started adopting information technology, what is being done now in terms of information technology usage and what the future holds for information technology usage provided it is within an appropriate framework. The chapter also proposes that our organisational and societal culture plays a vital role in the decisions we make and could act as a contributing factor when it comes to information technology investment decisions in the present and in future.

This chapter concludes with some predictions as to what variables are likely to have impact in the success of information technology investment in Fiji. Having discussed the issues relating to information technology investment and usage in Fiji, the next chapter looks at the results of measurement of intangible benefits of information technology investment by firms in Fiji from the data collected. This will be followed by results on the views of information technology personnel and investment managers on the Intangible benefits of information technology investment by firms in Fiji.

CHAPTER 5

TANGIBLE BENEFITS OF INFORMATION TECHNOLOGY INVESTMENTS

5.1 Introduction

This chapter discusses the results of the empirical study on the tangible impact of information technology investment by firms in Fiji. An analysis of annual reports was undertaken to collect all publicly available financial information. Publicly available financial statements through the regulators (e.g. Audited Key Disclosure Statements (KDS) for banks and credit institutions as required by the Reserve Bank of Fiji (RBF)) were also looked at to gather all available financial information for this industry. Structured questionnaires were then sent to firms requesting information technology investment related and contextual information not disclosed in the publicly available reports. For companies who do not make available annual financial statements to the public, a structured questionnaire was used to gather financial, information technology investment and contextual information.

This chapter is organised as follows. An overview of the data specification is provided next. This is followed by the results of the canonical analysis on the impact of information technology investments on firm processes. Results of the impact of these processes on firm performance will then follow. The impact of contextual factors on firm performance and process efficiencies is looked at next. This is followed by a brief summary of the chapter.

5.2 The Impact of Information Technology Investment on Business Processes

5.2.1 Background

A total of 131 questionnaires requesting respective information were sent to all medium and large firms in Fiji. For the purpose of this study, a company is a medium or a large company if their total assets was more than or equal to $500,000. A total of 192 sets of data in terms

of years were collected across the major industries in Fiji. Table 5.1 provides the details of this data set, in terms of the sectors from which the data was gathered.

TABLE 5.1
DATA SETS FROM DIFFERENT INDUSTRY TYPES

INDUSTRY TYPE	NO. OF YEARS OF DATA COLLECTED
TOURISM	5
MANUFACTURING	30
RETAIL	23
AGRICULTURE	5
FINANCIAL INSTITUTIONS	59
INSURANCE	11
WHOLESALING	0
AUTOSALES	10
ADVERTISING	6
FREIGHT	6
INVESTMENT	10
SUPERANNUATION	6
MEDIA	21
TOTAL	**192**

The structured questionnaire had provision for data to be collected for a maximum of 6 years (1999 – 2004). Data was collected for six years from the companies that provide annual financial reports to the public. Not all companies, however, provided data for all six years. Table 5.2 provides details on the number of firms and the number of data sets received.

TABLE 5.2
NUMBER OF YEARS OF DATA RECEIVED FROM DIFFERENT FIRMS

NO OF YEARS OF DATA RECEIVED	NO OF FIRMS	SETS OF DATA (YEARS)
6 YEARS	6	36
5 YEARS	8	40
4 YEARS	5	20
3 YEARS	8	24
2 YEARS	22	44
1 YEAR	28	28
TOTALS	**77**	**192**

Table 5.3 provides definitions of the variables used in the discussion of the results. These are the input level variables, intermediate process level variables, final performance level variables, contextual variables and data source from which these variables are derived.

TABLE 5.3
DEFINITION OF VARIABLES USED IN THE DISCUSSION OF RESULTS

VARIABLE	Definition
	GENERAL VARIABLES (DATA SOURCE)
NO OF EMPLOYEE	No of Employees in the Firm
REVENUE	Total Revenue of the Firm
PROFIT	Profit of the Firm after Taxes
ASSETS	Total Assets of the Firm
EQUITY	Total Equity of the Firm
OPERATING EXPENSE	Total Operating Expenditure of the Firm
LABOUR COST	Total Labour Cost (IT and non-IT) of the Firm
SELLING AND DIST EXPENSE	Total Selling and Distributive Expenditure
IT BUDGET	Total Information Technology Budget of the Firm
IT INVESTMENT	Total Value of Information Technology Investment of the Firm
TOTAL IT BUD ON STAFF TRAINING	Total Information Technology Budget Spent on Staff
IT BUD SPENT ON GEN STAFF EXP	Total Information Technology Budget Spent on General Staff Expenditure
	CONTEXTUAL VARIABLES
NO. OF TERMINALS	Total number of terminals (desktop, laptop, network terminals) in the firm
AGE OF BUSINESS OF BUSINESS	The Number of years of operation on the firm
YEARS OF IT INVESTMENT	The Number of years of Information Technology Investment by the Firm
SEPARATE IT DEPT	Separate Information Technology Department
	STAGE 1 INPUT (IT INVESTMENT) VARIABLES
IT BUDGET/REVENUE	Information Technology Budget as a percentage of Total Revenue
IT VALUE/REVENUE	Value of Organisations Information Technology as Percentage of Firm Revenue
IT BUDGET ON STAFF	Percentage of Firm's Information Technology Budget Spent on Staff
IT BUDGET ON STAFF TRAINING	Percentage of Firm's Information Technology Budget Spent on Staff Training
PC/EMPLOYEE	No of Terminals to Employee
	PROCESS VARIABLES
SALES REVENUE/EMPLOYEE	Sales Revenue Per Employee
OPERATING EXP/SALES	Operating Expenses as Percentage of Sales
LABOUR COST/SALES	Labour Cost as a Parentage of Sales
SELL & GEN EXP/SALES	Selling and General Expenses as a Percentage of Sales
SALES/TOTAL ASSETS	Sales to Total Assets
	PERFORMANCE VARIABLES
ROA	Return of Assets
ROE	Return on Equity
ROS	Return on Sales
SALES TURNOVER	Sales Turnover

TABLE 5.4 provides basic statistics of the data set that is used in this research. This includes the minimum, maximum, average and standard deviation these variables. The statistics provide information on the spread of data gathered.

TABLE 5.4
BASIC STATISTICS ON DATA

VARIABLE	MINIMUM	MAXIMUM	AVERAGE	ST DEV
NO OF EMPLOYEE	6	3500	351	635
REVENUE	113738	383439391	53503299	86713474
PROFIT	-37525851	313066177	14250697	52572092
ASSETS	586225	2484024662	234889662	473060983
EQUITY	-4902489	2475254112	120288617	440045192
OPERATING EXPENSE	74518	353592054	36540051	69034147
LABOUR COST	28000	100498240	10107311	17492876
SELLING AND DIST EXPENSE	0	39199914	4513947	8927552
IT BUDGET	0	20158085	1212025	3194818
IT INVESTMENT	0	621006165	23994829	110316476
NO. OF TERMINALS	1	864	157	27
AGE OF BUSINESS OF BUSINESS	1	133	35	33
YEARS OF IT INVESTMENT	1	104	26	26
SEPARATE IT DEPT	1	2	1	0
IT BUDGET/REVENUE	0	0.35815051	0.026005254	0.056348451
IT VALUE/REVENUE	0	2.148512794	0.14192518	0.362104898
IT BUDGET ON STAFF	0	4673618	551689	1068131
IT BUDGET ON STAFF TRAINING	0	1294233	76614	220550
PC/EMPLOYEE	0	1.625	0.653270077	0.360787884
SALES REVENUE/EMPLOYEE	15179	8205460	369340	1024852
OPERATING EXP/SALES	0.023983509	1.185620146	0.725121314	0.28551833
LABOUR COST/SALES	0.012692312	0.608289474	0.21914422	0.119716276
SELL & GEN EXP/SALES	0	0.4	0.088834762	0.103842452
SALES/TOTAL ASSETS	0.029480519	8.876785557	0.796977	1.090916977
ROA	-0.111	0.4576	0.069322785	0.100628426
ROE	-0.576147751	0.718715548	0.166397438	0.181819687
ROS	-0.199066214	0.960675714	0.163322189	0.207640346
SALES TURNOVER	0.029480519	8.876785557	0.796977	1.090916977
TOTAL IT BUD ON STAFF TRAINING	0	1294233	76614	220550
IT BUD SPENT ON GEN STAFF EXP	0	4673618	551689	1068131

5.2.2 Results

As discussed in Chapter 3, canonical correlation analysis was used in this research to study the impact of sections information technology investments on business processes and the contribution of these processes on performance in firms in Fiji. The aim of Canonical Correlation Analysis (CCA) is to identify and quantify the relations between a *p*-dimensional random variable **X** and a *q*-dimensional random variable **Y**. Here we look for linear combinations $a^T\mathbf{X}$ and $b^T\mathbf{Y}$ of the original variables having maximal correlation. In CCA the beta (β) weights are multiplied with observed scores (in Z score form) and then summed to yield synthetic predicted scores ($Y' = \beta_1 X_1 + \beta_2 X_2$). CCA will then use standardised weights to create two linear equations. These two equations are generated to yield the largest possible correlation between the variables

Furthermore, CCA will produce as many canonical functions equal to the smaller of the two (independent and dependent) variable sets. The preceding function will create two more synthetic variables that are as strongly correlated as possible given the residual variance left over after the previous functions and given the condition that these new synthetic variables are perfectly uncorrelated with both of the synthetic variables in the first variable (Sherry and Henson, 2005). The canonical correlation produces, amongst other things, the standard weights (Coef) and the structure coefficients (r_s). The structure coefficients are compared to determine the significance of the relationships amongst a set of independent and dependent variables.

5.2.2.1 Analysis of the Data

As discussed in Chapter 3, the model employed to analyse the data is as follows:

$$\alpha \in I\!R^p \text{ and } \beta \in I\!R^q$$

such that

$$(\alpha, \beta) = \underset{a,b}{\operatorname{argmax}} |\operatorname{Corr}(a^\top \boldsymbol{X}, b^\top \boldsymbol{Y})|.$$

The first stage in the data analysis included the determination of the correlation coefficients within and between the dependent variables and the independent variables. Table 5.5 provides information on correlation within and between the set of independent (information technology investment) and dependent (business processes) variables.

TABLE 5.5

TABLE 5.5 CORRELATIONS WITHIN AND BETWEEN INFORMATION TECHNOLOGY INVESTMENT AND PROCESS EFFICIENCY VARIABLES

CORRELATION WITHIN INFORMATION TECHNOLOGY INVESTMENT VARIABLES

	IT BUDGET/REVENUE	IT VALUE/REVENUE	IT BUDGET ON STAFF	IT BUDGET ON STAFF TRAINING	PC/EMPLOYEE
IT BUDGET/REVENUE	1	-0.078	0.0984	0.0418	0.2498
IT VALUE/REVENUE	-0.078	1	-0.0646	-0.0466	0.1947
IT BUDGET ON STAFF	0.0984	-0.0646	1	0.7881	-0.1828
IT BUDGET ON STAFF TRAINING	0.0418	-0.0466	0.7881	1	-0.11
PC/EMPLOYEE	0.2498	0.1947	-0.1828	-0.11	1

CORRELATION WITHIN FIRM PROCESSES VARIABLES

	SALES REVENUE/EMPLOYEE	OPERATING EXPENSE/SALES	LABOUR COST/SALES	SELL & GEN EXP/SALES	SALES/TOTAL ASSETS
SALES REVENUE/EMPLOYEE	1	-0.0734	-0.1709	-0.0767	-0.0193
OPERATING EXPENSE/SALES	-0.0734	1	0.4494	0.2147	0.0067
LABOUR COST/SALES	-0.1709	0.4494	1	0.0967	-0.1717
SELL & GEN EXP/SALES	-0.0767	0.2147	0.0967	1	0.3185
SALES/TOTAL ASSETS	-0.0193	0.0067	-0.1717	0.3185	1

CORRELATION BETWEEN INFORMATION TECHNOLOGY INVESTMENT AND PROCESS EFFICIENCY VARIABLES

	SALES REVENUE/EMPLOYEE	OPERATING EXPENSE/SALES	LABOUR COST/SALES	SELL & GEN EXP/SALES	SALES/TOTAL ASSETS
IT BUDGET/REVENUE	0.7469	0.0983	0.1941	-0.0363	-0.1243
IT VALUE/REVENUE	0.1787	-0.348	-0.201	-0.1147	-0.1513
IT BUDGET ON STAFF	-0.0842	0.1321	0.2318	-0.0104	-0.1267
IT BUDGET ON STAFF TRAINING	-0.0074	0.1763	-0.0376	0.0254	-0.0338
PC/EMPLOYEE	0.3041	-0.4465	-0.3333	-0.1385	-0.1332

For the purpose of this study, all correlation above 0.100 is deemed significant. The tables show moderate correlation within the information technology investment measures (independent variable) and the process efficiency measurement variables (dependent variables). As expected, information technology budget on staff and information technology budget on staff training are strongly correlated. There is a significant correlation (~70%) between the independent variables and the dependent variables. There is an indication of

likely relationship between these two sets of variables. There is, however, weak correlation between sales revenue per employee and information technology investment on staff and staff training variables and between selling and general expenses to most of the information technology investment variables. The canonical correlation will provide a clear indication of the impact of this correlation on how the sets of independent variables and dependent variables are related.

The second part of the analysis included the production of canonical correlation functions. The canonical correlation will provide the number of functions equal to the smaller of the number of variables in the independent and dependent sets, five (5) in this case. These correlations, however, does not say much on the magnitude of the relationship between a group of independent and dependent variables.

The analysis yielded five functions with the squared canonical correlations (r_e^2) of 0.709, 0.375, 0.225, 0.182 and 0.000 respectively. In the analysis of the canonical correlation functions, the first thing that needs to be established is whether the canonical model significantly captures the relationship between the two set of variables. The most common method is to consider the Wilks's Lambda (λ) as it tends to have the most general applicability. Table 5.6 provides the Wilks's (λ) and the significance effects of the five functions developed by the canonical model.

TABLE 5.6
Wilks's (λ) AND 1 – λ FOR THE FIVE FUNCTIONS

FUNCTION	Wilks's (λ)	1- Wilks's (λ)
1	0.133	0.867
2	0.458	0.542
3	0.732	0.268
4	0.982	0.018
5	1.000	0

The full model to measure the impact of information technology investment on firm processes was strongly significant with a Wilks's (λ) of 0.133. Since Wilks's (λ) is an inverse

size effect on the amount of variance not shared between the variable set, by taking 1- λ we find an overall effect of (1-0.133) = 0.867 = R^2_e for the full model.

The Wilks's λ tells us nothing about the magnitude of the relationship. In order to evaluate the magnitude of the relationships between the two sets of variables, comparison of the Standard Weights (Coef) and Structure Coefficients (r_s) need to be considered. Table 5.6 illustrate that Functions 1-4 show significance with Function 4 having minimal significance whereas Function 5 does not explain any relation since it has a Wilks's λ of 1.000. For the purpose of the research, Functions 1 to 4 are deemed to be providing reasonable amount of variance and thus is looked at next.

5.2.2.2 Analysis of Significant Canonical Correlation Functions

The third stage is to analyse the four significant functions, with the most significant being considered first.

5.2.2.2.1 Analysis of Function 1

Table 5.7 displays the canonical solution for impact of information technology investment on firm processes for Function 1.

TABLE 5.7
CANONICAL SOLUTION FOR IMPACT OF IT INVESTMENT ON PROCESSES FOR FUNCTION 1

VARIABLE	Coef	r_s	r_s^2 (%)
IT BUDGET/REVENUE	-1.008	-0.965*	93.12
IT VALUE/REVENUE	-0.250	-0.167*	2.79
IT BUDGET ON STAFF	0.105	0.000	0.00
IT BUDGET ON STAFF TRAINING	-0.016	0.030	0.09
PC/EMPLOYEE	0.053	-0.265*	7.02
r_e^2			70.90
SALES REVENUE/EMPLOYEE	-0.992	-0.938*	87.98
OPERATING EXPENSE/SALES	0.054	-0.029	0.08
LABOUR COST/SALES	-0.339	-0.164*	2.69
SELL & GEN EXP/SALES	-0.019	0.067	0.45
SALES/TOTAL ASSETS	0.099	0.170*	2.89

For the purpose of this study, all structure coefficients (r_s) above 0.100 are taken as significant and thus will contribute in explaining the correlation between independent and dependent variables. These significant structure coefficients are identified by an asterisk (*) in the respective tables displaying the canonical solutions for the functions.

