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Evaluation of Information Technology Investment in Telecommunications Billing Systems in South Africa

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Evaluation of Information Technology Investment in Telecommunications Billing Systems in South Africa

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**A research report submitted to the Faculty of Commerce, Law and
Management, University of the Witwatersrand, in partial fulfilment of the
requirements for the degree of Master of Business Administration**

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ABSTRACT

Managers in firms across the country are faced with the challenge of making key decisions regarding the justification and/or approval of IT investment on hardware and software assets, along with the associated professional services and operational support services. The appraisal of IT investments are of increasing importance to managers as economic and competitive pressures force companies to focus on cost reduction.

The purpose of this research is to assess current industry practices regarding the evaluation of Information Technology (IT) investments in South Africa, specifically investments in Telecommunications Billing Systems. The organisation and industry along with the characteristics of the particular information technology being considered affects the nature of the investment evaluation criteria adopted, the evaluation techniques used and the method used for post-implementation evaluation.

The sample for the research consisted of stakeholders of the Evaluation of Investments in Telecommunications Billing Systems at key network operators in South Africa, specifically stakeholders who are responsible for influencing decision-making regarding Billing Systems and those who are responsible for architecting Billing Solutions for operators at vendors.

This study has shown that, while industry acknowledges the importance of Billing Systems to operators, and believes in the need for investment evaluation of billing systems, the extent of adoption of available investment evaluation techniques has been restricted, due to awareness and perceived complexity of these techniques. Based on the interviews, the study has seen that although industry has adapted its existing evaluation techniques and criteria, it seeks improved methods for evaluating intangible benefits of IT investments. The study also found that the evaluation during and after implementation is not a common practice in the industry, with resource constraints and a lack of emphasis on the importance of these evaluations being the major reasons.

DECLARATION

I, _Sudhir Dinesh Kunver_, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Signed at

On the day of 2008

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TABLE OF CONTENTS

ABSTRACT.....	II
DECLARATION	III
ACKNOWLEDGEMENTS	IV
LIST OF TABLES	VIII
1 INTRODUCTION.....	9
1.1 PURPOSE OF THE STUDY	9
1.2 CONTEXT OF THE STUDY	9
1.3 PROBLEM STATEMENT.....	10
1.4 SIGNIFICANCE OF THE STUDY.....	10
1.5 DELIMITATIONS OF THE STUDY	11
1.6 DEFINITION OF TERMS.....	11
1.7 ASSUMPTIONS	12
2 LITERATURE REVIEW	13
2.1 INTRODUCTION	13
2.2 DEFINITION OF TOPIC OR BACKGROUND DISCUSSION	13
2.3 IMPORTANCE OF EVALUATION OF IT INVESTMENTS.....	16
2.4 IT INVESTMENT EVALUATION TECHNIQUES.....	19
2.4.1 FINANCIAL METHODS FOR EVALUATION OF IT INVESTMENTS	20
2.4.2 THE BALANCED SCORECARD METHOD FOR IT INVESTMENT EVALUATION	22
2.4.3 MULTI-DIMENSIONAL APPROACH TO IT INVESTMENT EVALUATION	24
2.4.4 PROJECT-SPECIFIC IT INVESTMENT EVALUATION TECHNIQUES	27
2.4.5 INDUSTRY-SPECIFIC IT INVESTMENT EVALUATION STUDIES	27
2.4.6 OTHER TECHNIQUES	28
2.5 EVALUATION CRITERIA.....	28
2.6 EVALUATION OF IMPLEMENTATION.....	30
2.7 CONCLUSION OF LITERATURE REVIEW	32
3 RESEARCH METHODOLOGY	33
3.1 RESEARCH METHODOLOGY / PARADIGM	33
3.2 RESEARCH DESIGN	33
3.3 POPULATION AND SAMPLE	34
3.3.1 POPULATION	34
3.3.2 SAMPLE AND SAMPLING METHOD.....	34
3.4 THE RESEARCH INSTRUMENT.....	35

3.5	PROCEDURE FOR DATA COLLECTION	36
3.6	DATA ANALYSIS AND INTERPRETATION.....	36
3.7	LIMITATIONS OF THE STUDY	36
3.8	VALIDITY AND RELIABILITY	37
3.8.1	EXTERNAL VALIDITY	37
3.8.2	INTERNAL VALIDITY	37
3.8.3	RELIABILITY.....	37
4	CHAPTER 4: PRESENTATION OF RESULTS.....	39
4.1	INTRODUCTION	39
4.2	DEMOGRAPHIC PROFILE OF RESPONDENTS	39
4.3	IMPORTANCE OF BILLING SYSTEMS AND THE BENEFIT OF INVESTMENT EVALUATION	39
4.3.1	CONTRIBUTION TO IMPROVED CASH FLOW AND PREVENTING REVENUE LEAKAGE	40
4.3.2	THE CRITICAL ROLE AS A SUPPORT SYSTEM FOR INTRODUCING NEW TECHNOLOGIES	40
4.3.3	POTENTIAL TO INTRODUCE NEW SERVICES BASED ON BILLING PACKAGES	40
4.3.4	REASONS FOR THE LACK OF EMPHASIS ON INVESTMENT EVALUATION FOR BILLING SYSTEMS	41
4.3.5	REASONS FOR THE NEED FOR INVESTMENT EVALUATION FOR BILLING SYSTEMS	41
4.4	TECHNIQUES AND TOOLS USED FOR EVALUATING IT INVESTMENTS IN BILLING PROJECTS.....	42
4.4.1	CURRENT INDUSTRY PRACTICE – DECISION MAKING BY CONSENSUS.....	42
4.4.2	REASONS FOR NOT ADOPTING FORMAL EVALUATION TECHNIQUES.....	43
4.4.3	THE USE OF FINANCIAL INVESTMENT EVALUATION TECHNIQUES.....	44
4.4.4	CHALLENGES WITH EXISTING INVESTMENT EVALUATION TECHNIQUES	45
4.4.5	TRUST AND CONFIDENCE BY MANAGEMENT IN OUTCOME OF EVALUATIONS.....	46
4.4.6	THE INFLUENCE OF CONTEXT AND CIRCUMSTANCE ON TYPE OF TECHNIQUE	47
4.5	EVALUATION CRITERIA EMPHASISED FOR IT INVESTMENTS IN BILLING PROJECTS	48
4.6	EVALUATION OF THE IMPLEMENTATION OF IT IN BILLING PROJECTS	52
4.6.1	LENGTH OF PAYBACK PERIOD AND SIZE OF INVESTMENTS	52
4.6.2	DIFFICULTY ATTRIBUTING BENEFITS TO PARTICULAR SYSTEMS	53
4.6.3	LACK OF TIME AND RESOURCES	53
4.7	SUMMARY OF THE RESULTS.....	53
5	CHAPTER 5: DISCUSSION OF THE RESULTS	55
5.1	RESEARCH QUESTION 1: DOES INDUSTRY REGARD IT INVESTMENT EVALUATION FOR BILLING SYSTEMS AS AN IMPORTANT ACTIVITY?	55
5.2	RESEARCH QUESTION 2: WHAT EVALUATION CRITERIA ARE ADOPTED BY THE INDUSTRY REGARDING INVESTMENT IN BILLING SYSTEMS AND ARE THESE BASED ON THE ORGANISATION’S STRATEGIES, GOALS AND OBJECTIVES?.....	55
5.3	RESEARCH QUESTION 3: WHAT LEVEL OF AWARENESS EXISTS IN THE INDUSTRY ABOUT FORMAL TECHNIQUES FOR EVALUATING INTANGIBLE BENEFITS OF BILLING SYSTEMS INVESTMENTS, AND TO WHAT EXTENT HAVE THESE BEEN ADOPTED IN PRACTICE?	56
5.4	RESEARCH QUESTION 4: WHAT IS THE INDUSTRY PRACTICES REGARDING POST-IMPLEMENTATION EVALUATION OF BILLING SYSTEM INVESTMENTS?	57

6 CONCLUSION59

6.1 SUMMARY OF THE STUDY 59

6.2 RECOMMENDATIONS TO MANAGEMENT 60

6.3 RECOMMENDATIONS FOR FURTHER RESEARCH..... 61

REFERENCES.....63

APPENDIX A - QUESTIONNAIRE66

KEY INTERVIEW QUESTIONS – PROMPT SHEET 66

APPENDIX B – TELECOMS APPLICATION MAP67

LIST OF TABLES

Table 1: Profile of respondents	35
Table 2 - Summary of Evaluation Criteria Suggested by Respondents	48

1 INTRODUCTION

1.1 Purpose of the study

The purpose of this research is to assess current industry practices regarding the evaluation of Information Technology (IT) investments in South Africa, specifically investments in Telecommunications Billing Systems.

1.2 Context of the study

Business Monitor International (BMI) projects expenditure to increase from US\$ 11.9 billion in 2012 to about US \$20 billion by 2016, faster than real Gross Domestic Product (GDP) growth. Major infrastructure and transport projects including an improvement in South Africa's broadband infrastructure, and international bandwidth will be growth drivers; however South African businesses are expected to maintain a cautious attitude to IT investments due to global economic uncertainty (BMI 2012).

Managers in firms across the country are faced with the challenge of making key decisions regarding the justification and/or approval of IT investment on hardware and software assets, along with the associated professional services and operational support services. The appraisal of IT investments are of increasing importance to managers as economic and competitive pressures force companies to focus on cost reduction. Therefore identifying and assessing the benefits of IT investment, in relation to each other and in relation to alternative capital investments, will be essential for the motivation of IT investment and the prioritisation of IT projects, which are competing for the limited financial resources of an organisation.

The telecommunications sector is the third largest in terms of spending on IT services in South Africa, according to BMI (2012), following the government and the financial services sectors. During the initial period of high growth in the Telecommunications Industry between 1996 and 2006, network operators were not under the pressures it finds itself in today to reduce costs for operational efficiency, due to competition, market saturation and the impact of the global financial crisis on consumer spending. Those

operators need to be able to discriminate amongst the potential IT investment projects now and in the future, and make decisions on which projects to embark on based on the value those investments will have on the organisational performance.

While there is a large research base of academic studies regarding IT investment evaluation, studies focusing on practices in the South African IT industry have been scarce, and so have studies focusing on investment evaluation practices by telecommunications operators.

1.3 Problem statement

This is an exploratory study into the current practices in the South African Telecommunications Industry for the evaluation of IT investments in Billing Systems.

1.4 Significance of the study

IT managers need to objectively assess proposed IT investment projects to determine the actual benefits those investments may yield and the implications of those benefits on the improvement of organisational performance.

The organisation and industry along with the characteristics of the particular information technology being considered affects the nature of the investment evaluation criteria adopted, the evaluation techniques used and the method used for post-implementation evaluation.

Previous studies on industry and technology specific IT investment evaluation practices included: the construction industry (Love & Irani, 2004), the service industry at large (Lin, Huang & Cheng, 2007), US lodging (Karadag, Cobanoglu, & Dickinson, 2009), health (Devaraj & Kohli, 2000), Australian organisations (Lin & Pervin, 2003); and Jordanian organisations (Al-Yaseen., Al-Gweri, Al-Jaghoub 2007)..

This study complements the study carried out by Apostolopoulos and Pramataris (1997) which was specifically related to IT investment evaluation in a telecommunication context, in that it focuses on the business support systems and specifically the billing domain of telecommunications networks.

Telecommunications operators in the maturing South African market, who have historically spent vast amounts of investment in technology, are seeking operational efficiencies. The aspects of management practice this study will assist IT managers with decision making in telecommunications operations to allow them to be more discerning in choosing amongst a variety of IT project investments and ensuring that their businesses benefit from the chosen investments. Managers and executives will benefit, because the outcomes of this study will provide a mechanism to objectively compare and justify investment in IT assets.

1.5 Delimitations of the study

This research topic focuses specifically on the Billing Systems domain of a telecommunications network, rather than the entire Customer Management Systems domain. The scope of this study is also limited to the network operators within the South African Telecommunications Industry, and it does not extend to the multi-national holding companies of these operators.

1.6 Definition of terms

Information Systems and Technology Capital Investment

An IT capital investment, defined by Bacon (1992), is any acquisition of computer hardware, network facilities, or pre-developed software, or any “in-house” systems development project, that is expected to add to or enhance an organisation’s information systems capabilities and produce benefits beyond the short-term.

Billing

TMForum (2010) define the Billing business process in the context of telecommunications operators as a group of processes responsible for the production of timely and accurate bills, for providing pre-bill use information and billing to customers, for processing their payments, and performing payment collections. In addition, it handles customer inquiries about bills, provides billing inquiry status and is responsible for resolving billing problems to the customer's satisfaction in a timely manner. This

process also supports prepayment for services.

1.7 Assumptions

It is assumed that the respondents will have sufficient experience and knowledge regarding the billing domain of a telecommunications network and the impact these technologies have on their organisation's performance, to clearly articulate answers to the interview questions. This is a reasonable assumption as most respondents will either be IT Managers or Billing Specialists at telecommunications operators. There will be a high sensitivity of the outcome of this research to this assumption.

2 LITERATURE REVIEW

2.1 Introduction

The literature review that follows focuses on articles published in scholarly journals over the past 20 years regarding IT investment evaluation. The literature review will follow the suggested classification by Gunasekaran, Love, Rahimi and Miele (2006), on the literature available for IT investment evaluation:

1. General IT evaluation and justification concepts
2. Evaluation criteria emphasised for justifying IT projects
3. Techniques and tools used for evaluating and justifying IT projects
4. The evaluation of the implementation of IT projects

The more recent studies conducted on this topic include Lin et al. (2007) whose research examined the relationship between the levels of IT maturity and the use of IT investment evaluation and benefits realisation methodologies in the service sector, and Gunasekaran et al. (2006) who developed a framework for IT evaluation that better reflects the new business environment.

2.2 Definition of topic or background discussion

IT Value

Literature regarding the value of IT from a strategic and business perspective varies. Carr (2003) argues that IT is a commodity and that firms have overestimated the strategic value of IT. Melville, Kraemer and Garbaxani (2004) find to the contrary that IT is valuable, offering extensive benefits ranging from flexibility and quality improvement to cost reduction and productivity enhancement. IT value should be separated into three dimensions according to Hitt and Brynjolfsson (1996): the effect IT has on productivity, business profitability and consumer surplus. Managers should be able to distinguish between these dimensions when evaluating the value of IT investment projects, and should then prioritise these based on the strategic objectives of the organisation.

IT Investment Evaluation

As suggested by Wilcocks (1992), 'evaluation' in the context of this topic is taken from a management perspective, and is about establishing by quantitative and/or qualitative means the worth of IT to the organisation. Evaluation brings into play notions of costs, benefits, risk and value, and it also implies an organisational process by which these factors are assessed, whether formally or informally (Wilcocks, 1992). In some of the literature reviewed, the term appraisal is used as opposed to evaluation, while many refer to the notion of investment justification. The terms 'appraisal' and 'evaluation' are frequently used within the Information Systems IS literature in a synonymous manner according to Ballantine and Stray (1998). Appraisal and evaluation are viewed as aspects of the same decision-making process, and both activities are intrinsically linked within that decision making process, although the activities of appraisal are carried out during the feasibility study stage, while the activities of evaluation can apply to a project during various stages including feasibility, development, implementation or after implementation (Ballantine and Stray, 1998). The use of the term 'justification' may imply a bias towards motivating for an evaluation that yields a positive outcome for a particular investment to be made, while the term evaluation suggests a higher degree of impartiality to the outcome.

What are Billing Systems?

The Tele-Management Forum, from here on referred to as the TMForum, is one of the largest communications and media industry associations. The TMForum have defined the Telecommunications Applications Map (TAM), intended to be used as a common reference map by operators and their suppliers to navigate the complex systems landscape that is typically found in fixed, mobile and cable operators (TMForum, 2010). Billing Systems fall within the Customer Management Domain of the TAM (TMForum, 2011) as depicted in the highlighted area of the diagram in Appendix B.

The following functionality is carried out by applications that would be deployed on various Billing Systems:

Product/Service Rating: This application calculates the customer specific charges (recurring, one time, volume and time-based usage etc.) and discounts. The following

functionality is included: charge calculation; rating of usage events; charge level discounts and taxes; arbitrary mathematical rating; pro rating of recurring charges; rerating; flexible accumulators of usage data; threshold notification; advice of charge; advice of rate (TMForum, 2010).

Billing Inquiry, Dispute and Adjustment Management: This is a front-end application including functionality for handling of billing enquiries, including the ability to view billing account and financial information, and the handling of disputed charges, including the opening, managing, tracking and resolution of the dispute, which may include an adjustment (TMForum, 2010).

Bill Format: This application formats the invoice and/or statement based on specified options, and then makes it available in appropriate media types e.g. paper, electronic (TMForum, 2010).

Online Charging: This application is a charging mechanism, where charging information can affect, in real-time, the service rendered. The charging request as well as the response is handled in real-time through the use of real-time guiding to customer and price plan, real-time rating and real-time balance-management of monetary and non-monetary balances and allowances. It is required that the application cater for fault tolerance, high throughput, low latency, high precision and flexible introduction of new price plans (TMForum, 2010).

Billing Account Management: The purpose of Billing Account Management is to provide functionality necessary to establish and modify a customer's billing account. Billing account configuration management and billing account association management functionality are included (TMForum, 2010).

Bill Calculation: The purpose of this application is to calculate a convergent bill for next generation voice, data, and content and commerce services – including pre-paid and post-paid services in a single convergent bill. Application functions include: performing charge and event distribution; support flexible bill cycle definition; discounts and promotions; taxes requirements and exemptions; contract commitment tracking; incorporate payments, adjustments and other financial activity (TMForum, 2010).

2.3 Importance of Evaluation of IT investments

Bacon (1992), Gunasekaran et al. (2001) and Milis and Mercken (2004) have all cited increasing economic and competitive pressures as being key drivers for the greater scrutiny and control over IT investments. Bacon (1992) indicates that companies faced with decreasing margins and limited capital resources, must ensure these resources are judiciously allocated among competing projects and therefore careful and correct IT investment decisions are becoming more of an economic and competitive necessity, a notion supported by Gunasekaran et al. (2001).

Fitzgerald (1998) emphasised that the ability to be able to evaluate IT investments effectively was of great importance at the time due to economic pressure arising from the recession at the time, which had resulted in an increasing focus on value for money in all areas of business activity. A similar phenomenon is being experienced today, after the recent global financial market crisis experienced from 2008, whereby cost-saving through the restriction of capital budget made available within business, is driving the need for rigorous motivation for the use of capital resources for IT investments.