Function 1 coefficient shows that the relevant information technology investment variables were information technology budget as a proportion of revenue, value of information technology investment as a proportion of revenue and number of Personal Computers (PCs) to employee. The information technology budget as a proportion to revenue had a strong relationship, with the other two variables having secondary contribution. These information technology investment variables were strongly correlated to sales revenue per employee and marginally correlated with labour cost as a proportion to sales and sales to total assets. It should be noted at this point that these four functions explain 86.7% of the variance shared between the two variable sets.

5.2.2.2.2 Analysis of Function 2

Table 5.8 displays the canonical solution for impact of information technology investment on firm processes for Function 2.

TABLE 5.8
CANONICAL SOLUTION FOR IMPACT OF IT INVESTMENT ON PROCESSES FOR FUNCTION 2

VARIABLE	Coef	r_s	r_s^2 (%)
IT BUDGET/REVENUE	0.296	0.136*	1.85
IT VALUE/REVENUE	-0.437	-0.622*	38.69
IT BUDGET ON STAFF	0.092	0.267*	7.13
IT BUDGET ON STAFF TRAINING	-0.038	0.156*	2.43
PC/EMPLOYEE	-0.806	-0.830*	68.89
r_c^2			37.45
SALES REVENUE/EMPLOYEE	-0.05	-0.180*	3.24
OPERATING EXPENSE/SALES	0.697	0.894*	79.92
LABOUR COST/SALES	0.447	0.714*	50.98
SELL & GEN EXP/SALES	-0.046	0.244*	5.95
SALES/TOTAL ASSETS	0.292	0.207*	4.28

In Function 2, all information technology investment variables were significant with r_s ranging from 0.136 to 0.830. Primary contribution came from PC to employee and information technology value as a proportion of revenue. These variables had a moderate impact on sales revenue per employee as the process efficiency measurement variables. Information technology budget as proportion to revenue, information technology budget spent on staff and information technology budget spent on staff training contributed strongly to improvement in operating expenses and labour cost per dollar of sales. These information technology investment variables had moderate impact on selling and general expenses as a proportion to sales and sales to asset ratio. Function 2, which explains 38.6% of the variance shared between the two variable sets, had all independent variables having an impact of process efficiencies.

5.2.2.2.3 Analysis of Function 3

Table 5.9 displays the canonical solution for impact of information technology investment on firm processes for Function 3.

TABLE 5.9
CANONICAL SOLUTION FOR IMPACT OF IT INVESTMENT ON PROCESSES FOR FUNCTION 3

VARIABLE	Coef	r_s	r_s^2 (%)
IT BUDGET/REVENUE	0.098	-0.004	0.00
IT VALUE/REVENUE	-0.135	-0.132*	1.74
IT BUDGET ON STAFF	-1.553	-0.311*	9.67
IT BUDGET ON STAFF TRAINING	1.530	0.327*	10.69
PC/EMPLOYEE	-0.095	0.019	0.04
r_s^2			25.50
SALES REVENUE/EMPLOYEE	0.175	0.277*	7.67
OPERATING EXPENSE/SALES	0.757	0.324*	10.50
LABOUR COST/SALES	-0.965	-0.673*	45.29
SELL & GEN EXP/SALES	0.057	0.159*	2.53
SALES/TOTAL ASSETS	0.143	0.329*	10.82

In Function 3, the significant investment information technology variables were proportion of information technology budget spent on staff, proportion of information technology budget spent on staff training and information technology value as a percentage of revenue. Information technology budget on staff training is positively correlated to all process efficiency measurement variables and the other two investment variables are correlated to labour cost of sales. Function 3, however explains only 10.28% of the variance shared between the two sets of variables.

5.2.2.2.4 Analysis of Function 4

Table 5.10 displays the canonical solution for impact of information technology investment on firm processes for Function 4.

TABLE 5.10
CANONICAL SOLUTION FOR IMPACT OF IT INVESTMENT ON PROCESSES FOR FUNCTION 4

VARIABLE	Coef	r_s	r_s^2 (%)
IT BUDGET/REVENUE	0.043	-0.021	0.04
IT VALUE/REVENUE	-0.265	-0.222*	4.93
IT BUDGET ON STAFF	-0.481	-0.892*	79.57
IT BUDGET ON STAFF TRAINING	-0.561	-0.920*	84.64
PC/EMPLOYEE	-0.055	0.054	0.29
r_c^2			1.82
SALES REVENUE/EMPLOYEE	0.134	0.096*	0.92
OPERATING EXPENSE/SALES	-0.438	-0.309*	9.55
LABOUR COST/SALES	0.312	-0.079	0.62
SELL & GEN EXP/SALES	-0.035	0.202*	4.08
SALES/TOTAL ASSETS	0.975	0.905*	81.90

Function 4 shows that information technology value as a percentage of revenue, information technology budget spent on staff expenditure and information technology budget on staff training as significant investment variables. Operating expense as a proportion to sales, selling and general expense as a proportion to sales and sales as a proportion to total assets is significant process measurement variables. Function 4 explains only 8% of relation between the two sets of variables. The two sets of variables were largely negatively correlated with the only significant positive correlation being seen between significant

information technology investment variables and operating expenditure as a proportion to sales.

5.2.2.3 Communality Coefficients

The final step in the analysis was to determine the communality coefficients (h^2) across the four functions for each variable. Communality coefficients indicate the degree of contribution of the variables in explaining the relationship between a set of independent and dependent variables. Table 5.11 displays the communality coefficient test statistics (h^2) for the four functions for each variable. The h^2 shows that all information technology investment variables and all except selling and general expenses to sales variables had significant contribution in explaining the relationship between the set of independent and dependent variables.

TABLE 5.11
COMMUNALITY COEFFICIENT TO THE FOUR FUNCTIONS

VARIABLE	r_s^2 (%) FUNCTION 1	r_s^2 (%) FUNCTION 2	r_s^2 (%) FUNCTION 3	r_s^2 (%) FUNCTION 4	h^2
IT BUDGET/REVENUE	93.123	1.850	0.00	0.0441	95.0178
IT VALUE/REVENUE	2.789	38.688	1.74	4.9284	48.1481
IT BUDGET ON STAFF	0.000	7.129	9.67	79.5664	96.3674
IT BUDGET ON STAFF TRAINING	0.090	2.434	10.69	84.64	97.8565
PC/EMPLOYEE	7.023	68.890	0.04	0.2916	76.2402
SALES REVENUE/EMPLOYEE	87.984	3.240	7.67	0.9216	99.8189
OPERATING EXPENSE/SALES	0.084	79.924	10.50	9.5481	100.0534
LABOUR COST/SALES	2.690	50.980	45.29	0.6241	99.5862
SELL & GEN EXP/SALES	0.449	5.954	2.53	4.0804	13.0110
SALES/TOTAL ASSETS	2.890	4.285	10.82	81.9025	99.9015

5.3.1 Discussion on the Impact of Input Variables on Processes

The four functions show strong correlation between the independent (information technology investment) and the dependent (process efficiency) variables. This study intends to look at the significance of the following directions of correlation amongst the two sets of variables.

- An increase in value of the information technology investment variables (values and ratios) should result in an increase in the value (ratio) of sales revenue per employee and sales as a percentage of total assets. For this relation, a positive correlation is of interest, as this will show the benefits of information technology investment on productivity and the efficiency to which assets are used to earn revenue.
- An increase in value of information technology investment variables (values and ratios) should result in a decrease in the different expenses to sales ratios. For this relation a negative correlation is of interest, as this will show the benefits of information technology investment on improving operating efficiencies in terms of operation efficiency, workforce efficiency and marketing efficiency.

Function 1 shows a weak positive relationship (negative correlation) between information technology budget as a proportion to revenue, information technology value as a proportion to revenue, PC and employee and selling and general expense as a ratio to sales. There exists a strong positive correlation between information technology budget as a proportion to revenue and sales revenue per employee. This, as expected, suggests that the more investment is made in proportion to revenue the more it improves worker productivity. Information technology value as a proportion to revenue and PC per employee seems to have moderate impact on employee productivity.

Function 2 provides strong evidence of favourable impact of information technology investment as a proportion to revenue on operational efficiencies, labour cost and selling and general operations. This is because there exists a strong positive relationship (negative correlation) between these dependent variables and the independent variables. The impact was expected. There also exists a weak positive relationship between information technology budget as a proportion to revenue and sales revenue per employee. The second function, therefore, shows a moderate relationship between

information technology budget as proportion to sales and employee productivity in terms of dollar sales. Furthermore, information technology budget spent on general staff expenditure and information technology budget on staff training results in improvement in sales volume in terms of total assets. The number of PCs per employee, indicating accessibility of end users to information technology, results in improving operational efficiencies and labour cost significantly and marginal improvement on selling and marketing. It, therefore, also impacts on worker productivity, as there is a positive correlation.

Function 3, which explains about 27% of the variance shared between the two sets of variables, shows moderate positive relationship between information technology investment on staff issues and operational efficiencies and sales and, marketing functions as the correlation ranges from 0.132 to 0.324. Furthermore, function 3 shows that a better-trained workforce impacts on getting more from your employees in terms of revenue generation (reduction in labour cost as a proportion to revenue).

The final function, explaining very little variance shared (1.8%), also shows a positive relationship between the independent variables and the dependent variables. The function provides evidence that information technology spending on staff has huge an impact on resource utilisation in terms of generating revenue, as there is a significant (~0.900) correlation.

Overall, it could be said that investment into different sections of information technology and value of investment has a significant impact on the improvement of the processes in firms in Fiji. This is supported by the fact that all functions show a positive correlation between information technology value as a proportion to revenue, information technology budget as a proportion to revenue, PC to employee and sales revenue performance employee and sales to total assets ratio. Further, strong negative correlation is seen

between the remaining independent information technology investment and dependent process efficiency variables. The r_2 type effect size of 0.867, which indicates the full model, explained a substantial portion (86.7%) of the variance shared between the set of information technology investment and process efficiency variables. Now that the results on the impact of information technology investment on firm processes have been discussed, the next section looks at whether these processes have an impact on the performance of the firms in Fiji.

5.3 The Impact of Firm Process Efficiencies on Firm Performance

5.3.1 Background

Details of collection of data sets for measuring the impact of firm process efficiencies on firm performance and the model used are the same as those described in section 5.2.1 and 5.2.2. Canonical correlation analysis was also used to study the relationship between these variables. This section of the study also considers all correlation above 0.100 as relevant in discussing the relationship within and between the two sets of variables and is indicated by an asterisk (*) in the respective tables.

5.3.2 Results – The Impact of Firm Process Efficiencies on Firm Performance

5.3.2.1 Analysis of the Data

The first stage in the data analysis in this section included the determination of the correlation coefficients between the independent and the dependent variables. Table 5.12 provides correlations with and between the set of process efficiency (independent) and firm performance (dependent) variables.

As expected, the correlation information in the Table 5.12 shows weak correlation within the process efficiency variables and strong correlation between the firm performance variables. This has resulted in a moderate correlation between the process efficiency (independent)

and firm performance (dependent) variables. The correlations indicate that the operational efficiencies and the firm performance are positively related with strong negative correlations.

TABLE 5.12
CORRELATIONS BETWEEN AND WITHIN PROCESS EFFICIENCY AND PERFORMANCE VARIABLES

CORRELATIONS FOR PROCESS EFFICIENCY VARIABLES

	SALES REVENUE/EMPLOYEE	OPERATING EXPENSE/SALES	LABOUR COST/SALES	SELL & GEN EXP/SALES
SALES REVENUE/EMPLOYEE	1	-0.0734	-0.1709	-0.0767
OPERATING EXPENSE/SALES	-0.0734	1	0.4494	0.2147
LABOUR COST/SALES	-0.1709	0.4494	1	0.0967
SELL & GEN EXP/SALES	-0.0767	0.2147	0.0967	1

CORRELATIONS FOR FIRM PERFORMANCE VARIABLES

	ROA	ROE	ROS	SALES TURNOVER
ROA	1	0.648	0.4693	0.3564
ROE	0.648	1	0.526	0.1459
ROS	0.4693	0.526	1	-0.2839
SALES TURNOVER	0.3564	0.1459	-0.2839	1

CORRELATIONS BETWEEN PROCESS EFFICIENCY AND PERFORMANCE VARIABLES

	ROA	ROE	ROS	SALES TURNOVER
SALES REVENUE/EMPLOYEE	-0.0039	-0.0752	0.1143	-0.0193
OPERATING EXPENSE/SALES	-0.5049	-0.5745	-0.6452	0.0067
LABOUR COST/SALES	-0.4109	-0.2498	-0.3455	-0.1717
SELL & GEN EXP/SALES	0.149	0.0422	-0.1446	0.3185

The second part of the analysis included the production of canonical correlation functions. As both sets of data (independent variables and dependent variables) contained four variables, the canonical correlation produced four canonical functions. The first thing we need to establish here again is whether the canonical model sufficiently captures any relationship between the two sets of variables. The Wilks's (λ) for each function, provided in Table 5.13, shows that the full model to measure the impact of process efficiency on firm performance is significant. This is because the full model has a (λ) of 0.361. Again, since the (λ) shows an inverse effect, the ($1 - (\lambda)$) of $1 - 0.361) = 0.639 = R^2_e$ show significant impact for the full model.

TABLE 5.13 (λ) FOR THE FOUR FUNCTIONS	
FUNCTION	Wilks's (l)
1	0.361
2	0.778
3	0.933
4	0.995

Table 5.14 provides details of the significant effects (1 – (λ)) of the four functions.

TABLE 5.14 (λ) AND 1- (λ) FOR THE FOUR FUNCTIONS		
FUCNTION	Wilks's (λ)	1- Wilks's (λ)
1	0.361	0.639
2	0.778	0.222
3	0.933	0.067
4	0.995	0.005

As the (λ) does not tell us anything about the magnitude of the relationship between the two sets of variables, the standard coefficient (Coef) and structure coefficients (r_s) will be looked at next for the three functions. Function 4 is not considered in this study because it explains only 0.5% of the variance shared between the two sets of variables.

5.3.2.2 Analysis of Significant Canonical Correlation Functions

5.3.2.2.1 Analysis of Function 1

Table 5.15 displays the canonical solution for the impact of firm processes on firm performance for Function 1. Function 1, which explains 64% of the magnitude of the variance shared between the two sets of variables, shows a strong negative correlation between the expenses as a proportion to sales and ROE, ROS and ROA.

TABLE 5.15
CANONICAL SOLUTION FOR IMPACT OF FIRM PROCESSES EFFICIENCIES ON FIRM PERFORMANCE FOR FUNCTION 1

VARIABLE	Coef	r_s	r_s^2 (%)
SALES REVENUE/EMPLOYEE	-0.015	0.067	0.45
OPERATING EXPENSE/SALES	-0.921	-0.957*	91.58
LABOUR COST/SALES	-0.195	-0.584*	34.11
SELL & GEN EXP/SALES	0.238	0.022	0.05
r_e^2			53.58
ROA	0.231	0.794*	63.04
ROE	0.280	0.805*	64.80
ROS	0.658	0.855*	73.10
SALES TURNOVER	0.205	0.141*	1.99

The independent variables mentioned above had moderate positive correlation with sales turnover. Sales revenue per employee had insignificant positive correlation with the performance variables.

5.3.2.2.2 Analysis of Function 2

Table 5.16 displays the canonical solution for the impact of firm processes on firm performance for Function 2.

TABLE 5.16
CANONICAL SOLUTION FOR IMPACT OF FIRM PROCESSES EFFICIENCIES ON FIRM PERFORMANCE FOR FUNCTION 2

VARIABLE	Coef	r_s	r_s^2 (%)
SALES REVENUE/EMPLOYEE	0.039	0.011	0.01
OPERATING EXPENSE/SALES	-0.435	-0.290*	8.41
LABOUR COST/SALES	0.690	0.414*	17.14
SELL & GEN EXP/SALES	-0.752	-0.782*	61.15
r_e^2			16.56
ROA	-0.604	-0.432*	18.66
ROE	0.481	0.106*	1.12
ROS	0.221	0.383*	14.67
SALES TURNOVER	-0.680	-0.888*	78.85

In Function 2, there exists a negative correlation between operating expenditure and selling and distribution expenditure as a proportion to sales and ROE and ROS. Negative correlation is also witnessed between labour cost as a proportion to sales and ROA and sales turnover. Despite the fact that function 2 explains 22.2% of the variance shared between the two sets of variables, the correlation between the two variables is quite significant.