In terms of competitiveness, managers are faced with the problem of having to constantly identify what their competitors are doing with IT; determine whether or not they can remain competitive with or without IT; and evaluate how the adoption of IT can improve their performance and competitiveness (Gunasekaran, 2001). Milis and Mercken (2004) concur with this, explaining that in an increasingly competitive business climate, there is a growing requirement for stronger cost control and a demand for higher returns while minimising risk in investments and have made the evaluation, justification and control of Information and Communications Technology investments a critically important issue.

Gunasekaran (2006) explains that the increase in the difficulty of the decision-making process around IT investment justification can be attributed to the increased complexity of business brought about by the rapid growth of supply chain management, the virtual enterprise and E-business, and therefore the complexities of this dynamic new business environment should be taken account.

Farbey, Land and Targett (1992) offer four objectives of IT investment evaluation being: to justify investments; to enable an organisation to make comparisons of merits of a number of different projects competing for the same resources; to provide a set of measures which enable the organisation to exercise control over the project; and to provide a learning experience necessary for organisations to improve their system evaluation capability for the future.

The size and continuing growth of IT investments is another major reason for the increased focus on the evaluation of these investments, as senior managers need to question the returns from such investments and whether the IT route has been, and can be, a wise decision (Wilcocks 1992). As indicated above, BMI (2012) have projected IT spending to be at US\$20 billion in 2016, and that between 2012 and 2016, the South African IT market compound annual growth rate is projected to be in the region of 13%, as the number of major IT infrastructure projects generate spending at provincial levels.

The mass of new IT products now available in the market pose an ever increasing problem to managers, as they constantly have to invest and justify their decisions to update software and hardware to keep abreast of their competitors (Gunasekaran et al., 2001). According to Kearney (1990), as cited in Wilcocks (1992), the lack of credibility in how IT benefits were being justified, imposes a constraint on further investment in IT in the future.

Selecting and effectively pursuing the right IT/IS investments can be a key factor in sustaining corporate viability and prosperity (Bacon, 1992). Well-managed IT investments that are carefully selected and focused on meeting business mission needs can have a positive impact on an organisation's performance. Likewise, poor investments, those that are inadequately justified or whose costs, risks, and benefits are poorly managed can hinder and even restrict an organisation's performance (Gunasekaran et al., 2001). According to Wilcocks and Lester's (1991) survey of American, British, Australian and New Zealand companies in 1990, the quality with which investment decisions are made on IT projects can have a dramatic effect on an organisation (Gunasekaran et al., 2001).

Ballantine and Stray (1998) have cited other reasons which include: (1) to gain information for project planning; (2) to ensure that systems continue to perform well; and

(3) to enable decisions concerning expansion, improvement, or the postponement of projects to be taken.

Hochstrasser and Griffiths (1991) identified the overwhelming belief by many industries that they are faced with outdated and inappropriate procedures for investment appraisal, and that all responsible executives can do is cast them aside in a bold leap of faith. On the other hand, Thomas et al. (2007) concluded from their study that the key to more effective IT evaluation is not more formal and sophisticated methods, but rather, more effective governance structures and leadership behaviours. The six key drivers of effective IT evaluation practices they identified, that lead to more efficient use of resources and improved IT project outcomes are: accountability of results, top leadership commitment, strong IT business relationship, and alignment to strategy, effective measurement regime and willingness to take action. (Thomas et al., 2007).

2.4 IT Investment Evaluation Techniques

There are a broad range of techniques covered in the literature for the evaluation of IT investments, and these are based on financial models, strategic models and multi-criteria decision making models. Irani and Love (2002) created a frame of reference that can be used to navigate through the variety of appraisal methods available to decision-makers: Analytical Portfolio Appraisal approaches such as Weighted Scoring Models, Conventional Programming Approaches, Risk Handling and Value Analysis; Strategic Appraisal techniques such as Technical Importance, Competitive Advantage, Critical Success Factors, Multi-criteria; Economic Ratio Appraisal including Payback, Return on Capital Employed, Cost Benefit Analysis, Net Present Value (NPV), Internal Rate of Return and Hybrid Discounting (Irani & Love, 2002).

The choice of techniques used depends on a number of factors as outlined by Sarkis and Sundaraj (2000):

- The technology being assessed as well as the organisation.
- Organisational characteristics also play a role. For example, the resources (time, money) may not be available to generate the data needed for some of the more complex models; thus, there may be a reliance on models that allow for rapid sensitivity analysis.
- The lack of in-house expertise in developing, applying and interpreting the techniques may also determine which would be most appropriate.
- Where the technique will be applied (in terms of the strategic management framework) can also influence its selection.
- Those models that are more data dependent may prove more effective in later stages and for future justifications, as more data would be available after a project has been implemented (i.e. the auditing stage) than early in the planning phases.

Simple systems can be evaluated on more simple techniques, primarily applying financial appraisal approaches. As systems become more encompassing and strategic, more elaborate techniques incorporating intangible factors and strategic measures should be

utilised to fully determine the organisational impacts of these systems (Sarkis & Sundaraj, 2000).

2.4.1 *Financial Methods for evaluation of IT investments*

There are various different methods described in the literature regarding IT evaluation. Capital budgeting or capital investment appraisal is a category of techniques from the financial management body of knowledge, and includes the following major techniques: Payback Period, Return on Investment (i.e. Accounting Rate of Return), Internal Rate of Return and Net Present Value. The Payback Period is defined as the amount of time required for an investment to generate cash flows to recover its initial cost (Firer, Ross, Westerfield & Jordan, 2004). Advantage include: ease of understanding, adjusts for uncertainty of later cash flows, biased towards liquidity; while disadvantages include: ignores time value of money; requires an arbitrary cut-off point; ignores cash flows beyond the cut-off date; biased against long-term projects, such as research and development and new projects (Firer et al., 2004). Internal Rate of Return is defined as the discount rate that makes the NPV of an investment zero (Firer et al., 2004). Advantages include: it is closely related to NPV, often leading to identical decision, and it is easy to understand and communicate; while disadvantages include: it may result in multiple answers or not deal with non-conventional cash flows and may lead to incorrect decisions in comparisons of mutually exclusive investments. Net Present Value is defined as the difference between an investment's market value and its cost is called the net present value of the investment (Firer et al., 2004).

Various arguments are put forth from the accounting and finance point of view regarding the view that Capital Investment Appraisal Techniques (CIAT) are appropriate for the appraisal of all types of capital investments, as summarised by Milis and Mercken (2004): in order to achieve the primary objective of maximising profit/shareholders wealth, a common method of appraisal is needed which can be applied equally to the whole spectrum of investment decisions; in contrast with non-traditional appraisal techniques, CIATs are well known and well understood.

Milis and Mercken (2004) state that the feasibility studies for ICT investment appraisals often are payback period and return on investment and Ballantine and Stray (1998) offer

the explanation that the high usage of payback is probably due to its simplicity and focus on liquidity. The following arguments are put forward by Milis and Mercken (2004) regarding their conclusion that the Payback Period technique should be considered the least suitable capital investment appraisal technique for the appraisal of ICT projects: projects with fast payback are favoured due to the fact that projects are judged on the period needed to compensate for the initial investment, with the result that companies using this technique tend to accept too many short-lived projects and reject too many long-lived ones; the inability to incorporate risk into the appraisal and the ignorance of the time value of money make this technique inapt for the evaluation of ICT projects. Return on Investment is more adequate than Payback Period because the total lifecycle of the investment is taken into account (Milis & Mercken, 2004).

The major drawback of Return on Investment is that the time value of money is not taken into consideration, a limitation that the Internal Rate of Return (IRR) technique does not have (Milis & Mercken, 2004). The following disadvantages are the IRR technique have been identified: the result of IRR is a percentage, making it difficult to compare projects that differ substantially in size and outcome; if the IRR differs substantially from the cost of capital, it will become difficult to compare projects with a different time pattern; there may exist more than one IRR for an investment; when this technique is used as a selection tool for mutually exclusive investment projects, risks are not accounted for, which is a major disadvantage when used in an ICT environment (Mills & Mercken, 2004). With NPV, different discount rates can be used to reflect the risk-levels of mutually exclusive investment and is considered superior to IRR. Only a small percentage of respondents in the Ballantine and Stray (1998) study use the more sophisticated discounted cash flow techniques of NPV and IRR and reasons for this might include educational backgrounds and experience of individuals carrying out the appraisal, the number of respondents unfamiliar with the techniques, and organisational policy dictating a particular technique.

Fitzgerald (1998) contend that where companies adopt a strict financial evaluation of IT projects, only investments that lead to cost savings tend to be approved, resulting in organisations choosing investments leading to measurable improvements in efficiency, but missing out on what might be more worthwhile projects that cannot be justified on

efficiency criteria alone. Ballantine and Stray (1998) find that the main arguments against using CIAT to appraise IT investments stem from the belief that IT is inherently different from other types of capital investment, for example, organisations know there will be unanticipated benefits from such investments, but cannot estimate them, or that the costs and benefits can never be fully attributable to a particular system or function/department, or the CIAT techniques do not allow for the inclusion of important intangible costs and benefits of IT investments. The following arguments are put forward for not using Capital Investment Appraisal techniques by Millis and Mercken (2004):

- They tend to meet the objectives of management rather than other stakeholders such as users, implementers and supporters, and by neglecting the criteria of the other parties involved, fails to incorporate factors that are of crucial importance for the acceptance and willingness of the other parties to cooperate;
- CIATs are conservative in nature, and investments tend to be penalised if the pay-offs are likely to be long-term, which is harmful to ICT projects since they are characterised by high risk and long term lead and payoff times, especially for projects dealing with the introduction of new technology;
- compared to other capital investments, there is a larger group of intangible benefits relative to tangible benefits, and the complexity involved in quantifying intangible benefits in financial terms is high, to the extent that the difficulties and costs of obtaining quantitative data could outweigh the benefits; while risks should be measured in a higher discount rate, traditional capital asset pricing models that underlie CIAT approaches fail to provide ways to measure discount rates properly when dealing with ICT. Millis and Mercken (2004)

Ballantine and Stray (1998) however, find that it is not clear from either the accounting and finance or IS literature whether the claims made by those opposed to the use of CIAT in the IT area are not atypical of the problems and difficulties encountered when appraising capital investments per se.

2.4.2 *The Balanced Scorecard method for IT investment evaluation*

Martinsons and Davidson (1999) suggested that the Balanced Scorecard may also help managers evaluate IT investments, as well as the performance of an IS organisation, in a

holistic manner. Kaplan and Norton (1992) introduced the balanced scorecard as a set of measures that give businesses a fast but comprehensive view of the business, including financial measures that tell the results of actions already taken, and complementary operational measures on customer satisfaction, internal processes, and the organisation's innovation and improvement activities – operational measures that are the drivers of future financial performance. Kaplan and Norton (1992) describe the balanced scorecard as a tool that allows managers to look at the business from four important perspectives: the customer perspective, which focuses on how customers see the business; an internal perspective focusing on what the business should excel at; an innovation and learning perspective, focusing on whether the business can continue to improve and create value; and the financial perspective focusing on how the business is viewed by shareholders.

Martinsons and Davidson (1999) as well as Milis and Mercken (2004), advocate the use of the balanced scorecard in the evaluation of information technology projects. Milis and Mercken (2004) suggest that it is relatively easy to tailor the balanced scorecard framework to the specific needs of IT investment evaluation. Martinsons and Davidson (1999) present a Balanced Scorecard for Information Systems with the following modifications to the perspectives and measures proposed by Kaplan and Norton (1992): the four perspectives proposed are user orientation, business value, internal processes and future readiness perspective incorporating innovation and learning; a reanalysis of the internal business/process perspective such that it focuses on efficiency.

Martinsons and Davidson (1999) provide a mission and objectives for each of the perspectives, and guidelines are provided for measuring and evaluating each perspective. For internal processes for example, the mission is defined as the ability to deliver IT products and services in an efficient and effective manner, and objectives including the anticipation and influence of requests from end-users and management, and being efficient in the planning, developing, operating, maintaining, acquiring and testing of applications and hardware (Martinsons & Davidson, 1999). Internal operations may be assessed by measuring and evaluating three of the basic processes performed by the IS department, including the planning and prioritisation of IS projects; the development of new IT applications and the operation and maintenance of current IT

application. Measures for the internal process perspective are provided: percentage of resources devoted to planning and review of IS activities; percentage of resources devoted to application development, time required to develop a standard-sized new application, percentage of applications programming with re-used code; time spent to repair bugs and fine-tune new applications (Martinsons & Davidson, 1999). Guidelines for creating a company-specific balanced scorecard are provided.

Milis and Mercken (2004) identified the following advantages of using the balanced scorecard for IT investment evaluation: the balanced scorecard forces management to take a broad view on ICT investments; many different techniques can be integrated into the framework, by for example having any of the financial appraisal techniques into the financial scorecard; the framework can be used for the feasibility evaluation and for follow up and ex-post evaluations. The drawbacks of include: there are no generic IT measures that fit all organisations, and metrics must fit a specific organisation's goals; when using the balanced scorecard for IT purposes, the perspective might be too narrow if the scorecard is just seen from an IT department perspective, and this can jeopardise the strategic fit (Milis & Mercken, 2004).

2.4.3 Multi-dimensional approach to IT investment evaluation

Sarkis and Sundaraj (2000) indicated that more sophisticated requirements have been addressed through a number of modelling techniques, which typically fall within the scope of multiple criteria decision making. Sarkis and Sundaraj (2000) explain some of these techniques below:

- The analytical hierarchy process (AHP): which assigns relative importance weights to various factors, whether they are tangible or intangible by asking managers their strength of preference of one factor over another. Factors are grouped into levels and their relative importance is based on their relationship to a controlling factor in the hierarchy;
- Expert systems – capable of guiding decision-makers by asking a number of “expert developed” questions and guiding them to an acceptable answer. These systems do not allow the manager to see why the decision is made but, similar to the AHP approach, they are dependent on managerial input;

- Multi-attribute utility theory (MAUT) – MAUT determines the “utility” of various factors, over a given range of levels, based on decision-maker preference. The result of this exercise is a utility curve for each factor, and each alternative would then be evaluated on each factor and an overall score would in turn be derived by summing these factor utilities;
- Scoring models – Scoring models are the most popular techniques and the simplest as well. Here, each factor, whether tangible or intangible, is assigned an importance weight and, further, each alternative is ranked on these factors using a scale of, for example, 1 (best) to 10 (worst). A weighted average of these rankings for each alternative yields the overall score for that alternative; and
- Some of the other techniques mentioned include data envelopment analysis (DEA), outranking; simulation; and goal programming.

Fitzgerald (1998) proposes a multi-dimensional approach to IT investment evaluation, which addresses effectiveness and efficiency criteria, after having made a distinction between efficiency and effectiveness IT projects: an efficiency project is defined as one that seeks to reduce the cost of performing a particular process or task by utilising information technology, and it does not seek to radically change the nature of the objectives that those tasks and processes were devised to fulfil, but simply seeks to achieve the same objectives at a lower cost; an effectiveness project seeks to identify ways of doing different things which better achieve the results, leading to increased revenues or better service. For effectiveness projects it is not just necessary to identify the benefits, but also that the recipients of those benefits will recognise and value the improvement and change their behaviour in some positive way as a result.

Eight specific tasks make up Fitzgerald's (1998) proposed multi-dimensional approach: Firstly, the costs should be identified and quantified using the traditional financial evaluation techniques, however emphasis should be placed on the recognition that costs are often significantly underestimated and that in practice many projects suffer from serious cost overruns. The second task is to identify to what extent the project contributes to the overall business strategy of the organisation, and the point is made that while it is always difficult to assess this contribution, the process of discuss and making arguments for a relative assessment is usually rich and worthwhile.

The third task is the identification and analysis of actual benefits associated with the project, and where benefits are quantifiable, the approach recommends that the assumptions that underlie the quantification should be clearly identified, and subjected to discussion and analysis. Furthermore, savings should be examined where they could potentially be negated by increased costs in other areas or where costs are simply shifted from one budget to another; a sensitivity analysis should be used in the assessment of benefits, whereby assumptions should be tested against the proposed benefits and those that are most critical need to be identified and subjected to re-evaluation and more detailed examination and questioning. The fourth task concerns identifying second order effects, which is likely to be experienced for any project that impacts roles, relationships, sources of power, or organisational structures, and if predicted, these effects can be addressed and if necessary mitigated, turned to advantage (Fitzgerald, 1998).

The fifth task concerns the evaluation of flexibility, which is a recognition that the success of a project is not just about the benefits that accrue when it is implemented but also about how well it continues to perform over the lifetime of the system. An important point is made that flexibility does not just occur, it has to be designed and planned for, and to do this, it is necessary to think through the kind of changes the business might be subjected to in the future and ensure that such change can easily be accommodated, and to examine whether the proposed system is actually building in constraints to flexibility. The sixth task is an assessment of how practical or implementable the project is, and it is cautioned that the potentially most beneficial effectiveness projects are likely to be the most difficult to implement because of the degree of change that they require, not just technically, but organisationally and politically (Fitzgerald, 1998).

The seventh task is the evaluation of risk, which is a measure of the degree of possible variation in the outcome or benefits of the project, which needs to be addressed; and the eighth task is an attempt to test and clarify some of the assessments, assumptions and stated benefits made earlier. A decision then needs to be taken as to whether to proceed with the project or not, before commitment to resources investment is made (Fitzgerald, 1998).

2.4.4 Project-specific IT investment evaluation techniques

Aside from the actual evaluation techniques, the literature also provides some direction as far as choosing appropriate techniques based on the nature of the IT project. Hochstrasser (1990) has proposed to choose an evaluation technique based on the type of IT project being undertaken, and has classified seven types of projects and potentially suitable evaluation techniques: the author classifies infrastructure projects as hardware or software systems installed to enable the subsequent development of front-end systems, and contends that these projects cannot be evaluated in terms of directly quantifiable business benefits; cost replacement projects include systems introduced to automate manual activities, or the upgrading of an existing information system by a new system, and these can often be evaluated by a cost benefit analysis or extended cost-benefit analysis; when systems are introduced to allow a company to handle an increased volume of data or extended range of tasks, this is classified as economy of scale or economy of scope projects respectively, and these can be evaluated by a company's increased ability for capacity handling or by a company's ability to expand the business horizon with the same level of resources respectively. Similarly, Hochstrasser (1990) classifies other IT projects types as customer support projects which could be evaluated by the Customer Resource Lifecycle; quality support projects which could be evaluated with Porter's (1980) value chain analysis; and new technology projects which could be evaluated by risk evaluation techniques.

2.4.5 Industry-specific IT investment evaluation studies

Literature regarding industry-specific studies on IT investment evaluation is generally scarce. Apostolopoulos and Pramataris (1997) are the only authors that could be sourced who had research published regarding IT investment evaluation in the domain. Apostolopoulos and Pramataris (1997) provided a framework for evaluating IT investments specifically in telecommunications infrastructure. The framework is based on economic criteria (cost-benefit analysis), technical criteria (requirements satisfaction level) and intangible benefits.