5.3.2.2.3 Analysis of Function 3

Table 5.17 displays the canonical solution for the impact of firm processes on firm performance for Function 3.

TABLE 5.17
CANONICAL SOLUTION FOR IMPACT OF FIRM PROCESSES EFFICIENCIES ON FIRM PERFORMANCE FOR FUNCTION 3

VARIABLE	Coef	r_s	r_s^2 (%)
SALES REVENUE/EMPLOYEE	0.710	0.802*	64.32
OPERATING EXPENSE/SALES	0.356	-0.013	0.02
LABOUR COST/SALES	-0.517	-0.517*	26.73
SELL & GEN EXP/SALES	-0.396	-0.424*	17.98
r_e^2			6.25
ROA	0.132	-0.117*	1.37
ROE	-1.221	-0.582*	33.87
ROS	0.992	0.349*	12.18
SALES TURNOVER	0.218	-0.195*	3.80

Function 3, which explains 6.7% of the variance shared between the two sets of variables, shows a slightly strong positive correlation between labour cost as proportion to revenue and selling and general expenditure as a proportion to revenue and all except ROS performance variables. ROS is negatively correlated with all process variables except sales revenue per employee. There exists a significant positive correlation between sales revenue per employee and ROS.

5.3.2.3 Communality Coefficients

The final step in the analysis was to determine the communality coefficients (h^2) across the three functions for each variable. Table 5.18 shows the communality coefficients (h^2) across the three functions for each variable. The h^2 shows that all the variables had a very significant contribution in explaining the relationship between the firm process efficiencies and firm performance variables. This is evident from the fact that h^2 ranges from 64.78 to 100.

TABLE 5.18
COMMUNALITY COEFFICIENT TO THE THREE FUNCTIONS

VARIABLE	r_s^2 (%) FUNCTION 1	r_s^2 (%) FUNCTION 2	r_s^2 (%) FUNCTION 3	h^2
SALES REVENUE/EMPLOYEE	0.45	0.012	64.32	64.7814
OPERATING EXPENSE/SALES	91.58	8.410	0.02	100.0118
LABOUR COST/SALES	34.11	17.140	26.73	77.9741
SELL & GEN EXP/SALES	0.05	61.152	17.98	79.1784
ROA	63.04	18.662	1.37	83.0749
ROE	64.80	1.124	33.87	99.7985
ROS	73.10	14.669	12.18	99.9515
SALES TURNOVER	1.99	78.854	3.80	84.6450

5.3.3 Discussion on the Impact of Process Efficiencies on Firm Performance

The correlation between the two sets of variables in the three functions considered relevant for studying the relationship between the processes and performance was significant. For the purpose of this section of study, the following directions of correlations amongst the two sets of variables are of importance.

- An increase in sales revenue per employee should see improvement in ROA, ROS, ROE ratios and sales turnover. For this relation a positive correlation is of interest, as this will show the positive impact of process efficiencies on firm performance.
- An improvement (decrease) in the selling and general expense to revenue ratio, operating expenditure to revenue ratio and labour cost to sales ratio should see an

improvement in performance ratios and sales turnover. For this relation a negative correlation between these variables is of interest, as this would indicate the contribution of operational efficiencies towards improving firm performance.

The first function provides evidence to support that there is a positive relation (negative correlation) between the expenses to sales ratios and return on assets, sales and equity and sales turnover. The effect of impact of operational efficiencies and labour cost is very significant on ROA, ROS and ROE of the firm. This is because the structure coefficients for these set of variables is between (0.584 and 0.957). This outcome is anticipated if information technology investments are to have an indirect impact on firm performance. The impact of improvement in operational activities in terms of cost is most significant in performance ratios indicating that directed information technology to achieve operational efficiencies should see improvement in performance of firms. Further, Function 1 also provides evidence that selling and general expense as a proportion to sales does not significantly impact performance improvements. These relationships explain 64% of the variance shared between the two variable sets in terms of its magnitude.

Function 2 on the other hand shows that labour cost as a proportion to sales impacts on sales turnover as there exists a positive relationship (negative correlation). Improvement in operating expenditure as a proportion to sales and selling and general expense as a proportion to sales provides positive impact on ROE and ROS but this is marginally significant. These relations support the outcome of Function 1. This function, however, explains 22% of the shared relationship between the two sets of the variables. This function also shows that employee productivity in terms of sales revenue per employee has insignificant impact on firm performance. There was, however, an expectation that productivity should result in improved performance.

Function 3, which provides very little (6.7%) of the variance shared between the two sets of variables, shows strong positive correlation between sales revenue per employee and ROS. Improvements in labour cost to sales ratio and selling and general expense to sales ratio improve the ROS. There exists an unfavourable relationship between labour cost to sales ratio and selling and general expense to sales ratio and ROA. Function 3 also shows that operational efficiencies had insignificant impact on performance.

Overall, as predicted, the results indicate that improvement in business processes through investment into information technology contributes towards improvement in business performance. The h^2 of the three functions provides strong evidence to suggest that all variables in the two sets provide a significant contribution at different levels in explaining relationships between the two sets of variables. The h^2 of the all the variables ranges from 64.78 to 100.01.

5.4 The Impact of Contextual Factors on Firm Processes and Performance within Firms

5.4.1 Background

As stipulated in the model discussed in chapter 3, this research also attempts to study whether contextual factors have any impact on how information technology investment affects firm processes and how these processes affect firm performance. In this research the way these contextual factors impact is considered separately. This is to avoid distortion of the results in terms of the relations within the independent variables at each stage of the model. In this way, we will be able to see the pure effect of the combination of contextual factors on firm processes and firm performance.

5.4.2 Results

5.4.2.1 Analysis of Data

The first stage in the analysis of data included the determination of the correlation coefficients between the dependent and independent variables. Table 5.19 provides correlation within the contextual variables, between contextual variables and process efficiency variables and between the contextual variables and firm performance variables. Other correlations within and between these variables were provided earlier in the chapter.

TABLE 5.19
CORRELATIONS WITHIN AND BETWEEN CONTEXTUAL FACTORS, PROCESS AND PERFORMANCE VARIABLES

CORRELATION BETWEEN CONTEXTUAL VARIABLES

	TOTAL ASSETS	AGE OF BUSINESS	YEARS OF IT INVESTMENT	SEPARATE IT DEPT
TOTAL ASSETS	1	0.1789	0.2983	-0.3164
AGE OF BUSINESS	0.1789	1	0.9045	-0.309
YEARS OF IT INVESTMENT	0.2983	0.9045	1	-0.3648
SEPARATE IT DEPT	-0.3164	-0.309	-0.3648	1

CORRELATION BETWEEN CONTEXTUAL FACTORS AND PERFORMANCE

	ROA	ROE	ROS	SALES TURNOVER
TOTAL ASSETS	-0.0668	0.073	0.6758	-0.2849
AGE OF BUSINESS	-0.1888	-0.0136	-0.0656	0.0306
YEARS OF IT INVESTMENT	-0.2403	0.0506	0.0393	-0.1382
SEPARATE IT DEPT	-0.05	-0.1521	-0.2897	0.1624

CORRELATION BETWEEN CONTEXTUAL AND PROCESS EFFICIENCY VARIABLES

	SALES REVENUE/EMPLOYEE	OPERATING EXPENSE/SALES	LABOUR COST/SALES	SELL & GEN EXP/SALES	SALES/TOTAL ASSETS
TOTAL ASSETS	0.2023	-0.4666	-0.2174	-0.2411	-0.2849
AGE OF BUSINESS	-0.0545	0.0328	-0.0128	0.1072	0.0306
YEARS OF IT INVESTMENT	-0.0414	-0.059	0.0264	-0.1289	-0.1382
SEPARATE IT DEPT	-0.1261	0.1041	-0.1732	-0.0173	0.1624

There exists a very weak correlation between the contextual factors and the process efficiency variables. The only significant correlation between contextual factors and firm performance is seen between firm size and ROS. Marginal correlation is seen between 50% of the contextual and process efficiency variables and between contextual and firm performance variables.

The second part of the analysis included the production of canonical correlation functions. The Wilks's λ and 1- λ for the four functions provided in Table 5.20 show that there exists a significant relation between the contextual factors and the process efficiency variables. This is because the 1- λ for the first function is .610, suggesting that 61% of the correlation is explained by this function. Functions 2 to 4 provide 28%, 10% and 0.7% of the variance shared between the two sets of variables respectively. For the purpose of this study, functions 1 to 3 are deemed to be providing a significant degree of relationship between the two variables. The full model to measure the impact of contextual factors on process efficiencies is also significant with a 1- λ of 0.610 = r^2_e. The Wilks's λ, however, tells nothing about the magnitude of the relationship between these two sets of variables. The canonical solutions for the three functions will be looked at next to determine the nature of the relationship between the two sets of variables.

TABLE 5.20
Wilks's λ and 1- λ FOR THE FOUR FUNCTIONS

Wilks's λ and 1- λ FOR THE FOUR FUNCTIONS

FUNCTION	Wilks's (λ)	1 - (λ)
1	0.390	0.610
2	0.719	0.281
3	0.891	0.109
4	0.993	0.007

5.4.2.2 Analysis of Significant Canonical Correlation Functions

The third stage is to analyse the three functions, with the most significant being considered first.

5.4.2.2.1 Analysis of Function 1

Table 5.21 provides the canonical solution for impact of contextual factors on process efficiencies for Function 1. The first Function shows that all contextual variables have a significant impact on the process efficiency variables. Size of the firm and number of years of information technology investment are positively correlated with sales revenue per employee.

TABLE 5.21
CANONICAL SOLUTION FOR IMPACT OF CONTEXTUAL FACTORS ON PROCESSES FOR FUNCTION 1

VARIABLE	Coef	r_s	r_s^2 (%)
FIRM SIZE	-0.571	-0.738*	54.46
AGE OF BUSINESS	1.622	0.140*	1.96
YEARS OF IT INVESTMENT	-1.522	-0.229*	5.24
SEPARATE IT DEPT	0.012	0.246*	6.05
r_e^2			44.49
SALES REVENUE/EMPLOYEE	-0.150	-0.210*	4.41
OPERATING EXPENSE/SALES	0.558	0.607*	36.84
LABOUR COST/SALES	-0.159	0.090	0.81
SELL & GEN EXP/SALES	0.495	0.750*	56.25
SALES/TOTAL ASSETS	0.435	0.627*	39.31

Age of business and separate information technology department are positively correlated with operating expenditure as a proportion to revenue, selling and general expenditure as a proportion of revenue and sales as a proportion of total assets. The contextual variables have insignificant impact on labour cost as a proportion to revenue.

5.4.2.2.2 Analysis of Function 2

Table 5.22 provides the canonical solution for impact of contextual factors on process efficiencies for Function 2.

TABLE 5.22
CANONICAL SOLUTION FOR IMPACT OF CONTEXTUAL FACTORS ON PROCESSES FOR FUNCTION 2

VARIABLE	Coef	r_s	r_s^2 (%)
FIRM SIZE	0.881	0.631*	39.82
AGE OF BUSINESS	1.653	0.089	0.79
YEARS OF IT INVESTMENT	-1.939	-0.143*	2.04
SEPARATE IT DEPT	-0.103	-0.186*	3.46
r_e^2			19.27
SALES REVENUE/EMPLOYEE	0.365	0.413*	17.06
OPERATING EXPENSE/SALES	-0.547	-0.576*	33.18
LABOUR COST/SALES	-0.350	-0.560*	31.36
SELL & GEN EXP/SALES	0.724	0.493*	24.30
SALES/TOTAL ASSETS	-0.165	0.116*	1.35

Function 2 shows that the number of years of information technology investment and separate information technology department has a positive correlation with operating expenditure as a proportion to revenue and labour cost as a proportion to revenue. Size of firm strongly correlated with sales revenue per employee and selling and general expenditure as a proportion to revenue. There is weak correlation between size of the firm and sales to total assets. The age of business does not provide any significant contribution in this function. This function, however, explains only 28.1% of the variance shared between the two sets of variables.

5.4.2.2.3 Analysis of Function 3

Table 5.23 provides the canonical solution for impact of contextual factors on process efficiencies for Function 3.

TABLE 5.23
CANONICAL SOLUTION FOR IMPACT OF CONTEXTUAL FACTORS ON PROCESSES FOR FUNCTION 3

VARIABLE	Coef	r_s	r_s^2 (%)
FIRM SIZE	0.342	0.073	0.53
AGE OF BUSINESS	0.150	0.029	0.08
YEARS OF IT INVESTMENT	0.174	0.011	0.01
SEPARATE IT DEPT	1.099	0.881*	77.62
r_e^2			10.50
SALES REVENUE/EMPLOYEE	-0.431	-0.262*	6.86
OPERATING EXPENSE/SALES	0.331	-0.155*	2.40
LABOUR COST/SALES	-0.970	-0.808*	65.29
SELL & GEN EXP/SALES	-0.386	-0.332*	11.02
SALES/TOTAL ASSETS	0.136	0.190*	3.61

Function 3 shows very weak negative correlation between all contextual variables except separate information technology department and sales revenue per employee, operating expenditure as a proportion to revenue and selling and general expenditure as a proportion to revenue. The only significant relationship shown in function 3 is between separate information technology department and sales as a proportion to total assets.

5.4.2.3 Communality Coefficients

In the final step, the communality coefficients were considered. The communality coefficients (h^2) provided in Table 5.24 shows that age of business and number of years of information technology investment makes minimal contribution in explaining the relations amongst all functions. The sales revenue per employee also had marginal contribution across all functions, with an h^2 of 28.33%.

TABLE 5.24
COMMUNALITY COEFFICIENT TO THE THREE FUNCTIONS

VARIABLE	r_c^2 (%) FUNCTION 1	r_c^2 (%) FUNCTION 2	r_c^2 (%) FUNCTION 3	h^2
FIRM SIZE	54.464	39.816	0.53	94.8134
AGE OF BUSINESS	1.960	0.792	0.08	2.8362
YEARS OF IT INVESTMENT	5.244	2.045	0.01	7.3011
SEPARATE IT DEPT	6.052	3.460	77.62	87.1273
SALES REVENUE/EMPLOYEE	4.410	17.057	6.86	28.3313
OPERATING EXPENSE/SALES	36.845	33.178	2.40	72.4250
LABOUR COST/SALES	0.810	31.360	65.29	97.4564
SELL & GEN EXP/SALES	56.250	24.305	11.02	91.5773
SALES/TOTAL ASSETS	39.3129	1.3456	3.61	44.2685

5.4.3 Results on the Impact of Contextual Factors on Firm Performance

5.4.3.1 Analysis of the Data

The first stage of determination of the correlation coefficients between the independent variables and the dependent variables for this section was discussed in the previous section. The second part of analysis that included the production of the canonical correlation functions showed a significant relationship between these two sets of variables. Table 5.25 provides the Wilks's λ and 1- λ for the four functions.

TABLE 5.25
WILKS'S (λ) AND 1 - (λ) FOR THE FOUR FUNCTIONS

FUNCTION	Wilks's (λ)	1- λ
1	0.204	0.796
2	0.709	0.291
3	0.901	0.099
4	0.994	0.006

The first two functions explain 79.6% and 29.8% of the variance shared between the two sets of variables respectively. The full model to study the impact of contextual factors on firm performance is also significant with 1- λ of 0.796 = r^2_e. For the purpose of this section of the study, functions 1 to 3 are deemed to be providing a significant degree of relationship between the two sets of variables. As stated earlier, the Wilks's λ , however, does not provide any details on the magnitude of the relationship between the two sets of variables. The next section will look at the three canonical solutions from the canonical correlation to establish the degree and nature of the relationship between the contextual factors and the firm performance measurement variables.