2.4.6 Other techniques

Some of the other techniques found in the literature include Fuzzy Cognitive Mapping proposed by Irani and Sharief (2006), and the portfolio approach proposed by Ward (1990).

According to Serafeimidis (1997), the gap between evaluation theories and organisational practices is the limited attention paid to social roles and the cognitive aspects of the evaluation participants, and furthermore, the primary focus has been on issues of content and methodologies ignoring relationship with the context where they are located (Serafeimidis, 1997).

2.5 Evaluation Criteria

Bacon (1992) describes the significance of the criteria used in making the decision on IT investments: first, the criteria and the way in which they are applied significantly impact the effectiveness with which IT investment decisions are made, and they determine whether the “right” projects are selected; second, the criteria are significant for the organisation’s finance and management accounting function in terms of their role in maximising return on investment and their involvement in the cost vs. benefit analysis that may precede an IT capital investment decision; and finally in terms of the right “balance” in the use of criteria, between the two opposing views in considering cost vs. benefit analysis – one view being that cost vs. benefit analysis, beyond an intuitive assessment, is neither feasible nor useful, especially when the numbers seem to be stretched to fit the need. The other view imposes a universal requirement for a clear, measurable, and reliable return on investment over two to three years or less. It is oriented to traditional, cost-saving, productivity-oriented projects, and it tends to screen out those providing better customer service, improved decision support, enhanced communication and similar strategic payoffs.

Gunasekaran et al. (2001) are of the opinion that evaluation criteria should be based on the organisational strategies, goals and objectives, and they provide seven groups for commonly employed criteria for IT investment evaluation, with an explanation of each group: i) strategic impact – the strategic significance of IT in organisational performance

plays a key role in determining whether a particular IT is needed, and how it should be implemented; ii) tactical considerations – it is equally important to develop suitable programmes and actions for successfully implementing and using IT; iii) operational performance, which tends to produce tangible identifiable and measurable results; iv) financial measures – in the final analysis, programmes, actions and projects should lead to improved financial performance and hence the modelling of financial and non-financial performance measures would help companies make informed decisions about IT planning and implementation; v) non-financial indicators – the strategic and intangible nature of some IT benefits make it desirable to include non-financial performance measures in the analysis of IT investments; vi) tangibles such accuracy and promptness of issuing bills; and vii) intangibles, such as good company image and reputation, teamwork, technological edge etc. (Gunasekaran et al., 2001).

In terms of operational performance, tangibles and some financial indicators, TMForum (2010) defines a number of Performance Metrics for Billing Systems which are relevant to investment evaluation in that these provide a link between Billing Systems and organisational performance. They have categorised these into Customer Experience Metrics, which provide a view of the measures that impact the end-customer's reaction to the service offering thereby driving customer loyalty and Operational Efficiency Metrics which provide a view of cost and expense drivers. Customer Experience Metrics include: experience of preferred access to billing information, experience of preferred bill-payment transactions, promptness in received billing information, duration to prepare and dispatch bills, bill accuracy, and timeliness of customer information. Operational Efficiency Metrics include the cost efficiency of the billing process, operational efficiency of the billing process, unit revenue cost of billing process, mean time to prepare and dispatch bills, billing data availability time, error revenue efficiency of billing process, error correction efficiency of billing process, percentage of written off collectable debt; and billing revenue leakage.

Bacon (1992) surveyed companies based on a list of evaluation criteria categorised in terms of financial, management and development criteria. Financial criteria include: Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index Method (PIM), Average or Accounting Rate of Return (ARR), Payback Method (PBM); and Budgetary Criteria or Constraints. Management criteria include: Support Explicit Business Strategy

or Objectives, Support Implicit Business Strategy or Objectives, Response to Competitive Systems, Support Management or Executive Decision Making, Probability of Achieving Benefits; and Legal or Government Requirements. Development criteria includes: Technical/System Requirements, Introduce or Learn New Technology; and Probability of Project Completion.

2.6 Evaluation of implementation

Hochstrasser (1990) argues that the high rate of failure in IT projects is partly attributed to a lack of solid but easy to use management tools, for evaluating, prioritising, monitoring and controlling investments in IT. Voss (1986) claims that most technology focused investments fail due to organisational problems, and has identified economic justification as a significant contributing factor.

Bacon (1992) found that more accurate quantification of cost vs. benefit and more informed Information Systems Technology (IST) investment decisions are facilitated where there is effective benefit-tracking and chargeback in place.

Kumar (1990) found that the inhibitors of post implementation evaluations included unavailability of evaluators, including project personnel who may be reassigned, and the fact that corporate management did not perceive adequate benefits from evaluation. Post implementation evaluations are being performed for the limited, short-term reason for formalising the end of the development project and may not provide the more important long-term, feedback improvement benefits of the evaluation process (Kumar, 1990).

Farbey et al. (1992) stated a few reasons why evaluation may be difficult: firstly the impacts of modern IT are so wide-ranging that organisations are often simply unaware of what the costs, benefits and disadvantages of a system might be; the benefits of IT investment are seldom attributable only to the technology as IT becomes more and more integral to the way business is conducted; IT investment is very often targeted at second order effects; much of IT which has the character of infrastructure is difficult to assign either costs and benefits in a logical fashion; lifetime costs are difficult to estimate

because the life of new systems is uncertain due to technological obsolescence and changing requirements; there are project champions who frequently under-estimate costs in order to increase the chance of the project being accepted (Farbey et al., 1992).

Kumar (1990) suggested that the formal post-evaluation be performed when the system has had a chance to settle down and its impacts become visible through continued operation, because evaluation would be looking at the longer term impacts and viability. Additionally, an independent quality assurance group should manage and perform the evaluation.

Hamilton and Chervany (1981) describe four evaluator viewpoints which, although dated, may be equally relevant for evaluating information system effectiveness: user viewpoint which is concerned with accuracy, reliability, timeliness in responding to request, assistance and the adequacy with which the requirements definition is met; Management Information Systems (MIS) viewpoint concerned with whether a system has been developed, installed and works; management viewpoint, concerned with meeting deadlines, minimising costs, minimising turnaround time and maximising training of MIS personnel, and maintaining a stable workload; internal audit viewpoint concern relate to application control compliance (Hamilton & Chervany, 1981).

2.7 Conclusion of Literature Review

In this literature review, the reasons for the evaluation of IT investments have been discussed, along with the techniques used for investment evaluation including financial and multi-criteria techniques, as well as literature regarding the relevant evaluation criteria and the evaluation of implementation. While academic literature regarding Billing Systems investment evaluation was not found, the TMForum's performance benchmarking metrics for Billing Systems were described.

Research Question 1: Does industry regard IT investment evaluation for Billing System as an important activity?

Research Question 2: What evaluation criteria are adopted by the industry regarding investment in Billing Systems and are these based on the organisation's strategies, goals and objectives?

Research Question 3: What level of awareness exists in the industry about formal techniques for evaluating intangible benefits of Billing Systems investments, and to what extent have these been adopted in practice?

Research Question 4: What is the industry practices regarding post-implementation evaluation of Billing System investments?

3 RESEARCH METHODOLOGY

This section outlines the methods that were used to carry out this research. Literature regarding qualitative research methodologies will be discussed. This will be followed by an explanation of the research design, population and sample group and research instrument that were used. A discussion on the data collection and data analysis techniques that were adopted is also included in this section.

3.1 Research methodology / paradigm

According to Saunders, Lewis and Thornhill (2003), exploratory studies are a valuable means of finding out what is happening; to seek new insights; to ask questions and to assess phenomena in a new light. This form of study is appropriate for this particular research, as the intention was to find out what practices are currently adopted in the industry as far as evaluation of investments in Billing Systems are concerned, to gain insight into the reasons for adopting these practices, and to understand the potential for alternative evaluation methods. A qualitative study is more appropriate, as there are a limited number of decision makers within the small group of network operators that make and influence decisions around investment in Billing Systems, and in-depth interviews with key individuals will generate more meaningful insights from relevant people than a large quantitative survey study would.

Creswell (2003) describes the qualitative research approach as one which involves the researcher collecting open-ended, emerging data with the primary intent of developing themes from the data, which in the case of this particular research, would be along the lines of common experiences of managers regarding IT evaluation and decision-making.

3.2 Research Design

The researcher formulated five general interview questions based on the research propositions that emerged from the literature review. The prompts were used to stimulate thoughts from the respondents if they did not spontaneously discuss a particular issue, or did not provide sufficient insights from their environment /experience that adequately address the questions posed.

3.3 Population and sample

3.3.1 *Population*

The population for the research consists of stakeholders of the Evaluation of Investments in Telecommunications Billing Systems in South Africa, specifically those who are responsible for influencing decision-making regarding Billing Systems at network operators and those who are responsible for architecting Billing Solutions for operators at vendors.

3.3.2 *Sample and sampling method*

Saunders et al. (2003) describes the purposive or judgemental sampling method as one which enables you to use your judgement to select cases that will best enable you to answer your research question(s) and to meet your objectives. While such samples cannot be considered to be statistically representative of the total population, as pointed out by Saunders et al. (2003), this particular research was not proposed to be generalised across the total population of telecommunications operators across the world, but was rather an exercise to gain insights into current operator practices within the South African industry. The purposive sample design: Two groups of stakeholders were approached to participate in the study:

- Group 1: IT Managers and Specialists responsible for Billing Systems in operators
- Group 2: Vendors responsible for selling Billing Systems to operators

This sampling method was appropriate as it was important to get insights from industry practitioners regarding their current practices of Billing System investment evaluation. Ten interviews were conducted, and each respondent was approached individually to participate in the interview.