5.4.3.2 Analysis of Significant Canonical Correlation Functions

5.4.3.2.1 Analysis of Function 1

Table 5.26 displays the canonical solution for the impact of the contextual factors on firm performance for Function 1.

TABLE 5.26
CANONICAL SOLUTION FOR IMPACT OF CONTEXTUAL FACTORS ON FIRM PERFORMANCE FOR FUNCTION 1

VARIABLE	Coef	r_s	r_s^2 (%)
FIRM SIZE	-1.011	-0.989*	97.81
AGE OF BUSINESS	0.082	-0.043	0.18
YEARS OF IT INVESTMENT	0.080	-0.167*	2.79
SEPARATE IT DEPT	0.053	0.318*	10.11
r_e^2			71.23
ROA	0.587	0.036	0.13
ROE	0.264	-0.093	0.86
ROS	-1.325	-0.830*	68.89
SALES TURNOVER	-0.283	0.341*	11.63

The first Function, which explains 79.6% of the variance shared between the contextual factors and firm performance variables, shows a strong positive correlation between firm size

and ROS. Number of years of information technology investment has minimal impact on the ROS. Separate information technology department is positively correlated with sales to total assets ratio. The age of business has not provided any significant explanation for the performance measures. The contextual factors do not affect ROA and ROE. The r^s for these two variables are 0.036 and -0.093 respectively.

5.4.3.2.2 Analysis of Function 2

Table 5.27 displays the canonical solution for the impact of the contextual factors on firm performance for Function 2.

TABLE 5.27
CANONICAL SOLUTION FOR IMPACT OF CONTEXTUAL FACTORS ON FIRM PERFORMANCE FOR FUNCTION 2

VARIABLE	Coef	r_s	r_s^2 (%)
FIRM SIZE	0.339	-0.056	0.31
AGE OF BUSINESS	1.868	-0.244*	5.95
YEARS OF IT INVESTMENT	-2.383	-0.613*	37.58
SEPARATE IT DEPT	0.058	0.243*	5.90
r_e^2			21.25
ROA	0.634	0.421*	17.72
ROE	-1.018	-0.282*	7.95
ROS	0.426	-0.008	0.01
SALES TURNOVER	0.692	0.649*	42.12

Function 2 shows that all contextual factors except firm size are moderately correlated with the performance measurement variables. Positive correlation exists between age of business and number of years of information technology investment and ROE and between separate information technology department and ROA and sales as a proportion to total assets. The impact of firm size is insignificant in this function and the contextual factors do not impact on ROS as a measure of firm performance.

5.4.3.2.3 Analysis of Function 3

Table 5.28 displays the canonical solution for the impact of the contextual factors on firm performance for Function 3.

TABLE 5.28
CANONICAL SOLUTION FOR IMPACT OF CONTEXTUAL FACTORS ON FIRM PERFORMANCE FOR FUNCTION 3

VARIABLE	Coef	r_s	r_s^2 (%)
FIRM SIZE	-0.198	-0.131*	1.72
AGE OF BUSINESS	-1.151	-0.787*	61.94
YEARS OF IT INVESTMENT	0.217	-0.643*	41.34
SEPARATE IT DEPT	-0.656	-0.317*	10.05
r_e^2			9.36
ROA	1.244	0.691*	47.75
ROE	-0.158	0.366*	13.40
ROS	-0.290	0.460*	21.16
SALES TURNOVER	-0.880	-0.377*	14.21

Function 3, which explains about 10% of the variance shared between the two sets of variables, shows that all contextual factors are negatively correlated with all performance variables except sales as a proportion to total assets. Sales as a proportion to total assets is positively correlated with all contextual factors. All contextual factors in function 3 provide significant contribution as their r^s ranges from -0.631 to -0.787.

5.4.3.3 Communality Coefficients

The final stage of determination of the communality coefficients (^{h2}) for all functions provided in TABLE 5.29 shows that all variables except separate information technology department and ROS make a significant contribution across all functions (1-3), in explaining the existing relationship. Separate information technology department and ROS had an h^2 of 26.07 and 22.31 respectively.

TABLE 5.29
COMMUNALITY COEFFICIENT TO THE FOUR FUNCTIONS

VARIABLE	r_s^2 (%) FUNCTION 1	r_s^2 (%) FUNCTION 2	r_s^2 (%) FUCNTION 3	h^2
INTERVIEWEE	97.81	0.314	1.72	99.842
AGE OF BUSINESS	0.18	5.95	61.94	68.075
YEARS OF IT INVESTMENT	2.79	37.58	41.34	81.711
SEPARATE IT DEPT	10.11	5.90	10.05	26.066
ROA	0.13	17.72	47.75	65.602
ROE	0.86	7.95	13.40	22.213
ROS	68.89	0.01	21.16	90.056
SALES TURNOVER	11.63	42.12	14.21	67.961

5.4.4 Discussion on the impact of Contextual Factors on Firm Processes and Firm Performance.

The six functions considered in this section of the results showed significant correlation between the independent (contextual factors) and the dependent (process efficiency and firm performance) variables. This shows that contextual factors impact on the process efficiencies and on the firm performance.

The relationship derived in functions 1, 2 and 3 from the canonical correlation between the contextual factors and the process efficiency variables reveals that for the first function, the size of firm and number of years of information technology investment has a positive impact on the employee productivity (sales revenue per employee). This impact is marginal, however, as the r^s for the Sales Revenue/Employee is -0.210. This suggests that the bigger the firm and the more mature the firms are in terms of investment into information technology, the more productive they are. Interestingly, the function also reveals that bigger and more mature information technology investment firms have improved operational, sales and marketing efficiencies. This is because there is a negative correlation between these variables. The correlation in function 1 also indicates mature firms and firms with separate information technology department are able to utilise their assets more efficiently to earn

revenue, as there is a positive correlation between these variables. Firm size and number of years of information technology investment negatively affected the sales turnover.

The second function reveals that bigger firms are able to achieve better employee productivity, as these are positively correlated. They are also able to achieve good operational efficiency and workforce management, as there is a negative correlation between these sets of variables. Mature information technology investing firms and firms with a separate information technology department seem to impact processes negatively as there exists a negative correlation between these variables and sales revenue per employee and sales as a proportion to total assets and also a positive correlation with operating expenditure as a proportion to sales and selling and labour cost as a proportion to sales. These variables, however, resulted in good improvement in selling and general expense as a proportion to sales as there was a negative correlation.

In function 3, the only contextual factor that affects process efficiency variables significantly is separate information technology department. The contribution of all other contextual factors is insignificant. Firms with separate information technology department had lower operating expenditure, labour cost and selling and general expenses as a proportion to sales. There is an indication, perhaps, as to how well technology is managed. It also improves the sales turnover. Overall, it could be said that the contextual factors chosen in this study do improve efficiencies in business processes.

The functions showing the relationship between the contextual factors and firm performance also showed the positive relation of the contextual factors towards firm performance. The first function shows that bigger firms and number of years of information technology investment achieve good return on sales (-0.830), but they have an insignificant impact on ROE. Firms that have separate information technology department seem to achieve good sales turnover, as there exists a positive correlation between these variables. The age of

the firm makes no impact on performance, whereas the contextual factors do not impact ROA and ROE.

The second function shows that mature firms and the number of years of information technology investment by firm's results in a better return on equity. Firms with separate information technology department see good returns on assets and good sales turnover. The size of the firm did not contribute in function 2 and the contextual factors did not impact ROS.

The third function, which explains 9.9% of the variance, shared between the two sets of variables shows that bigger firms, number of years of information technology investment, mature firms and firms with separate information technology department achieve better sales turnover. This function also shows that all contextual factors negatively impact returns on asset equity and sales. There is an indication here, perhaps, that newer and smaller firms make use of technology and thus also achieve better returns on assets, sales and equity or vice versa. In general, the results support the fact that contextual factors do impact on firm performance, depending on how one makes of the interpretation.

5.5 Summary

The results of the study on the impact of information technology investment and contextual factors on firm processes and the impact of these processes on firm performance indicate there is a significant positive relationship amongst most of the variables as the overall $(1-\lambda)$ for the two functions is 0.867 and 0.639 respectively. An evaluation of the significant canonical correlation functions reveals that there exists a strong positive relationship between information technology investment and process improvements. The second part of the results shows that improvement in processes impacts positively on firm performance in terms of return on assets, sales and equity as improvements in process measures improve

firm performance. The last part of the results also provides positive results in terms of the impact of contextual factors on process efficiency and firm performance.

Now that the tangible impact of information technology investment on processes and the impact of these processes on the performance of the firm are ascertained, the next section will discuss the views and statistics on the intangible impact of information technology investment on firms in Fiji. Following this, an extensive discussion on the results will be undertaken, which then will be used to develop a framework for studying the impact of information technology investment in developing countries.

CHAPTER 6

THE INTANGIBLE IMPACT OF INFORMATION TECHNOLOGY INVESTMENTS

6.1 Introduction

This chapter discusses the results of the interviews conducted to obtain the views on intangible benefits of information technology investment to firms in Fiji. Views were gathered from Twenty-five individuals occupying different positions in the firms. This includes the General Manager IT, Director IT, and IT Managers, IT Developers, Chief Financial Officers, Service Department Managers, Front End Officers, Business Analysts, Accountants and Process Managers. Table 6.1 provides further details on this. It is expected that the views from these individuals would provide a better picture in terms of the nature of the intangible benefits of information technology investments with firms in Fiji.

TABLE 6.1
POSITION HELD BY INTERVIEWEES

POSITION OF INTERVIEWEE	NO OF INTERVIEWEES
GENERAL MANAGER / DIRECTOR / MANAGER IT SERVICES	7
CHIEF FINANCIAL OFFICER	2
SERVICE DEPARTMENT MANAGERS	8
IT SPECIALISTS	2
OPERATIONS/ FRONT END OFFICERS	1
BUSINESS ANALYSTS	1
ACCOUNTANTS	2
PROCESS MANAGEMENT MANAGERS	2
TOTAL	**25**

This chapter begins with a background and the overview of the research exercise undertaken and then the outcome of the interviews will be looked into in greater detail. This will be followed by a discussion of the results, followed by the summary and conclusion of the chapter.

6.2 Background

This study obtained views of the individuals involved in the management and use of information technology on whether and what type of intangible benefits information technology investment brings to firms. The issues on which the views were gathered are provided in Table 6.2. The major areas of interest were impact on staff, efficiency, and image of entity, adoption process and accounting controls.

TABLE 6.2

ISSUES ON WHICH VIEWS WERE GATHERED

ISSUES ON WHICH VIEWS WERE GATHERED
EMPLOYEE-SUPERVISOR RELATIONSHIP
CUSTOMER-EMPLOYEE RELATIONSHIP
QUALITY OF SERVICE PROVISION
EFFICIENCY OF SERVICE PROVISION
LEVEL OF SERVICE SATISFACTION
STAFF TURNOVER
IMPACT ON TECHNOLOGY ADOPTION
IMPACT ON CORPORATE IMAGE
IMPACT ON AVERAGE COST
PROGRESS OF COMPANY IN 5 YEARS
IMPACT ON ACCOUNTING CONTROLS

A letter of request for interview was sent to the firms requesting an interview at the first instance. The first interview generally targeted a senior in terms of one who is actively involved in the management of information technology investments in the firm. Upon confirmation and during interview, permission was sought to gather views on this issue from other managers and/or users of information technology within the firm. This was to ensure that views were collected from individuals dealing with a variety of issues involved in information technology management and usage. Table 6.3 provides details of the firms in terms of the sector where interviews were conducted.

TABLE 6.3

SECTORS IN WHICH INTERVIEWEES WERE CONDUCTED

SECTOR	NO OF INTERVIEWS
EDUCATION	2
TELECOMMUNICATIONS	3
BANKING	8
REGULATION	2
PUBLIC/TAXATION	1
RETAIL	2
CREDIT INSTITUTIONS	4
SERVICE	2
GENERAL MERCHANTS	1
TOTAL	**25**

A semi-structured questionnaire was used to gather views and the interviewees were also asked to rank the extent to which they have derived intangible benefits from information technology investments in areas as provided in Table 6.2. A Likert scale was used that contained five alternatives ranging from one to five, with one being, seeing excellent improvement/benefits intangibly from information technology investments and 5 where negative impact was witnessed (refer to appendix 1 for more details on this). The interviewees were briefed on the nature of the research and an interview schedule was provided to them two weeks in advance of the date of the interview. Once the interviews were completed, transcripts were made ready and the contents were confirmed with all the interviewees.

It was pleasing to note that the interviewees were eager to share their views on information technology investments, as there was no requirement to disclose any financial information. Since the interviewees mostly included ones whose performance was directly related to the way in which technology was utilised, they showed good interest. There were a few interviews where the interviewees showed disappointment in terms of how technology was introduced. Disappointment comes from the fact that there lies a difference in who makes the decision in terms of what to be invested on and who actually is responsible to ensure

that the investment delivers the desired result. The next section looks at the outcome of the interviews.

6.4 Results

6.3.1 Overview of the Results

The results generally provide evidence to support that investment into information technology brings about significant intangible benefits to firms in Fiji. This is supported by the fact that the average ranking for each question is between 1.96 and 3.04. Table 6.4 provides details of the ranking provided for the questions where this option was available.

TABLE 6.4
ANALYSIS OF INTERVIEWEE RANKING IN TERMS OF INTANGIBLE BENEFITS OF INFORMATION TECHNOLOGY IN DIFFERENT AREAS

INTERVIEWEE /ISSUE	EMPLOYEE SUPERVISOR RELATIONSHIP	CUSTOMER EMPLOYEE RELATIONSHIP	QUALITY OF SERVICE PROVISION	EFFICIENCY OF SERVICE PROVISION	LEVEL OF SERVICE SATISFACTION	STAFF TURNOVER	IMPACT ON TECHNOLOGY ADOPTION	IMPACT ON CORPORATE IMAGE	IMPACT ON AVERAGE COST	PROGRESS OF COMPANY IN 5 YEARS	IMPACT ON ACCOUNTING CONTROLS
	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK
1	3	2	4	4	4	4	1	4	4	4	2
2	1	2	2	2	2	2	1	3	2	2	1
3	2	2	2	2	2	2	1	2	3	2	2
4	3	3	2	3	3	3	2	2	3	2	2
5	2	2	2	1	3	3	1	3	3	1	1
6	2	1	2	2	2	3	1	2	2	2	1
7	3	3	3	3	4	3	2	2	2	2	2
8	3	3	3	2	3	4	2	3	3	3	2
9	1	1	2	2	3	1	1	2	1	1	2
10	1	2	1	1	2	4	2	1	3	2	1
11	3	2	2	3	3	4	2	3	3	1	3
12	2	2	2	1	1	3	2	1	3	1	2
13	2	2	2	2	3	3	2	2	3	1	2
14	2	1	1	2	3	3	2	1	4	2	3
15	1	1	1	1	2	3	1	2	2	1	1
16	2	2	1	2	3	3	1	2	2	2	1
17	1	2	2	1	1	2	2	1	1	2	1
18	2	2	2	2	2	3	1	2	3	2	1
19	3	2	2	3	3	4	3	2	3	2	2
20	2	1	2	2	2	3	1	2	2	2	1
21	3	3	3	3	4	3	2	2	2	2	2
22	3	3	3	2	3	4	2	3	3	3	2
23	1	1	2	2	3	1	1	2	1	1	2
24	1	2	1	1	2	4	2	1	3	2	1
25	3	2	2	3	3	4	2	3	3	1	3
Average	2.08	1.96	2.04	2.08	2.64	3.04	1.6	2.12	2.56	1.84	1.72
Lowest Rank	3	3	4	4	4	4	3	4	4	4	3
Highest Rank	1	1	1	1	1	1	1	1	1	1	1

Ranking ranged from one to three mostly (Excellent Improvement to Some Improvement).There were a few cases of no improvement (4). No interviewee ranked that the investments into information technology as having had negative implications to their firm.