Table 1: Profile of respondents

Description of respondent type	Number sampled
Telkom Strategy and Planning Executive	1
Telkom 8TA Billing Systems Manager	1
CellC Billing Systems Executive	1
MTN Billing Systems Engineer	1
Vodacom Post-paid Billing Systems Specialist	1
Vodacom Technology Strategy Manager	1
Vodacom Solution Architecture Manager	1
ATOS Origin Billing Architect	1
Hewlett Packard Billing Architect	1
Opennet Billing Architect	1

3.4 The research instrument

There are three principle ways of conducting exploratory research as explained by Saunders et al. (2003): carrying out a search of literature, talking to experts on the subject through unstructured/in-depth interviews, conducting focus group interviews. For this research, the in-depth interview was used as a research instrument, as this allowed the interviewer to clarify responses and obtain a deeper understanding of industry practices. As Kalof, Dan and Dietz (2008) suggest, in-depth interviews compared to other survey modalities provide the following advantages: they are better suited for in-depth open-ended questions; they permit longer questionnaire length than the other survey modalities; allows the interviewer to probe, clarify and ask follow-up questions; and this form of research is particularly useful to clarify an understanding of a particular problem.

The first question posed to the interviewees was to ascertain how serious organisations are regarding IT investment evaluation in general, and what their key drivers for this evaluation in practice are. As the literature has documented, formal methods of IT investment evaluation are rarely adopted by organisations and is something often done on 'gut-feel', it was crucial to determine what the respondents' experience has been in

this regard. The second and third questions were related to familiarity and practice of the techniques of IT investment evaluation. The final two questions pertain to the challenges faced in adopting evaluation techniques in practice.

3.5 Procedure for data collection

In-depth/unstructured one-on-one interviews are informal, in which there is no predetermined list of questions to work through, although a clear idea about the aspect(s) that the research would like to explore (Saunders et al., 2003). The questions included in the Appendix were used as a guide; however, depending on the respondent and their context, some additional questions were posed to probe certain aspects. As suggested by Saunders et al. (2003), the interviewee was given an opportunity to talk freely about events, behaviour and beliefs in relation to the topic.

3.6 Data analysis and interpretation

When commencing research from a deductive position, the research seeks to use existing theory to shape the approach adopted for the research process and to aspects of data analysis (Saunders et al., 2003).

Content analysis was used, which as Leedy and Ormrod (2001) describe is a detailed and systematic examination of the contents of a particular body of material for the purpose of identifying patterns, themes, or biases. The method that was undertaken by the researcher follows that suggested by Leedy and Ormrod (2001), whereby the transcripts and handwritten notes were collected during all the interviews and constituted the body of the data that was used in the content analysis phase. This was followed by the identification of common themes in the data collected from the interviews, and the synthesis of the data.

3.7 Limitations of the study

The purposive sampling procedure used, decreases the generalisability of findings (Creswell 2003), however, as Saunders et al. (2003) state, generalisability is not of crucial importance from an interpretivist point of view, as we are constantly being told of

the ever-changing world of business organisations, and if we accept that the circumstances of today may not apply in three months, then some of the value of generalisation is lost.

3.8 Validity and reliability

Validity is concerned with congruence, or a 'goodness of fit' between the details of the research, the evidence, and the conclusions drawn by the researchers (Kalof et al., 2008). The two aspects of validity that were considered are external and internal validity.

3.8.1 *External validity*

External validity is the ability to generalise from a study to a larger population (Kalof et al., 2008). In this specific case, a generalisation to a larger population was difficult due to the purposive sample size adopted, however, we can generalise the results to IT managers responsible for Billing Systems in the South African Telecommunications Industry at this point in time, as the sample did include key respondents from the major operators in the South African industry who were directly involved in the motivation and decision-making around Billing Systems.

3.8.2 *Internal validity*

Internal validity means that the study draws appropriate conclusions from the data at hand (Kalof et al., 2008). In this research, care was taken to ensure the variables of the study measure what they were intended to. Additionally, in the absence of randomisation and to avoid drawing causal inferences incorrectly, alternative explanations of what was observed were considered as a threat to the internal validity of the study.

3.8.3 *Reliability*

Kalof et al. (2008) describe research findings as being reliable if similar findings are revealed time after time in repeated applications of research. Often we try to ensure reliability by asking multiple questions on the same subject (Kalof et al., 2008). For this

research, questions in the interview were posed a number of times during the course of the interview to ensure that respondents provided a consistent response.

4 CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

The results in this Chapter will be presented according to following themes of IT Investment Evaluation, three of which are categorised by Gunasekaran et al. (2001):

- Importance of Billing Systems and the benefits of investment evaluation
- Evaluation criteria emphasised for evaluating IT investments in Billing Projects
- Techniques and tools used for evaluating IT investments in Billing Projects
- Evaluation of the implementation of IT in Billing Projects

4.2 Demographic profile of respondents

The sample included respondents from each of the major telecommunications network operators in South Africa. While multiple respondents were obtained from some operators as planned, only a single respondent from other operators was possible. Most of the respondents at operators were management level directly involved in projects around Billing Systems Investment either as Architecture and Strategy managers, or Billing Systems managers, while a few respondents were Billing Specialists or Engineers involved in the motivation of decision making around investments. Billing Vendors were also interviewed to obtain their perspective of investment evaluation practices in the industry.

4.3 Importance of Billing Systems and the benefit of investment evaluation

A number of reasons for the importance of billing systems to operators were identified by the respondents, including: 1: The role that it plays in contributing to the operators' cash flow, by reporting on accounts timeously, and identifying and preventing revenue leakage gaps; 2: The critical role it plays of a support system for the introduction of new technologies; and 3: The potential to introduce many new services in the network.

4.3.1 Contribution to improved cash flow and preventing revenue leakage

Respondent two emphasised the importance of Billing for an operator: “There is no company out there, whether you [are] a service provider or not, that is not concerned about their cash flow and getting their money back for the services that they render”. The importance of Billing in terms of improving the business financials was further emphasised by Respondent nine who indicated that with the right Billing System, and the right processes, it is possible to identify revenue leakage gaps, and if that gap can be prevented in future, this already contributes to an improvement in the bottom line. It is possible to lose millions in revenue leakage.

4.3.2 The critical role as a support system for introducing new technologies

Respondent four explained that in order to support the introduction of a technology like 3G for example, major enhancements or a replacement of the Business Support Systems including Billing were necessary. Billing has been described as necessary in terms of being able to offer any service: “If you cannot bill it you do not really have the service.” Substantial investment is necessary to enable operators to offer those services, and if they had not offered those services, the implication would be lagging behind to such an extent that “we would have been a ‘no-number’ in the South African market for sure”.

4.3.3 Potential to introduce new services based on billing packages

Respondent seven explains that with a Billing System the company already has the potential to introduce many services in the network, but it is the way they package the services together that makes it interesting for a customer. By using a Billing System, the company can create a lot more revenue streams without any investment in new services, because it already exists and the Billing System facilitates this.

4.3.4 Reasons for the lack of emphasis on Investment evaluation for Billing Systems

Some of the reasons for the importance of Billing Systems were also used by respondents as reasons that Investment Evaluation in Billing Systems may be less of a focus area for operators: The potential to introduce many services and create revenue streams implied that a particular investment could be undertaken without scrutinising benefits for each individual product. The essential nature of Billing Systems being a support system for introducing new technology, suggested to respondents that investment evaluation was less critical, and the implication of lagging behind the market was far too great to avoid investment.

4.3.5 Reasons for the need for investment evaluation for Billing Systems

On the other hand, the respondents outlined two major reasons that Investment Evaluation of Billing Systems are important for operators: 1: There are a growing number of restrictions on budgets allocated to IT projects; and 2: There are ranges of Billing products and vendors available from those at the high-end which offer feature-rich products to those that offer products with basic functionality.

Respondent one and Respondent three explained some of the controls they have in place for IT spending. Controls regarding the total budgets allocated for IT investment spend are enforced at some operators in the form of stipulating budgetary restrictions on IT spend based on percentage of revenue. Other controls include assessing net book values of existing equipment: when evaluating major Capital Expenditure investments in IT systems either as a result of an upgrade or new replacement systems, IT managers need to analyse the extent to which a write-off may be necessary if equipment has not been fully depreciated.

Respondent two explained the necessity to be able to evaluate and compare billing systems. In the billing space, you can buy excellent products which have a rich feature-set, such as a Gartner top-quadrant vendor, that can deliver a billing system with all the bells and whistles to you. Alternatively, you can buy products that have small accounting-

type capabilities. The challenge is in selecting an appropriate product along with a vendor who can deliver quality services for that product cost-effectively.

4.4 Techniques and tools used for evaluating IT investments in Billing Projects

Respondents suggested that less formalised techniques and non-financial evaluations, such as decision making by consensus were the predominant approach to evaluating IT investments in Billing Projects, and the reasons for this included: the link to strategic and marketing considerations in assessing billing investments; lack of awareness of the techniques that are available to assess intangible benefits; the complexity of some of the techniques themselves and the complexity involved in trying to quantify benefits.