6.3.2 Impetus for Success and Motivation for Information Technology Investments

Three common issues were highlighted by the interviewees in terms of success of information technology investment. The first was that for the information technology investment to be beneficial either tangibly or intangibly it need to be with a firm's investment framework. In other words, investment must be evaluated with the required rigidity as with any other investment and its costs and benefits well evaluated. As one interviewee highlighted:

> *"you can not expect efficiency if you do not have a benchmark or set of guidelines within which you carry out your information technology investments. Technology brings about new expectations and demands. If investments into information technology do not follow a plan, then we will keep on investing into technology without any perceived benefits." (Transcript 1)*

This provides an important insight that despite the fact that there lies a lack of strong competition and perhaps for some firms operating in monopolistic environment, an abundance of financial resources for investment, technology investment is not taken as being synonymous with benefits. Proper guidelines are always necessary for benefits to pertain. Most of the interviewees shared similar sentiments that even though information technology investments may not bring tangible benefits, other benefits and impacts are always considered before a decision to invest into any information technology project is made. This is evident from the fact that when asked whether investment into information technology creates further demand for investments, most comments were somewhat positive but with caution. One view was:

> *"yes, but one needs to follow the guidelines for these increased demand to show positive results." (Transcript 4)*

The second issue was that firms appreciate that fact that investments into information technology may only bring about intangible benefits and may have no impact on the financial performance. It was interesting to note that many firms do invest into information technology

with this fact known. One of the interviewees in the finance sector said the following to support this:

> *"Look, we have just changed our software for our ATMs. I do not expect any tangible benefits from this in terms of more customers or more frequent usage of our machines. However, this will certainly improve our customers' experience in using these services. That is good enough for us." (Transcript 3)*

The third issue was that there are some firms who may not see any direct (tangible and intangible) benefits of information technology investments. This could be largely due to the fact that quality and efficiency of service delivery is not likely to change from introduction of modern technology. Despite this, these forms still invest in information technology. This is undertaken as a risk management strategy. Some of these firms invest in information technology to automate their process because they feel that it would be easier to recover from automated processes than from the manual ones in an event of a disaster. On the issue of investments into information technology creating further demands, one interviewee said:

> *"An important issue here is what the purpose of information technology investments is. We have considered investments as a means of reducing business risks by moving away from manual processes." (Transcript 9)*

Now that the three main issues highlighted are discussed, the following sections will discuss the specific intangible benefits of information technology investments by firms in Fiji.

6.3.3 Information Technology Investments Impact on Internal and External Relationships

The views of the interviewees indicate that there is a positive relationship between investment into information technology and its impact on the employee-supervisor and employee-customer relationship. One shared view was that information technology makes supervisors more independent, thus removing some frustration in terms of delegation of

trivial activities. There were, however, concerns that this could only be possible with appropriate support.

> *"Supervisors can do their own work thus reducing dependency on the assistants. But effectiveness will depend upon how support is provided rather than the equipment." (Transcript 1)*

Another view shared was:

"information technology will enhance communication and will promote provision for feedback." (Transcript 5)

These benefits, however, differ within different sectors. In the service delivery sector, this has made a huge impact. As suggested by one interviewee from this sector:

> *"because we are an organisation striving for excellence in service delivery, this has been a major motivating factor. We have seen huge improvement in internal communication through tools like e-mail." (Transcript 16)*

Technology adoption also needs to be considered when one tries to see the benefits of it in terms of the stated relationships. As one interviewee indicated:

> *"It takes time for people to get used to new technologies. The effect of introduction/update will be seen in the first year but in some cases may be quite low." (Transcript 19)*

There was an indication, however, that we must give time for technology adoption to see its full benefits. Another issue shared especially among interviewees from the regulatory sector is that there is a need to set limits to technology investments in improving the relationships. This is because there is a risk that some technologies could open the window for employees to disclose sensitive information to parties outside the firm. In general, however, views supported the fact that technology investments help improve and strengthen the relationship between supervisors and employees within firms and this will definitely have an impact on the work environment and eventually on the employee productivity.

On the issue of the employee-customer relationship, mixed views were shared by the interviewees. While the view that technology boosts the way in which we can reach our

customers was generally agreed to, there were also concerns that there exists a tendency for the receivers of the service to want more. Some of the views shared were:

> *"we have improved our service delivery. But the use of technology makes us and our customers appreciate that we need to do more. I feel that we have improved fairly well but we need to do more to further enhance our service to our customers." (Transcript 2)*

> *"With integration, we are able to offer our customers a one-stop service delivery environment. In doing so, we see improvement in the morale of our front-end employees as they are able to meet the customer demands more efficiently. (Transcript 3)*

The issue of lack of direction in information technology investments is also pertinent here. If technology investment is demand driven and without proper guidelines, then an organisation will always play catch-up. In other words, one may be delivering the service more efficiently, but would always see loopholes appearing within the system as their reaction are always reactive. In general, many firms see improvement in service delivery through investments into information technology. As one interviewee said:

> *"we can not afford to stay back. We are operating in a global environment. Society's mobility has improved a lot and they see things elsewhere and the demand for such type of service gets created locally."(Transcript 4)*

Competition, however, is also a determining factor and we could see more benefits if these technologies are introduced in a competitive environment.

6.3.4 Service Delivery and Satisfaction

There was an overwhelming support for the view that investment into information technology brings about improvement in quality of service delivered and the efficiency to which the service is delivered. There was, however, a caution shared amongst most of the interviewees. The following comment perhaps represents the views of most of the interviewees:

"There seems to be a greater demand for better quality service and if these services can not be provided due to lack of an information technology investment framework in terms of what needs to be done next, then the expectation gap will always increase." (Transcript 1)

It seems that from the customer end, there is always a push for better service. One, however, needs to be careful that this urge for improvement does not get customer driven. There is a need to be proactive in adopting new technologies, which can bring about a better quality of service and efficient delivery of these services. As one interviewee highlighted:

"There is a huge room for improvement and through the current technology; we have managed to make some improvement. The customer expectation is always changing and we need to be on the move all the time." (Transcript 10)

The view provided by the following interviewee provides further support for a proactive approach in information technology investment.

"But the customers are always expecting more (e.g. same day loan approval). As we have to follow the protocols, I feel it is not appropriate to stretch technology adoption beyond the desired limit." (Transcript 8)

A simple comment like the following goes a long way in supporting the view highlighted above.

"It seems people still need more." (Transcript 16)

In general, the responses of the interviewees strongly suggest that investments into information technology certainly bring about improvement in quality of service produced and the way this service is delivered. There are some reservations, however, about whether its impact, from the customer side is as satisfactory in terms of service satisfaction.

6.3.5 Staff Turnover, Corporate Image and Technology Adoption – Creation of Further Demand

Interviewees had mixed views on the nature of impact of information technology investments on staff turnover. Sentiments were shared that there lies a weak link between staff turnover and technology adoption. To some extent, this could be agreed to because financial

incentive does seem to be the primary driver. There were some interviewees, however, that felt that they witnessed a big improvement in staff retention through adoption of technology. One interviewee had the following to say:

> *"This is the area where we have improved the most. We are able to recruit and retain quality staff due the change in the working environment. We can now attract employees from our competitor firms." (Transcript 9)*

The following view perhaps provides a more realistic view on the status of our work force behaviour.

> *"It depends upon the purpose of information technology investments especially in relation to staff. If one intends to harness the company culture, then improvements in staff turnover could be seen. Information technology investments make a workforce more marketable, but a good company culture will not result in staff turnover despite financial incentive. Further, some technologies (e.g. e-mail) have become a norm so it is not expected to drive the staff away." (Transcript 3)*

The above view perhaps indicates that any investment into information technology that affects staff should look at the issue in totality and not as a once in while handout. There are some instances where any amount of investment into information technology may have little or no effect on staff issues. As one interviewee put it:

> *"We do not see a great link between these two things as a technology oriented workforce is not a determining factor in meeting our KPIs. Staff do move for greener pastures and I feel that no amount of introduction of modern technology can stop this as far as our organisation is concerned." (Transcript 19)*

On the issue of the appreciation for the need for better technologies from current investments, the majority of the interviewees shared the view it creates further demand to acquire technology that is more modern. One of the stronger views on this issue was:

> *"Sometimes it is only when one has made some investments into information technology that one realises what more could be done. Now we want to convert some of our processes into web-based processes. This would give our customers a one-*

stop-shop in terms of getting application forms, checking their application progress etc." (Transcript 5)

Another view shared was:

"Certainly. We started with something different and now we have changed our software three times. Increased service quality demands means acquiring technology that is going to enhance service delivery. Further, one always needs to appreciate the value of modern technology. Then there is always a demand for better quality information." (Transcript 16)

These issues are more pertinent in a competitive environment where one always needs to have an edge over one's competitors in order to survive. This was the view shared by an interviewee from a competitive sector.

"In a competitive industry, one has to keep up with developments in modern technology. I feel that technology investment is an ongoing process. You don't expect to be efficient and not keep abreast with advancements in technology." (Transcript 22)

There was, however a caution. Some views were shared that it is important that these investments need to be made within the guidelines of the firm. In other words, any information technology project must be thoroughly evaluated and its costs and benefits thoroughly scrutinised. As one interviewee mentioned:

"In an unplanned situation, however, these demands are not for appreciation for better service but due to the demand driven by the customers." (Transcript 18)

Another interviewee mentioned:

"Yes, but one needs to follow the guidelines for these increased demands to show positive results." (Transcript 21)

The interviewees provided mixed views on the impact of information technology investments on corporate image. One way to explain this could be the fact that the external environment is the major determinant of corporate image. Improvements in internal processes and functions and providing staff with a better set of tools may not be well communicated to outsiders or may not be of much interest to outsiders and this would have little impact on the image of the entity. As one interviewee put it:

"There has been some improvement but this gets marred by other challenges we face every day due to the nature of the service we provide." (Transcript 5)

If, however, information technology investment is made within a strategic framework with benefits considered in the longer run, then we could see big improvements in terms of the corporate image in the eyes of the public. This is supported by the following comment:

"Information technology investments within a particular framework bring huge benefits to the organisation in terms of their image. This is true for our company." (Transcript 10)

Another interviewee highlighted:

"Focused investments into information technology will certainly improve the corporate image. Many of our investments are not targeted to show immediate dollar returns. These investments are made to enhance the efficiency of our operations with the intention of lifting the corporate image." (Transcript 3)

These views have provided support for the fact that if an investment into information technology is towards front-end processes, then entities could see improvements in their corporate image. This is because image is improved through word of mouth. Overall, the views shared strongly suggest that a directed information technology investment is sure to bring about improvements in corporate image. This could only be sustained if it is not marred by other factors. The service sector sees more benefits in terms of their corporate image from directed investments into information technology.

6.3.6 Cost of Service Provision

Despite the fact that this study focused on the intangible benefits of information technology investment, interviewees' views were sought on its impact on cost. This was done primarily to ascertain whether there is a desire to see some ultimate impact on the cost of providing services or carrying out internal processes. The common view shared by the interviewees was that they eventually would like to see a reduction in the cost of the processes or service delivery. This would naturally be achieved through efficiency. Interviewees shared that they

did not see much improvement in the short term but cost becomes an issue with progressive investment in information technology within respective areas in a firm. As the interviewees said:

> *"In a competitive market, some information technology investments will not lead to cost reductions (changing ATM software). But investment in information technology is largely driven by the desire to reduce the cost of providing service or completing a process and hence its impact on performance." (Transcript 2)*

> *"If investments are made within strategic guidelines, then the cost of process completion or service delivery has to go down. We have achieved some operational efficiencies but investment into information technology will not bring about cost benefits immediately if it was made with a strategic investment framework." (Transcript 18)*

There were some interviewees, however, who believed that there exists a pool of benefits and cost reduction is one of them. In some cases, the cost benefit advantage may occupy a lower place as other benefits may be more pertinent at a particular time. The following comment by an interviewee puts this in perspective.

> *"When I take an information technology investment proposal to request for funds, I don't just tell them how much it will cost us but I also have to inform them what the benefits are both tangibly and intangibly. We must see clear-cut benefits before we make an investment decision. I must emphasize, however, that cost savings may not be out immediate priority. There are of course intangible benefits that need to be considered first." (Transcript 21)*

The feedback received on cost implications; therefore, suggests that all investments eventually would come to that. As an immediate benefit, firms focus on efficiency, effectiveness and better corporate image but the follow-on effect of all these achievements should be reflected in the numbers at the end.

6.3.7 Impact on Accounting Controls

Interviewees expressed views that adoption of technology certainly improves accounting controls if investment is made in the area of accounting information systems (AIS). However, as mentioned by an interviewee:

> *"Technology investments on their own do not improve accounting controls. Human involvement is always necessary. We can never be too dependent on technology controls as they are established by humans anyway." (Transcript 16)*

There perhaps lies a hint that paperless accounting processes are not completely safe and human involvement at some stage is necessary. Views, however, have been shared that it is easier to place and manage controls in a technology oriented function. On the specific issue of accounting controls, interviewees agreed that they do strengthen the controls but we need to be cautious. Heavy reliance on these controls only and lack of human involvement in terms of evaluation of the effectiveness of these controls or in completing a process were seen as having disastrous implications. Overall, however, there was strong agreement on the benefits of information technology investments on accounting controls, but suggested that over-reliance on them may not be a feasible thing to do.

6.3.8 Value of Information Technology Investments

It was pleasing to note that there was a consensus that there is need to invest in information technology despite there being no immediate financial returns or only low returns in the end. Interviewees were asked to comment on the statement, "we should not invest into information technology because it does not provide adequate financial returns". The following views provide evidence to support the appreciation of benefits of information technology investments beyond financial returns.

> *"Those who think on such lines have a great misconception on the potential of information technology." (Transcript 2)*

"This is not true. Those who share these views do not appreciate the value-adding feature of information technology investments. This seems to be a misunderstanding. I think we all need to move on and incorporate technology into business processes."(Transcript 8)

"As I mentioned earlier, that if information technology investments are taken within a strategic framework, benefits will always be there. When I take up an information technology investment proposal to management, I must show what the intangible benefits of the project are." (Transcript 2)

"I strongly disagree. An organisation that does not invest would be left behind in the competition. This is the information technology age and organisations must keep tune with it." (Transcript 20)

'This is an immature statement. Information technology investments can not always be measured in financial terms." (Transcript 22)

Such comments suggest that firms tend to appreciate the benefits of information technology investments beyond financial returns. As expected, some firms have treated this with caution. The explanation given is the need to have a framework within which firms could invest in information technology. As interviewee simply put:

"With proper focus, returns are inevitable."

Some interviewees used the time frame issue to justify continuous investments in information technology.

"One should take risks to achieve growth/profits. Heavy investment should be weighed against returns before a commitment is made. It is the return the investment brings that counts. Financial returns will surely not be favourable in the short term. The advantage of the investment will be laid out over a period of time." (Transcript 19)

This comment was interesting as it tries to assert the point that returns will be there, we just have to be patient, and not the fact that benefits could be beyond the tangible in nature. In

totality, interviewees appreciate the value of information technology investments beyond tangible returns and also see and anticipate tangible returns in the longer run.

6.3.9 Information Technology Investments in a Non-Competitive Market in a Developing Economy

Interviewees were asked about the need to for developing economies like Fiji to take advantage of the modern technology despite absence of external pressure (e.g. competition). There was overwhelming support for this view and agreement that there is a need to invest into information technology whether or not there is external pressures to do so. As one interviewee said:

> *"You don't have to wait for competition. The management's view should be in line with providing a service of excellence with the ultimate goal of best quality. To develop technologically, one has to incorporate technology. There is no need for external pressure to do this." (Transcript 1)*

> *"It is a must because globalisation demands that one must be in par with the rest of the world especially in terms of provision of quality of service. This is despite the absence of strong competition. Each organisation must meet the demands of its customers in terms of the expectations. Society now knows what quality of service is expected." (Transcript 16)*

> *"Accepting new technologies can contribute to efficiency gains with better human resource deployment and engagement. Careful consideration is, however necessary should such initiative negatively impact staff retention, should maintenance of these technologies are costly." (Transcript 8)*

> *"I feel that this is a must in today's environment. Even though we are a small company, we feel insecure if we think we are not doing what we should do. Customers are more educated now and they too expect better from us. And these are strong incentives for all firms to continually improve the way in which we deal with our customers" (Transcript 18)*

6.4 Discussion

The aim of this part of the research was to obtain views on whether there lie benefits from information technology investments beyond tangible ones. This section of the study, therefore, specifically looked at whether investments into information technology brought any intangible benefits to firms in Fiji.