4.4.1 Current industry practice – decision making by consensus

Respondent one described the overall decision making process as “decision making by consensus”. A particular IT investment or product is discussed amongst business units across the organisation, and if consensus is reached and the financials support the decision, it is implemented. That part of decision making may not be structured. Some of the potential reasons cited for this approach include: many large telecommunications operators are corporates that have grown up rapidly in a small space of time and may have developed their own informal evaluation methods; there may be pressure to launch new products and services, and there may be a feeling that formal techniques might slow things down; some operators who are subject to global shareholders’ investment review boards indicated that even their formal non-financial techniques are not enforced, and the process is rather about gaining consensus from group architects. Respondent one summarised that it comes down to convincing people that what you are doing is beneficial for the company, and has more to do with managing relationships than producing hard and fast facts.

Respondent four explained that some of the techniques mentioned were used. For example the balanced scorecard is one of the major tools used; however, there had not been a lot of emphasis on that. A lot of emphasis was placed on the balanced scorecard

for the company and how the system can support them to achieve those goals. However, this is not a tool that management in the technology areas used and it was potentially used by the business side, marketing and financial teams, in his view.

Respondent six described how they prioritise various enhancements that may be required on the Billing System, and ascribed this to management intuition base on experience that is used rather than following a formal investment evaluation technique to manage this. “How do you actually measure, quantify, and prioritise other than using intuition or experience.” He further indicated that if there was a formal technique that could be applied for this, it would definitely be used because they have been “burnt” by relying on intuition and experience in the past.

4.4.2 Reasons for not adopting formal evaluation techniques

Complexity and awareness are two of the major reasons cited for not adopting formal investment evaluation techniques for IT investments. Respondent one suggested that education was probably a major reason, with many people not being aware of the different techniques that are available, but also indicated that the techniques might be perceived as being too theoretical and not having a practical impact, and too complex and abstract. Respondent four explained that when it comes to the bigger replacements like replacing a full Billing System, he had come across some complicated models, which are complicated to the extent that the person that completed the model does not really fully understand it, as there are many technical parameters that need to be included. He further explained that “the business template or the template that we used to actually justify from a financial perspective was hugely complicated – and I think many of the people did not understand it fully.” Due to the complexities, operators may sometimes turn to vendors or a consultant for help in formulating a business case, which happens often, however he feels that this is really something that should be done by operators. Some of the variables that may be necessary to use in these models such as the current cost of acquisition, cost of maintaining and growing your subscriber bases are complex in themselves to quantify.

While most respondents indicated that some formal financial evaluation techniques are adopted by their organisations, all respondents explained that decision making does not

solely rely on the outcome of these formal financial evaluations, and that less formalised techniques and non-financial evaluations are the predominant approach adopted. Respondents explained that investment decisions are closely related to broader strategic and marketing decisions around introducing new capabilities and products and services to the market for competitive advantage, and to the operational decisions of aligning with vendor product lifecycles and reducing operational overhead incurred by using older technology.

4.4.3 *The use of financial investment evaluation techniques*

Financial techniques for investment evaluation featured when considering investing in Billing Systems for the introduction of new products and services, through the process of generating business cases for those products. These techniques also featured when considering the costs to run and maintain systems based on older technologies vs. the cost of replacement.

Respondents one and six indicated that financial techniques such as Return on Investment, Net Present Value Internal Rate of Return, and profitability are used predominantly when generating business cases for introducing new products and services to the market. Investment evaluation in the context of IT systems including Billing Systems is then carried out based on the benefits of introducing new products or services. Respondent one suggested that the initial stages of product conceptualisation are normally accompanied by high-level and often vague business cases, however, during the latter stages; a more detailed analysis is carried out by finance teams when pricing products, the costs associated with procuring, managing and operating IT Systems including Billing Systems, are considered in further detail. If this analysis shows that a product is likely to incur a loss, this is factored into decision-making regarding whether to proceed or not. In many cases, products might still be introduced for strategic and tactical reasons even though they may not in themselves be profitable to offer.

Respondent seven believes that the cost to maintain a system is probably one of the major considerations for operators in deciding whether they should continue with their existing system. This includes cost of people managing the system and the environment, including development resources for a customisations around Billing Systems; the

infrastructure which the system needs to run on in the sense that the only way to boost performance in older versions is to throw in more hardware, whereas with newer systems, it may be possible to purchase additional software licences to cater for load rather than hardware.

4.4.4 *Challenges with existing investment evaluation techniques*

Respondents explained the challenges with their existing investment evaluation techniques included: subjectivity potentially leading to sub-optimal investment choices; business cases require quantifying benefits financially; the importance of value networks and supplier relationships is not considered; and technologists have a bias towards features and capabilities of the systems.

Respondent one described some of the challenges with the existing techniques adopted by their organisation: “Since it is based on human perception because of its decision by consensus, there are a lot of personal opinions, maybe company politics, and other factors that they might not even be aware of, that decision making may have become subjective and lead to sub-optimal investment choices”.

Respondent two shared her experience in developing a business case for modernising the billing landscape at a large operator five years ago. “A number of smaller projects were created each with its own business case manager, core team etc. Eventually the whole programme was canned because it was so expensive, and because they were not successful at quantifying the benefits, and this made it difficult for a capital allocation committee to approve the funds.” In her view, there is no way of scientifically proving the extent of the business benefit in monetary terms.

A potential reason for the difficulties explained by Respondent two are that there are a lot of complexities in a billing value chain that people do not realise, because they do not see it, and regard it as being very much “something that happens by itself”. This makes convincing people to make an investment in the billing environment not an easy job. According to her, they had been successful once when they acquired their mainstream billing system, which was done 17 years ago, and they are still to see it happen again.

“We might be successful changing a few things here and there, but a mainstream billing project, only happens once in a company’s life.”

Respondent three offered a potential reason from a technology strategy perspective on why evaluating IT investments from a pure financial business case perspective or from one of the formal methods of investment evaluation may not address the needs of the operator – in certain instances there may be long standing relationships with suppliers, wherein trust has been built in terms of support and agreements. Models such as value network analysis and value webs were quoted as techniques that could be used in terms of analysing exchange relationships between business partners between supply chain and distribution chains.

In many instances, according to Respondent three, engineers and technologists make decisions, and they are focused on looking at capability and functionality and not at the intangible things that could have an impact. In the case of operators who belong to a larger multi-national group of operators, they achieve economies of scales in terms of procuring equipment from certain vendors and adopting certain things at a certain point in time, as they are released throughout the group.

When assessing intangible benefits, Respondent three suggested that it might come back to what the primary drivers are at that point in time – cost containment might be important in current economic circumstances, however if the same exercise were done after you were out of a cost containment cycle, there may be more strategic reasons for assessing what your competitors are doing and how to respond to them.

4.4.5 Trust and confidence by management in outcome of evaluations

The issue of trust and confidence in the outcome of an evaluation process is relevant in deciding whether or not to adopt a particular technique. Respondents offered differing views: some indicated that management are likely to use the outcome of techniques as one of many inputs into decision making, while others indicated that management especially at CxO (Chief Information / Technology / Finance / Executive Officer) level would use the data presented to them to make a decision.

Respondent one offered an opinion on whether or not management would trust outcomes of the result of formal IT investment evaluation techniques, and suggested that management are likely to take these outcomes as one of many inputs into their decision making. They would take cognisance of the outcome and list any risk highlighted through that process, however, they will still proceed in the direction they are going. They may want to keep power of decision making, with a preference to stick to what they know and control it. It also might be that people just have not tried techniques and it would be just a matter of driving methods but instead of a dictatorial manner, rather encouraging people to use them.

Respondent four believed that in the perspective of the board members who might need to approve IT investments of above a certain threshold, they may only view final figures from the evaluations carried out and a lot of decisions are made based on the outcome of evaluations and information presented by their CEOs and CxOs.

Respondent two provided some insight into IT executive level strategists thought processes around IT Billing investment evaluation, indicating that while there may be many textbooks and theoretical models which might be suggested and/or adopted as best practice, they prefer to reduce something to the basics being: "There is a cost related to do business and cost related to stay in business, and then there is the company objectives and strategy".

4.4.6 The influence of context and circumstance on type of technique

The context and circumstance that an operator finds it will influence the type of technique used, as illustrated by Respondent six. During the start-up phases of their operation, if they wanted international roaming billing capabilities for example, the required features would be procured for their systems regardless of the envisaged revenues and service uptake of the international roaming service. After a couple years of operation, the focus is rather to look at well researched growth figures, growth forecasts, finance forecasts, and what the sort of return on investment can be achieved across a specific period of time, before an investment is made. The challenge is then on the technical teams to see if the capability can be provided to match the required rate of return. However, there continues to be some "hygiene" or non-negotiable products which the market expects to

be provided and the capabilities are then procured irrespective of the cost, or expected return. Marketing focus groups are used to determine which services fall into this category.

4.5 Evaluation criteria emphasised for IT investments in Billing Projects

The following table summarises the criteria suggested by the respondents in evaluating IT investments in Billing Projects:

Table 2 - Summary of Evaluation Criteria Suggested by Respondents

Criteria	Description
Marketing Functionality	These are features and capabilities of the Billing System necessary to support the introduction of new products and services in the market
Operational Capability	These are capabilities that allow ease of administration and accuracy of the output e.g. bill calculations
Cost	Capital Expenditure and On-going Operational expenditure, along with cost of changes in business processes
Reduction in Risk	Example: risks introduced by outsourcing, complexity of integration introduce risk
Product release cycles	Aligning with vendor roadmaps and product releases

Technology lifecycles	End of Life Hardware and Software Support, or a strategic decision to renew technologies at predefined intervals
Economies of scale	The potential benefits of investing as a group of operators for a particular capability and achieving economies of scale across the group.
Supplier relationships	Factoring in strategic partnerships undertaken with vendors to supply equipment and services for various aspects of the operator's network.
Strategic Drivers	Strategic intent to transform the network in its entirety to new generation technologies

Respondent two believes that the customer will determine what investment the company will make in a Billing System, the customer base that it has and hope to have in future, will determine if the company can afford to make that investment. In between there is a lot of metrics to determine, for example, effectiveness and efficiency, but in the end, this is for the customer to decide.