The views of the interviewees provided strong acceptance of the idea that there are huge intangible benefits from information technology investments in different areas in a firm. Information technology as a tool for management goes a long way in improving the relationships with the subordinates. Information technology creates a better communication platform that is able to clear misconceptions arising from unclear communication. Investments into information technology helps firms create a healthy workforce through development of a cooperative company culture. The interviewees, however, raised a concern that if information technology investments are made as a way of handouts to staff, then desired benefits may be difficult to achieve. In terms of employee-customer relationships, views provided support the fact that information technology makes employees more resourceful and, therefore, they are able to serve their customers more efficiently. This contributes in boosting the employee morale and in the end will contribute towards firm performance.

In addition to the above discussion, investments into technology have been proven to bring about a better quality product or service delivery. Interviewees also considered that they have witnessed improvements with the efficiency in which these services are provided. There, however, lies a caution. In order to achieve maximum benefits from information technology investments, interviewees stated that there should exist appropriate guidelines within which these investments should be made. Some felt that if technology investments become demand (customer) driven, then desired benefits will be harder to achieve, as one will always be playing a catch-up game.

The interviewees also mentioned that they see some improvement in corporate image through investments in technology but agree that corporate image is determined more through external factors than internal ones. They, therefore, suggested that investments into technology in front-end operations could bring about better improvements in corporate image than investments in back-end operations. They also highlighted that any image improvement through information technology investments is easily diminished by other factors.

The interviewees shared mixed views on the impact of information technology investment impact on staff turnover. Expectantly, this seems to be a minority incentive for the local workforce. Financial benefits and a pathway to migration still seem to be the primary motivators.

There seems to be an overwhelming support for the fact that investments into information technology makes firms appreciate the benefits of these technologies and this helps in the technology adoption process. This is crucial in developing economies, as this will act as an important catalyst for growth and advancement. As previously stated, interviewees did emphasise the importance of having a clear direction for information technology investments and of ensuring that the strategic benefits of the investment are always considered. There were also views that highlighted that there is a need to minimise external (demand-driven) pressures when it comes to making information technology investment related decisions.

Firms also see good value in technology investments as they strongly agreed with the statement that we should make information technology investments despite absence of strong external pressure. They also disagreed with the view that one should not invest into information technology because information technology does not show clear tangible benefits. Strong views were provided that firms must move on and as far as possible, incorporate these modern technologies in their business processes. Views also supported

suggestions that technology investments especially in AIS improve accounting controls in firms. They did, however, emphasise that these controls should not be heavily relied upon, as they are man-made. There was a suggestion perhaps that regular audits of these controls are necessary.

In general, the interviewees provided strong support for information technology investments as information technology has the potential to bring about huge intangible benefits. They also felt that these benefits would ultimately have some impact on firm performance. They highlighted that there is a need for firms to continue to invest into information technology and that they should look into both the tangible and intangible benefits in doing so.

6.4 Summary and Conclusion

The study on the intangible benefits of information technology investments revealed that there are huge intangible benefits form information technology investments. The average ranking for each question supports this, which is between 1.96 and 3.04. Some areas include internal and external relationships, technology adoption, process modernisation and even risk management. The results also indicate that there is expectation that investments will affect performance in the end. In summary, the following findings are pertinent in relation to intangible impact of information technology investments in developing economies.

- If information technology investment is to be beneficial either tangibly or intangibly, it needs to be within the firm's investment framework. A rigorous evaluation of the investment is necessary.
- Investments into information technology may bring about intangible benefits only. Firms invest into information technology with this fact known.
- Investment into information technology is made as a risk management strategy. This could be useful during disaster management.

- Technology assists in promoting relationships among colleagues in firms, through the promotion of independence and facilitation of feedback. It is, however, pertinent that technology adoption is suitable to the prevalent environment. For employee-customer relationships, technology acts as an important facilitator of information but one has to be careful that this does not become demand driven from the customers' perspective.
- Technology seems to have questionable impact on retaining staff. While it has huge potential in boosting the morale of workforce, it holds little weight in terms of incentives, compared to other facts.
- Directed technology investments bring about improvement in corporate image. External factors, however, are the primary determinants.
- Despite the nature of the investment, most firms anticipate cost reduction in processes at some stage. This is despite the fact that some firms acknowledge that investment into information technology may bring only intangible benefits.
- Technology enhances both accounting and non-accounting controls but over-reliance is discouraged.
- There is a consensus on the benefits of information technology investments. Firms also see good value in information technology investments and, therefore, agree that there is a need to continue investments into information technology despite lack of strong external pressure.

Now that the intangible benefits of information technology investments have been discussed, the next section will provide a comprehensive discussion on the tangible and intangible benefits of information technology investments in relation to prior studies.

CHAPTER 7

DISCUSSION

7.1 Introduction

This chapter discusses the results of this research and compares them with previous studies in developed and developing economies discussed earlier in this thesis. Discussion in this chapter also focuses on the reasons that contribute to the outcome in terms of results of this study. In studying the tangible and intangible benefits of information technology investments within firms in Fiji, important insights could be provided as to the areas of information technology investment providing desired results and ways in which firms can achieve maximum utilisation of information technology as a vital business resource. This section also provides discussion on the above issue.

7.2 Overview of the Results and a Comparison with other Studies in the Post-Productivity Paradox Era

The results of the tangible impact of information technology investment on firm processes, the impact of these processes on performance and the impact of contextual factors on business processes and firm performance within firms in Fiji show numerous significant correlations between these sets of variables. The summary and significance of the correlations is provided in Table 7.1 - 7.4.

TABLE 7.1
SUMMARY OF RESULTS - IMPACT OF IT INVESTMENTS ON PROCESSES

FUNCTION 1				FUNCTION 2				FUNCTION 3				FUNCTION 4			
IND VAR	DEP VAR	CORRELATION	IMP	IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP
1,2,5		**+VE**	**F***	**1,3,4**	**5**	**+VE**	**F***	**2,3**	**2,4**	**-VE**	**F***	2,3,4	2	+VE	U
1,2,3	3	+VE	U	**2,5**	**2,3,4**	**-VE**	**F***	2,3	1,5	-VE	U	**2,3,4**	**4**	**-VE**	**F***
1,2,3	5	-VE	U	1,3,4	1	-VE	U	2,3	3	+VE	U	2,3,4	1,5	-VE	U
				2,5	**1**	**+VE**	**F***	**4**	**1,5**	**+VE**	**F***				
				2,5	5	-VE	U	4	2,4	+VE	U				
				1,3,4	2,3,5	+VE	U	**4**	**3**	**-VE**	**F***				

Note: * indicates significant relation. The variable numbers represent the variable names in the respective order as shown in function tables
F - Favourable, U - Unfavourable, IND VAR - Independent Variables, DEP VAR - Dependent Variable, CORR - Correlation, IMP - Impact

TABLE 7.2
SUMMARY OF RESULTS - IMPACT OF PROCESSES ON PERFORMANCE

FUNCTION 1				FUNCTION 2				FUNCTION 3			
IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP
2,3	1,2,3,4	-VE	F*	2,4	1,4	+VE	U	1	3	+VE	F*
				2,4	2,3	-VE	F*	1	1,2,4	-VE	U
				3	1,4	-VE	F*	2,4	3	-VE	F*
				3	2,3	+VE	U	2,4	1,2,4	-VE	U

Note: * indicates significant relation. The variable numbers represent the variable names in the respective order as shown in function tables
F - Favourable, U - Unfavourable, IND VAR - Independent Variables, DEP VAR - Dependent Variable, CORR - Correlation, IMP - Impact

TABLE 7.3
SUMMARY OF RESULTS - IMPACT OF CONTEXTUAL FACTORS ON PROCESSES

FUNCTION 1				FUNCTION 2				FUNCTION 3			
IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP
1,3	2,4,5	-VE	F/U	1	1,4,5	+VE	F/U	4	1,2,3,4	-VE	F/U
1,3	1	+VE	F/U	1	2,3	-VE	F/U	4	5	+VE	F/U
2,4	2,4,5	+VE	F/U	3,4	2,3	+VE	F/U				F/U
2,4	1	-VE	F/U	3,4	1,4,5	-VE	F/U				F/U

Note: The variable numbers represent the variable names in the respective order as shown in function tables
F - Favourable, U - Unfavourable, IND VAR - Independent Variables, DEP VAR - Dependent Variable, CORR - Correlation, IMP - Impact

TABLE 7.4
SUMMARY OF RESULTS - IMPACT OF CONTEXTUAL FACTORS ON PERFORMANCE

FUNCTION 1				FUNCTION 2				FUNCTION 3			
IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP	IND VAR	DEP VAR	CORR	IMP
1,3	3	+VE		2,3	2	+VE		1,2,3,4	1,2,3	-VE	
1,3	4	-VE		2,3	1,4	-VE		1,2,3,4	4	+VE	
4	3	+VE		4	1,4	+VE					
4	4	-VE		4	2	-VE					

Note: The variable numbers represent the variable names in the respective order as shown in function tables
F - Favourable, U - Unfavourable, IND VAR - Independent Variables, DEP VAR - Dependent Variable, CORR - Correlation, IMP - Impact

The summary of the results shows that all independent variables (various sections of information technology investment) had an impact on process efficiency variables that measure the impact of information technology investment on process efficiencies (see Table 7.1). The results also indicate that all process efficiency variables were impacted by upon the information technology investment variables. Further, all process efficiency variables affect all firm performance measurement variables. Operating expenses to sales, labour cost to sales and selling and general expense as proportion to sales, however, has a larger degree of impact on all performance variables. Similarly, all contextual factors used in this

study had significant impact on firm processes and firm performance as shown in Tables 7.3 and 7.4. It is, however, difficult to determine the nature of the impact (favourable or unfavourable) as it is difficult to develop appropriate guidelines on these contextual factors in terms of the context in which they are appropriate.

The results of the study on the intangible impact of information technology investments also provides suggestions that there exist huge intangible benefits from such investments. Benefits are witnessed in the area of internal and external relationship management, accounting controls, technology adoption processes, efficiency and effectiveness in service delivery and process completion and improvement in corporate image. The study revealed that information technology investments impact on staff turnover is marginal and/or insignificant. There was strong support for the fact that firms should make information technology investment a continuous process within their information technology investment guidelines despite their not seeing tangible benefits in the short run. This is indicated by the interviewees' perception that there are huge short-term intangible benefits, which firms cannot afford not to take advantage of. It was also interesting to note from the views of the interviewees that information technology investment itself becomes a driver for modernisation and efficiencies. In other words, strong views were shared in support of the fact that "when we have made some form of investment into information technology then we realise its current and future potential."

Brynjolfsson (1993), in explaining the possible reasons for the existence of the productivity paradox, highlighted the measurement of the output and inputs as one of the reasons for not finding positive results in terms of impact of information technology investment in performance. In developing a model to conduct this research, this consideration was foremost. As stated earlier, it is believed that the impact of information technology investments on performance can be best understood by first looking at its impact at the intermediate level and then evaluating the performance in relation to the impact of the

information technology investment on processes. The significance of the correlations in this study could be attributed to this fact.

Most of the post-productivity paradox studies that considered information technology investment, accounting and other measures (see for example Hitt and Brynjolfsson, 1996; Tam, 1998; Bharadwaj, et al.1999; Brynjolfsson and Yang, 1999; Brynjolfsson et al.2000; Krishnan and Sriram, 2000; Anderson et al.2001; Barua et al.1995; Mitra and Chaya, 1996; Shin, 1997; Rai et al.1997; Strassmann, 1997; and Sircar et al.2000) found some, and in some cases, significant positive relationship between information technology investments and performance. The results of this study support these finding by providing the result of the impact of information technology investment on firm processes and performance from a developing country perspective.

Tam (1998) performed a test on four Southeast Asian countries (Hong Kong, Malaysia, Singapore and Taiwan) to examine the relationship between the value of company's information technology and one-year market return. He found no correlation between one-year shareholder return and computer capital in any of the four countries. He did, however, find positive correlation between computer capital and market value of the firm in Malaysia. This result was disappointing. However, as Dehning and Richardson (2002) state the fact that this study (together with Hitt and Brynjolfsson, 1996) found few significant correlations between information technology and annual returns is unsurprising. There is a problem in using market returns to gauge firm performance because the test is of a joint hypothesis (Dehning and Richardson, 2002). The first hypothesis looks at information technology investment and firm performance and the second on the market relationship between information technology investment and firm performance. As Dehning and Richardson (2002) put it

> *"there may be multi-year differential firm performance, but no difference in market return due to market participants' anticipation of that performance advantage."*

In other words, no abnormal return is expected because the market anticipates the results. The study by Tam (1998) is of significance because it is one of the very few studies that used data from outside the United States to measure the impact of information technology investments. The lack of correlation between the result of Tam's (1998) study and this study could be attributed to the measurement problem identified by Brynjolfsson (1993) and further highlighted by Dehning and Richardson (2002).

The significant correlation in this study could also be related to the other explanation provided by Brynjolfsson (1993), the mismanagement of information technology. This is an external problem. Brynjolfsson's (1993) explanation for this was:

> *"there is something in its nature that leads firms and industries to invest in it when they should not. This creates slack instead of productivity."*

This could also, however, be explained with the agency theory framework. In developing economies, first, there are many private companies, of which the majority are being family owned. In this case there may be no or extremely weak agency relationship. There is, therefore, no incentive for these firms to do what Brynjolfsson (1993) suggested. In other words, there is no incentive for these firms to make investments into information technology without careful thought. Secondly, for listed companies in developing economies, there exists a "close" relationship between the principal and agent and hence the existence of a weak agency relationship, including consideration for cultural values discussed in chapter 4.

In a conventional agency relationship, earnings management is an important tool used by mangers to leverage their own performance and for renewal of contracts. In such situations, therefore, management may "invest in something when they should not" or "man should invest in something when they do not." The relevance of such scenarios of earnings management in developing economies is questionable or perhaps not relevant. As suggested by Patel (2002), our capital market experiences "block shareholding" where a majority of the

shares are held by a minority of the shareholders. Further, there exists a degree of "closeness" and overlap between management and shareholders. As such, like all other decisions, information technology investment decisions are expected to be carefully evaluated and considered. This also could contribute towards significant correlation between information technology investments, processes, contextual factors and firm performance in Fiji compared to Tam (1998) and other studies in developing economies. This discussion does not suggest that firms in other countries make uninformed decisions but attempts to explain incentives (lack of) to do so.

Another factor that could seek to explain the outcome of this study is the question of in what we invest. As discussed in chapter 4, developing countries including Fiji are normally tier 2 technology adopters. In other words, we do not tend to invest in innovative untested technology. Developing economies do seem to invest in tested technologies with proven performance record. Hence, it could be argued that this could be a further factor that could explain the better usage of information technology and thus better returns. While, the potential of modern technology is not underestimated here, one must acknowledge the fact that they do posses significant amounts of risk in terms of suitability and adaptability in a new environment. It should be further noted that firms in developing economies are in no rush to invest in technology due to the monopoly or near monopoly status of most industries. This is in contrast with the developed economies where, businesses are always looking to modern technology for that competitive advantage.

Alternatively, investors in developed economies are generally called "innovative information technology investors" desiring to be the market leader. This, however, comes at increased cost of investment and it would significantly increase the assets of the entity. One of the reasons, thus, to explain low return on performance, especially ROA, is that any contribution to earnings from information technology investment is not in par with the relevant increase in

the asset amount. This, therefore, distorts firm performance especially, when one looks at ROA as a measure of firm performance.

Another issue to consider is the fact that many entities today have no other option but to acquire modern technologies. This could be due to the rapid expansion and competitive forces. Survival, therefore, could depend upon this decision. In such situations, the evaluation of information technology investments in accordance with returns benchmarks may become secondary. This could be prevalent in developed economies where either firms' have grown enormously in size or the industries have become very competitive. This could also explain moderate results in this area in developed economies

This discussion, however, does not suggest in any way that information technology utilisation in developing countries has reached its fullest capacity. One of the impeding factors prevalent in developing economies is the prevailing company culture within the firms. It would be fair to comment that there are significant differences between investing in information technology and utilising information technology to its maximum. As suggested by interviewees while providing their views on the intangible benefits of information technology investments, a particular company culture plays a vital role in success of information technology investment. There is a concern that information technology investment, like any other investment may not be fully utilised in a non-competitive labour market. This is a pertinent issue in developing economies and could be one of the explanations for sustained customer frustrations in developing countries, despite attempts by firms to better resource their front-end operations. There, perhaps, lies an indication that information technology investment in developing economies provides greater potential provided it is complemented with a positive attitude in the front-end operations.

Studies like Sircar et al. (2000) have also used canonical correlation to determine the relationship between information technology investment and performance and considered r^s

of 0.300 using rule of thumb and above as being significant. Similarly, this study has considered and r^s of 0.100 and above as being significant to ensure that a full analysis of all possible relationships is undertaken as it will have an impact on the framework that will be developed in the next section. Table 7.5 provides the r^s at respective ranges for the four relations.

TABLE 7.5
RANGE OF r^s AMONGST ALL RELATIONSHIPS

IT INVESTMENTS AND FIRM PROCESSES		
r^s RANGE	NUMBER	PERCENTAGE
0.100 - .0200	8	27.59%
0.200 – 0.300	5	17.24%
ABOVE 0.300	16	55.17%
TOTAL	29	100.00%
FIRM PROCESSES AND FIRM PERFORMANCE		
r^s RANGE	NUMBER	PERCENTAGE
0.100 - .0200	3	15.79%
0.200 – 0.300	1	5.26%
ABOVE 0.300	15	78.95%
TOTAL	19	100.00%
CONTEXTUAL FACTORS AND FIRM PROCESSES		
r^s RANGE	NUMBER	PERCENTAGE
0.100 - .0200	4	20.00%
0.200 – 0.300	4	20.00%
ABOVE 0.300	12	60.00%
TOTAL	20	100.00%
CONTEXTUAL FACTORS AND FIRM PERFORMANCE		
r^s RANGE	NUMBER	PERCENTAGE
0.100 - .0200	2	11.11%
0.200 – 0.300	3	16.67%
ABOVE 0.300	13	72.22%
TOTAL	18	100.00%

The r^s in respective relationships show a majority at 0.200 and above, an important finding in asserting that a slighter stronger relationship between variables is not due to "lowering" the rule of thumb.

7.3 The Future of Information Technology investment in Developing Countries

The results of this study strongly suggest that firms should invest in information technology as it provides significant tangible and intangible benefits. The results indicate the information technology investment impacts positively on business processes and then these improved processes positively impact firm performance. Firms must realise that information technology investment does not bring about immediate improvement in performance. They should, however, expect significant improvement in processes and witness good intangible benefits. Information technology also acts as an important catalyst for growth and development in developing economies. Firms should take advantage of the opportunities available through information technology.

It is important, however, that investments are made within a framework or a set of guidelines in order to return their full advantage. Experiences in developed economies in the dotcom era demonstrated that the major reason for failure of large number of information technology initiatives "was not knowing what they were doing". In other words, the investments were not carefully planned and the values of the conventional processes were ignored. It is also important to understand that technology must fit into the processes, and not vise versa. Further, in order to achieve the maximum benefits from information technology investments an appropriate corporate culture is necessary. There is a need for firms to use information technology to motivate their workforce and instill in them the value of maximum customer value. Through this, better value from information technology investment is certain.

It is also pertinent that firms in developing economies should drop the attitude of "no need to invest due to lack of competition. In today's dynamic environment, continuous process improvement through total quality management (TQM) or business process reengineering (BPR) is vital. Information technology is the best tool to achieve this. Further, it is important that information technology investment becomes part of the company culture. This is

because maximum benefits can be derived from information technology only when there is an appreciation for the fact that the life span of technology in terms of its applicability is very short. Firms, therefore, should continually develop and evaluate information technology investment proposals in order to make appropriate decisions as to how investment into information technology should progress.

7.4 Summary

This chapter has discussed the results of this research. It has also provided possible reasons for significant correlation between information technology investment, firm processes, firm performance and contextual variables in a developing economy like Fiji. The results also support the outcome of post-productivity paradox studies, mostly in the United States. There was, however, a stronger correlation witnessed compared to these previous studies with the exception of work by Sircar et al. (2000). This, it was suggested, could be attributed to the mismeasurement problem identified by Brynjolfsson (1993). Explanations are also being provided within the agency theory framework.

The results of this study provide strong incentives for firms in Fiji and other developing economies to continue investing in information technology as it has been proven to provide huge tangible and intangible benefits. For those firms that to date underestimated the potential of information technology, there is no better time to start.

The next chapter develops a framework for measuring information technology investment in developing economies. This is pertinent in developing economies because investment resources in most of them seem to be scarce. Following this, the conclusion is provided, which includes mention of the limitations of this research and directions for future research.

CHAPTER 8

FRAMEWORK FOR ASSESSING THE IMPACT OF INFORMATION TECHNOLOGY INVESTMENTS AND CONTEXTUAL FACTORS ON BUSINESS PROCESSES AND THE IMPACT OF THESE BUSINESS PROCESSES AND CONTEXTUAL FACTORS ON FIRM PERFORMANCE

8.1 Introduction

This chapter attempts to provide a framework that firms in developing economies could use to measure the impact of information technology investments and contextual factors on firm process efficiencies and the impact of these processes and contextual factors on firm performance. The proposed framework will be able to address five important questions:

- What type of relationship we can capture between an aggregate of sectors of information technology investment and contextual factors and a set of firm process efficiency measures?
- What form of relationship we can capture between an aggregate of process efficiencies measures and contextual factors and a set of firm performance measures?
- How are information technology investments related to business processes?
- How are business processes related to firm performance?
- What is the impact of contextual factors and process efficiencies on firm performance?

8.2 Development of an Information Technology Investment Evaluation Framework

Extensive review of the literature was conducted and the relevant factors prevalent in developing economies were considered in developing a proposed framework for measuring the impact of information technology investment and contextual factors on process efficiency

and firm performance. This is provided as Figure 3.1. This framework was then used to develop a model to study the impact of information technology investment and contextual factors on firm processes and the impact of these processes together with the contextual factors on firm performance as provided in Figure 3.2. Canonical correlation analysis was undertaken to measure the correlation between information technology investment, contextual factors, process efficiency and firm performance variables.

One of the ways to determine the extent of contribution of each variable in establishment of relationship between the respective set of variables as stipulated in the model is to look at the communality coefficients (h^2) of these variables. Table 8.1 provides the h^2 of all variables used in this study. The h^2 provided for each function is its total contribution across all significant functions.

TABLE 8.1
COMMUNALITY COEFFICIENTS FOR ALL RELATIONSHIPS

VARIABLE	IT INVESTMENT TO PROCESSES (h2)	PROCESS TO PERFORMANCE (h2)	CONTEXTUAL FACTORS TO PROCESSES (h2)	CONTEXTUAL FACTORS TO PERFORMANCE (h2)
IT BUDGET/REVENUE	95.02	-	-	-
IT VALUE/REVENUE	48.15	-	-	-
IT BUDGET ON STAFF	96.37	-	-	-
IT BUDGET ON STAFF TRAINING	97.86	-	-	-
PC/EMPLOYEE	76.24	-	-	-
SALES REVENUE/EMPLOYEE	99.82	64.78	28.33	-
OPERATING EXPENSE/SALES	100.05	100.01	72.43	-
LABOUR COST/SALES	99.59	77.97	97.46	-
SELL & GEN EXP/SALES	13.01	79.18	91.58	-
SALES/TOTAL ASSETS	99.90		44.27	-
ROA	-	83.07	-	65.60
ROE	-	99.80	-	22.21
ROS	-	99.95	-	90.06
SALES TURNOVER	-	84.65	-	67.96
TOTAL ASSETS	-	-	94.81	99.84
AGE OF BUSINESS	-	-	2.84	68.08
YEARS OF IT INVESTMENT	-	-	7.30	81.71
SEPARATE IT DEPT	-	-	87.13	26.07

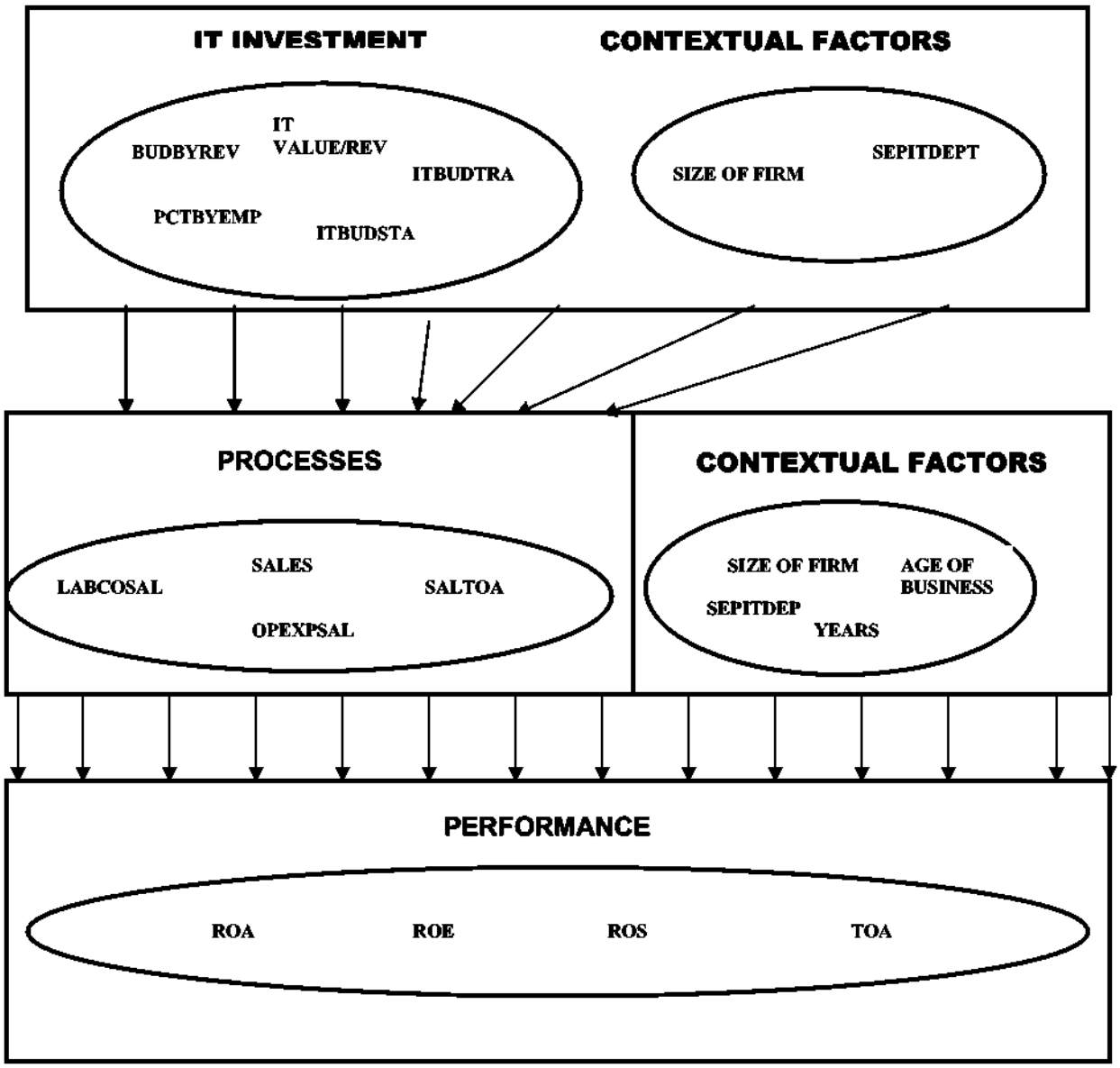
All investment measurement variables and process efficiency variables except selling and general expense as a proportion to revenue provided significant contribution in establishing relationships between these variables. In other words, all information technology investment variables had a significant impact on all but selling and general as a proportion to revenue process efficiency variables. In studying the impact of contextual factors on process efficiencies, Table 8.1 shows that all variables had significant correlation with h^2 ranging from 64.78 to 100.01.This means that all contextual factors had an impact on all process efficiencies.

The results of the impact of contextual factors and process efficiencies on firm performance show that size of firm and separate information technology department had impact on all process efficiencies. The impact of sales revenue per employee was, however, weak (h^2 = 28.33). All contextual factors variables had significant impact on all firm performance variables. The contribution of separate information technology department (h^2 = 26.07) and the impact on ROE (h^2 = 22.21) was, however weak. In light of the above discussion on the relationship of the variables, the following refined framework (Figure 8.1) for measuring the impact of information technology investment and contextual factors on firm processes and the impact of the process efficiencies together with contextual factors on firm performance is suggested.

It is expected that this proposed framework would be useful for firms in developing economies in assessing the impact of their information technology investment within a two-stage model. The issues of staff training and information technology budget volume are important in developing economies. This framework could act as an important tool for firms in establishing the adequacy and impact of their spending on staff related issues in relation to information technology development and usage. This framework also provides strong support for the fact that if information technology investments are targeted towards improving the business processes in the short run, improvement in the firm performance in

the longer run in inevitable. This is because there is a strong positive relationship between process efficiencies and firm performance.

FIGURE 8.1
FRAMEWORK FOR ASSESSING THE IMPACT OF INFORMATION TECHNOLOGY INVESTMENTS AND CONTEXTUAL FACTORS ON BUSINESS PROCESSES AND THE IMPACT OF THESE BUSINESS PROCESSES AND CONTEXTUAL FACTORS ON FIRM PERFORMANCE



NOTE: AGE OF BUSINESS - The Number of years of operation on the firm; YEARS OF IT INVESTMENT - The Number of years of Information Technology Investment by the Firm; SEPITDEP - Separate Information Technology Department; IT BUDGET/REVENUE - Information Technology Budget as a percentage of Total Revenue; IT VALUE/REVENUE - Value of Organisations Information Technology as Percentage of Firm Revenue; ITBUDSTA - Percentage of Firm's Information Technology Budget Spent on Staff; ITBUDTRA - Percentage of Firm's Information Technology Budget Spent on Staff Training; PCBYEMP - No of Terminals to Employee; SALES REVENUE/EMPLOYEE - Sales Revenue Per Employee; OPERATING EXP/SALES - Operating Expenses as Percentage of Sales; LABOUR COST/SALES - Labour Cost as a Parentage of Sales; SALES/TOTAL ASSETS - Sales to Total Assets; ROA - Return of Assets; ROE - Return on Equity; ROS - Return on Sales; TOA - Asset Turnover

There is also strong evidence to support the claim that management of information technology plays an important role in information technology utilisation, as the separate information technology department variable contributes very significantly overall in explaining process efficiencies. Continuous information technology investment will make firms better information technology users, as number of years of information technology investment is a very strong factor in performance improvements. Table 8.2 provides a list of significant variables in this study.

TABLE 8.2
A LIST OF SIGNIFICANT VARIABLES

VARIABLE	IT INVESTMENT TO PROCESSES (h2)	PROCESS TO PERFORMANCE (h2)	CONTEXTUAL FACTORS TO PROCESSES (h2)	CONTEXTUAL FACTORS TO PERFORMANCE (h2)
IT BUDGET/REVENUE	95.02	-	-	-
IT VALUE/REVENUE	48.15	-	-	-
IT BUDGET ON STAFF	96.37	-	-	-
IT BUDGET ON STAFF TRAINING	97.86	-	-	-
PC/EMPLOYEE	76.24	-	-	-
SALES REVENUE/EMPLOYEE	99.82	64.78	-	-
OPERATING EXPENSE/SALES	100.05	100.01	72.43	-
LABOUR COST/SALES	99.59	77.97	97.46	-
SELL & GEN EXP/SALES		79.18	91.58	-
SALES/TOTAL ASSETS	99.90	-	44.27	-
ROA	-	83.07	-	65.60
ROE	-	99.80	-	-
ROS	-	99.95	-	90.06
SALES TURNOVER	-	84.65	-	67.96
TOTAL ASSETS	-	-	94.81	99.84
AGE OF BUSINESS	-	-	-	68.08
YEARS OF IT INVESTMENT	-	-	-	81.71
SEPARATE IT DEPT	-	-	87.13	-

8.3 Summary

This chapter has proposed a framework that firms in developing economies could use to assess their information technology investment in relation to contextual factors, process efficiencies and firm performance. It is expected that that this framework will provide important insights to firms in terms of how to make better use of their available information technology resources and what should be the nature and scope of their future information technology investments.

The final section of this thesis, which follows, will provide concluding remarks on this study and discuss its limitations together with discussion on scope for further research.

CHAPTER 9

CONCLUSION

9.1 Introduction

This chapter suggests that there are huge benefits from investing in information technology investments provided it is undertaken within an appropriate set of guidelines and then measured using an appropriate framework. By studying the impact of information technology investments and contextual factors on business processes and the impact of these processes and the contextual factors on firm performance, this study has contributed substantially to work towards understanding the productivity paradox. A two-stage model was used, which is developed from the Barua et al.(1995) BVC model and an extensive review of the literature suggested that information technology investment will impact at the intermediate level (processes) first and these processes will then contribute towards achieving the desired business performance. This study has suggested that the contextual factors do indeed have an impact on how information technology is utilised.

9.2 Information Technology Investments - A Critical Success Factor of Development and Growth

One of the major problems identified in the pre-productivity paradox and in some case post productivity paradox research is the measurement techniques used in carrying information technology investment related studies. This problem is addressed in this study by first measuring the impact of information technology investment in two stages. Secondly, this study believed that a combination of information technology investments in different areas (staff training, general staff expenditure etc.) impacts on a group of business processes and then these groups of processes would affect a set of firm performance measures. Canonical correlation analysis was undertaken to study this relationship. The results strongly support

this, as there was strong correlation between the sets of variables used in this study at both levels.

The proposition of this study that information technology investments first impact at the intermediate level was further supported by the fact that strong positive views were provided by interviewees on the intangible impacts of information technology investments. The results of the study on the intangible benefits of information technology investment showed that huge benefits are witnessed at front-end operations and in other areas. This would inevitably have an impact on the tangible outcome, especially at the intermediate level. With continued improvement at the intermediate level, performance improvement would surely be seen.

Information technology investment is also seen to be providing a soothing role in the customer-employee and manager-employee relationship as it acts as a tool that promotes independence and transparency and acts as a massive information tank. Information technology investment also acts as a revelation in terms of realising the importance of technology in today's business environment despite absence of strong competition. Its impact on improving corporate image, strengthening internal controls and motivating staff should also not be underestimated. All this, however, is strongly dependent on the prevailing company culture. With the right mind set in a firm, the benefits of information technology investment is incomparable.

The results of this study support the findings of similar studies in this area (see Sircar et al.2000; Mitra and Chaya, 1996; Barua et al.1995; Shin, 1997 and Rai et al.1997) despite the use of different models and data analysis techniques. The value of spending on staff training and development and on general staff issues was appreciated in this study. This thus supports the view that effective use of information technology is an important precondition for its success. Mere spending on anything will not bring about the desired outcome. This is strongly supported by the fact that having a separate information

technology department made a huge contribution in improving processes and performance in firms.

The proposed framework in its updated form as provided in chapter 8 can work as an excellent investment framework for evaluating the relationship between information technology investments, contextual factors, business processes and firm performance. This evaluation is important for developing countries as investment resources are scarce. There is no substitute for performance evaluation when it comes to determining the path to success and continued growth of business and economy. This is necessary for developing economies.

Overall, it was noted that the findings of this study are generally consistent with the beliefs of the general community that information technology is an important determinant to achieving process efficiencies and performance improvement. It has further proved that any direct spending on staff issues will always be of good use.

The question of "does information technology investment improve processes and do these processes then lead to improvement in business performance" is well answered in this research. The identified measures of information technology investments and contextual factors do affect the business processes thus meeting the first, second and the forth objectives. These processes, together with the contextual factors then also lead to improvement in business performance thus meeting the first, third and the forth objectives. The research also has resulted in the development of a framework that could be used further study the impact of information technology investments on performance in developing economies thus meeting the fifth objective.

9.3 Limitations of this Study

This research examined the impact of information technology investments and contextual factors on business processes and the impact of these processes and contextual factors on firm performance by using the data from the last 6 years. One would argue that having data for the last 10-15 years would be more relevant, but the unavailability of data and the unwillingness of firms to provide information technology investment related data act as major constraining factors. The nature of this study nevertheless was exploratory and it is believed that data for the last six (6) years was appropriate in understanding the impact of information technology investments on firms in Fiji.

This study considered information technology investment returns in all industries. The variables considered and, therefore, were the ones applicable to all the industries, thus restricting four or five variables at each stage. Incorporation of more variables could bring more revelation in the area of returns from information technology investments. This could be possible for similar industry specific studies.

This study, in measuring the tangible impact of information technology investments, did not include intangible measure in the model. It is agreed that these intangible measures will provide greater insights in this area of study. These variables, however, are difficult to measure and quantify, especially in a general study. This is in terms of the variety of measure of intangible benefits available in different industries. It is believed that these variables could be incorporated into similar models with industry specific studies. This study, nevertheless, considered the intangible benefits of information technology investments using an alternative methodology.

It is widely agreed that the ROI is the most common measure of firm performance. It is also agreed that ROI may not be able to capture all the benefits of investments. External factors like inflation and revaluations could have serious impact of the credibility of ROI as the sole

measure of investment performance. With unavailability of the specific data that could be used to scrutinise investment performance and for wider applicability, this study considered ROI to be an adequate measure of information technology investment performance.

Further, in relation to other countries, Fiji does not have agencies that collect firm performance and other related data. While most of the financial data used was publicly available through annual reports and KDSs, some information was sought directly form the firms. This is a challenging task and the quality and credibility of the data received in some cases is hard to verify. The outcome of the study and the measurement method, however, provides some support for the integrity and support of the "private" data.

In studying the impact of the intangible benefits of information technology investments, twenty five (25) interviews were conducted. The interviewees included information technology managers and directors, information technology supervisors, IT developers, front-end information technology users, information technology fund managers, chief financial officers and professional accountants. There will always be a belief that the more views are gathered, the better one can understand the intangible benefits of information technology investments. The similarities in the views of the 25 interviewees, however, suggest that this was an appropriate sample. The willingness of the interviewees to share their views was encouraging.

9.4 Directions for Future Research

There will always be room for improvements in approaches to studying the impact of information technology investment. Further studies can always incorporate additional information technology, contextual factors, process efficiency and firm performance variables in the current model.

This study in attempting to determine the impact of information technology investment and contextual factors on process efficiencies and firm performance in developing countries used data only for firms in Fiji. This could perhaps be expanded to include other developing countries within the current model, to give a better indication of the impact of information technology investments in these economies.

There is a continuous demand for more international studies in this area to provide an explanation for the existence of the productivity paradox and find ways of better measuring the impact of information technology investments. There is a huge potential for this in Australasia. One of things that could be done is to undertake this study with an Australasian perspective. Tam (1998) researched on this issue in Asia and the results were disappointing. With improved models available, more international studies in this are necessary. Further, there is not much done in measuring the impact of information technology investment in Australia and New Zealand. Such study with different economic environments is expected to provide more insights on the impact of information technology investments in these differing economic environments.

9.6 Summary and Conclusion

This thesis studied the impact of information technology investments and contextual factors on business processes and the impact of these processes and contextual factors on firm performance in Fiji. A two-stage model was adopted and the results were very positive. This study reaffirms the fact that investment into information technology is a very important contributor to improvement in performance.

It is expected that the framework developed in this study will be useful to firms especially in developing economies in evaluating their information technology invest and is expected to provide insights as to where and when to investment in information technology. The more we study the way investment is made into information technology, the better we can understand

its benefits. This chapter, therefore, also provided insights for future research, especially in the Pacific for a better understating of the potential and implications of information technology investments.

In conclusion, this thesis reaffirms the view that the importance of information technology can no longer be questioned. With a right attitude, right group of minds and forward corporate culture, the benefits derived from information technology investments will be unmatched.

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APPENDIX

APPENDIX 1 - STRUCTURED QUESTIONNAIRE FOR COMPANIES WHICH PROVIDE ANNUAL FINANCIAL REPORT

THE UNIVERSITY OF THE SOUTH PACIFIC

SCHOOL OF SOCIAL AND ECONOMIC DEVELOPMENT

DEPARTMENT OF ACCOUNTING AND FINANCIAL MANAGEMENT

Research on the Impact of Information Technology Investment on the Businesses Processes and Business Performance in Fiji

This survey is to obtain information on the impact of information technology investment on the business processes and business performance in Fiji. The information that you will provide will be confidential and will be used in ways that will respect confidentiality.

A) Industry/Sector _____

1. Tourism
2. Manufacturing
3. Retail
4. Agriculture
5. Banking
6. Insurance
7. Wholesaling
8. Auto Sales
9. Other _____

B) Number of Employees

1998	_____	2001	_____
1999	_____	2002	_____
2000	_____	2003	_____

C) Number of Employees

1998	_____	2001	_____
1999	_____	2002	_____
2000	_____	2003	_____

C) Total Information Technology Budget in

1998	_____	2001	_____
1999	_____	2002	_____
2000	_____	2003	_____

D) Total Value of Information Technology Investment in

1998	_____	2001	_____
1999	_____	2002	_____
2000	_____	2003	_____

E) Total Information Technology Budget Spent on General Staff Expenditure in

1998	_____	2001	_____
1999	_____	2002	_____
2000	_____	2003	_____

F) Information Technology Budget Spent on Staff Training in

1998	_____	2001	_____
1999	_____	2002	_____
2000	_____	2003	_____

G) Number of Terminals or Desktop Systems

1998 _____

1999 _____

2000 _____

2001 _____

2002 _____

2003 _____

H) Age of Business _____

I) Number of Years of Investment in Information Technology _____

J) Separate Information Technology Department

Yes ☐ No ☐

Thank you very much for your cooperation

COVERING LETTER

February 8, 2005

Acklesh Prasad
Department of Accounting and Financial Management
School of Social and Economic Development
The University of the South Pacific
SUVA

The Company Secretary
«Address1»
«Address2»
«City»

Dear Sir/Madam,

Re: Information on Information Technology Investments by your Company

I wish to obtain information on the investments in information technology by your company.

Currently, I am pursuing my Masters Degree in Accounting at the University of the South Pacific. The topic for my thesis is :

> *"Measuring the Impact of Information Technology Investments on Firm Processes and Performance in Fiji."*

This study intends to identify the impact of investment into different areas of information technology (e.g. infrastructure, training, etc.,) on firm processes and how improvements into these processes relate to improvement of firm performance.

This research would contribute towards better understanding the "productivity paradox" and hopes to provide insights into what areas of information technology investment in Fiji leads to improvement into overall firm performance.

It would be much appreciated if you could kindly complete the enclosed questionnaire and return it to me via the enclosed pre-paid envelope. I assure you that this information will be used in strict confidentiality. I have collected other information on your company from the published annual reports.

Thanking you for your cooperation.

Yours faithfully,

.....
Acklesh Prasad
Department of Accounting and Financial Management

STRUCTURES QUESTIONNAIRE FOR FIRMS TO DO NOT PROVIDE ANNUAL FINANCIAL REPORTS FOR THE PUBLIC

THE UNIVERSITY OF THE SOUTH PACIFIC

SCHOOL OF SOCIAL AND ECONOMIC DEVELOPMENT

DEPARTMENT OF ACCOUNTING AND FINANCIAL MANAGEMENT

Research on the Impact of Information Technology Investment on the Businesses Processes and Business Performance in Fiji

This survey is to obtain information on the impact of information technology investment on the business processes and business performance in Fiji. The information that you will provide will be confidential and will be used in ways that will respect confidentiality.

A) Industry/Sector _____

10. Tourism
11. Manufacturing
12. Retail
13. Agriculture
14. Banking
15. Insurance
16. Wholesaling
17. Auto Sales
18. Other _____

D) Number of Employees

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

C) Total Revenue in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

D) Total Profit in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

E) Total Assets in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

F) Total Equity in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

G) Total Operating Expenses

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

H) Total Labour Cost

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

I) Total Selling and Distribution Cost in

1999 _____
2000 _____

2001 _____
2002 _____
2003 _____
2004 _____

J) Total Information Technology Budget in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

K) Total Value of Information Technology Investment in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

L) Total Information Technology Budget Spent on General Staff Expenditure in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

M) Information Technology Budget Spent on Staff Training in

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____
2004 _____

N) Number of Terminals or Desktop Systems

1999 _____
2000 _____
2001 _____
2002 _____
2003 _____

2004 _____

O) Age of Business _____

P) Number of Years of Investment in Information Technology _____

Q) Separate Information Technology Department

Yes ☐

No ☐

Thank you very much for your cooperation

COVERING LETTER

Wednesday, April 12, 2006

Acklesh Prasad
Department of Accounting and Financial Management
School of Social and Economic Development
The University of the South Pacific
SUVA

«Title»
«Company»
«Address1»
«City»

Dear Sir/Madam,

Re: Information on Financial Performance and Information Technology Investments by your Company

I wish to obtain information on financial information and the investments in information technology by your company.

Currently, I am pursuing my Masters Degree in Accounting at the University of the South Pacific. The topic of my thesis is:

> *"Measuring the Impact of Information Technology Investments on Firm Processes and Performance in Fiji."*

This study intends to identify the impact of investment into different areas of information technology (e.g. infrastructure, training, etc.,) on firm processes and how improvements into these processes relate to improvement of firm performance.

This research would contribute towards better understanding the "productivity paradox" and hopes to provide insights into what areas of information technology investment in Fiji leads to improvement into overall firm performance.

It would be much appreciated if you could kindly complete the enclosed questionnaire and return it to me via the enclosed pre-paid envelope. While the questionnaire requests for information for six years, information on some years only will be equally appreciated. Further, if the information on a variable follows a trend, please indicate the trend only and I will compute the figures for the rest of the years. I assure you that this information will be used in strict confidentiality.

Thanking you for your cooperation.

Yours faithfully,

Aprasad.

Acklesh Prasad
Department of Accounting and Financial Management

APPENDIX 2 - THE INTANGIBLE IMPACTS OF INFORMATION TECHNOLOGY INVESTMENTS

QUESTIONNAIRE

THE UNIVERSITY OF THE SOUTH PACIFIC

SCHOOL OF SOCIAL AND ECONOMIC DEVELOPMENT

DEPARTMENT OF ACCOUNTING AND FINANCIAL MANAGEMENT

The Impact of Information Technology Investment on the Businesses Processes and Business Performance in Fiji

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The Intangible Impact of Information Technology Investments

This survey is to obtain views on the intangible impact of information technology investment on the business processes and business performance in Fiji. The information that you will provide will be confidential and will be used in ways that will respect confidentiality

1. How has introduction/update of technology in your organisation affected the relationship between supervisors and subordinates [internal relationship focus]?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (if any)

2. How has this affected the customer-employee relationship?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (if any)

- Supplementary Question

What can you say about the quality and efficiency to which you provide core services before and after adoption of these technologies?

Quality

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (if any)

Efficiency

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (if any)

3. How has the level of service satisfaction changed [complaints and suggestion box activities]?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (If any)

4. Has these technologies had and affected staff turnover?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (if any)

5. Does introduction of modern technology created further demand in your organisation to appreciate the need to keep up to date with these modern technologies, thus helping in the technology adoption process.

☐ Excellent Demand ☐ Good Demand ☐ Small Demand ☐ No Demand ☐ No Appreciated

Comments (If any)

6. What is the impact of this on the corporate image of your entity?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (if any)

7. What other improvements have you witnessed in your organisation after these technologies were introduced?

8. How has the average cost of providing the core services being affected after these technologies were introduced?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (If any)

9. What are your views on the need for entities to in developing economies to take advantage of modern technologies despite absence of strong external pressure [e.g. competition]?

10. Where do you see your company in five years time with your current trend of investment in to information technology?

☐ Excellent Improvement ☐ Good Improvement ☐ Improvement ☐ No Improvement ☐ Worsened

Comments (If any)

11. "Organisations should not invest too heavily into information technology because this does not greatly improve the end of the year financial results". Please comment on this statement.

12. What is the impact of Investment of information technology on Accounting Controls? Can your organisation now survive if such controls were to be removed.

☐ Huge Reliance ☐ Good Reliance ☐ Some Reliance ☐ No Effect ☐ Controls Worsened

13. Any General Comments?