Respondent seven supported this argument, and believes it is necessary to look at new types of services, to keep up with the competition, and with public demands as well. Previously, specifically in the telecoms industry, it used to be a "push environment"; the operators approach has been to offer capabilities in the market which they were easily able to provide technically. Over the last few years the customers became more demanding, and if they could not get the functionality they were looking for, they could switch across to other operators.

Intangible benefits are extremely difficult to quantify in some way, according to Respondent two. "Even though it is intangible, every financial manager, business case manager or chief financial officer, wants it to be presented in rand and cent value. The

only way one can really approach it is by looking at what the opportunity cost would be if you do not do it. First there is the opportunity to communicate with the customer, the opportunity to get cash into the bank; and in the marketing world there are always formulae of calculating the opportunity cost. Even just to explain it to someone who is not really part of the billing environment is very difficult.”

Respondent two illustrated an example of the impact of an intangible benefit such as the reduction in risk on a business case for a change to a Billing System: “There was a debate regarding whether to outsource the print shop of a billing division as it is seen as a routine job, and seen as part of the billing value chain where we just print the bills. However, the business case for outsourcing is negatively impacted when considering the penalties that the operator will pay to print shops, who may run on rigid schedules, if there are delays in delivering files to external printers, which may arise if the billing environment is late, for example, because of something that happened, incorrect bills, exchanges did not forward usage records, or whatever, penalties are incurred each time.”

Respondent three described the influence technology lifecycles and long-term planning has on investments in new technology. “We do have a five year roadmap, we definitely have a roadmap for billing both prepaid and post-paid, it incorporates the order management component and Customer Relationship Management (CRM), product catalogues and inherently in that, we show how we are going to evolve or decommission some of the platforms in order to adopt the new platforms.” This allows them to take the lead rather than being reactive. A vendor’s roadmap will also dictate in terms of their lifecycle, but also the adoption of emerging technologies and models, that will influence our roadmap and lifecycle of technologies.”

Respondent four described the criteria they adopt and the importance of functionality. Due to saturation in the mobile market worldwide, with the exception of countries in emerging markets, the effort to get new subscribers is huge “and we find that we need to steal subscribers or get them to churn from other operators, in order to increase the subscriber base. For this reason, functionality and differentiation is the key factor I would say and for us certainly functionality is the major driver. Functionality is the first thing that will swing a decision. So that is why in terms of functionality, we weight the functionality

in terms of what is nice to have, what is essential to stay alive and remain in business, what is nice to have but would not kill you if you do not have it. Thus we weight it according to that.” Price and architecture were regarded as additional factors according to Respondent four: “If the architecture supports whatever functionality is required, and supports the company’s strategy. Most of these new systems and vendors support all the latest functionality requirements.”

Respondent six described the process at an incumbent fixed line operator entering the mobile space. “Initially, they looked at whether existing Billing Systems for fixed line services could cater for the mobile requirements. Rather than focusing on return on investment during the initial phases, the focus was on criteria related to functionality we need in the network, and how quickly we can get that, rather than the cost of the investment into the billing platform. The turnaround time for an upgrade was also an important factor in deciding not to upgrade the existing fixed line billing system. A combined upgrade path of fixed and mobile requirements on the same platform introduced further risk and potential delays, and this impacted the mobile environment in terms of its pressure to launch, as every month delayed resulted in lost revenues, and since they already spent on advertising, booking radio commercials which are not refundable, they would incur considerable losses. Thus a decision was made to get something that can easily plug into the environment, and cater for our needs.”

Respondent six further explained how the criteria had changed over the years. “In the beginning, it was a case of offering the functionality in order to compete but as the years progressed, in order to be competitive it was important to be cost competitive, and any new product we built in, we needed to make sure that we build it, as simple as possible and cost effectively as possible, rather than build an exact product that is required to build something more from a cost-effective perspective so that it becomes more competitive even though all the functionality does not exist.”

“How easily and quickly you can adapt or change it [was another consideration]. In the mobile environment you want to be flexible and fast. Those are very important. You do not want to spend millions on a solution. Unfortunately one of the lower priorities is ease of use. If you do not look at that you need to consider up-skilling and training. Also some things that we burnt our fingers on, was not to evaluate the Operational Support

System (OSS) functionality. Business Support System (BSS) and OSS are separate but very tightly coupled. Call centres use the BSS systems before they do any form of support. We should have prioritised the view for call centre agents.”

Respondent seven mentioned the importance of local skills to support the system – Large billing vendors, bringing costly international resources for support. “All the enhancements and product changes if you are using external/offshore resources could be quite costly to make those changes. Is there a local capacity to support because it is always much cheaper.

Respondent six believes that on-going costs are very difficult to calculate in the beginning or decide on. “You usually have a base set of functionality and sort of request or try to evaluate how adaptable the solution is and configurable it is. The one thing we have noticed and I am sure many other operators have noticed, is that once you have the solution, changes may be very expensive even though very fast and flexible. ROI is negated by costs.”

4.6 Evaluation of the implementation of IT in Billing Projects

Respondents indicated that post-implementation reviews of investments in Billing Projects are seldom carried out for various reasons including: length of payback period and size of investments; lack of time and resource to carry out the review; the inter-dependence between multiple systems for the delivery of particular services and the difficulty in attributing benefits to particular systems.

4.6.1 Length of payback period and size of investments

Respondent four believes that the tracking of investments after they have been made is lacking in general in the industry. This could apply to small development work required for marketing departments that have come up with a new product, or on a huge Billing System replacement project which costs a large sum. “I do not think there is anybody who could say, based on the money that we have invested, we will see a return after or breakeven point after x amount of years.” In addition, the scale of the investment influences this payback period significantly.

4.6.2 *Difficulty attributing benefits to particular systems*

Operators would typically project the impact on subscriber growth or revenue growth, and what the cost will be etc., but to be able to accurately attribute those measures back to the actual investment in the Billing System is “not something that has been seen in this industry, to be honest”. Bacon (1992) concurs with this even if the projected benefits are realised, it is difficult to prove that they are attributable to the IT investment.

4.6.3 *Lack of time and resources*

Investments have been driven by competition, and the regulator. The marketing departments gets so busy even after implementation, with designing new products reacting to market, reacting to regulatory, implementing new ideas, that the business model around the prior investments are never given the right priority and tracked to do a post implementation evaluation. Respondent four explained: “I have done a lot of replacements and I have never seen a post evaluation two to three years down the line to see whether we have reaped the benefits we might have got.”

4.7 Summary of the results

To summarise the responses:

While respondents believed that there was a need to evaluate Billing Systems in the context of comparing and analysing differences between vendor products, many felt that the use case of evaluating whether a Billing System investment should take place at all were part of a broader decision in the business outside the scope of the Billing System Manager and Engineer, and once this decision had been taken, the Billing aspect of the investment was a necessary consequence due to the critical nature of Billing for the operator.

While most respondents indicated that some formal financial evaluation techniques are adopted by their organisations, all respondents explained that decision making does not solely rely on the outcome of these formal financial evaluations, and that less formalised techniques and non-financial evaluations are the predominant approach adopted.

Respondents explained that investment decisions are closely related to broader strategic and marketing decisions around introducing new capabilities and products and services to the market for competitive advantage, and to the operational decisions of aligning with vendor product lifecycles and reducing operational overhead incurred by using older technology.

Controls regarding the total budgets allocated for IT investment spend are enforced by some operators in the form of stipulating budgetary restrictions on IT spend based on percentage of revenue.

Financial Techniques such as Return on Investment, Net Present Value Internal Rate of Return, and profitability are used predominantly when generating business cases for introducing new products and services to the market. In many cases, products might still be introduced for strategic and tactical reasons even though they may not in themselves be profitable to offer.

Complexity and awareness are two of the major reasons cited for not adopting formal investment evaluation techniques for IT investments. Failure to quantify benefits has the consequence of getting funds approved by a capital allocation committee; however difficulty in scientifically proving the extent of the business benefit in monetary terms is very restrictive. Many strategic factors play a role in the decision making process around IT investments such as long-standing relationships with suppliers and pure financial business cases fall short in taking these factors into consideration. Priorities at operators change based on various factors such as economic circumstances - cost containment might be important in current economic circumstances, however if the same exercise were done after the company is out of a cost containment cycle, there may be more strategically reasons for assessing what the company's competitors are doing and how to respond to them.

There may be opportunity to introduce more formal evaluation methods into organisations however, management are likely to take cognisance of the outcome of these processes and list any risk highlighted through that process, and however, they will still proceed in the direction they are going. They have a strong preference to stick to what they know and can control.

5 CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Research Question 1: Does industry regard IT investment evaluation for Billing Systems as an important activity?

Based on the responses, there seems to be a lack of emphasis placed on whether a particular investment in Billing Systems such as an upgrade or replacement should be made at all. While, investment evaluation was considered important from the perspective of comparing and selecting among various vendors, the decision to embark on a project had either already been made or had been outside of the respondents' scope of investment evaluation exercise, or in some cases the decision would be made by management on the basis of the costs, effort and risk identified as part of the exercise. One major reason as highlighted by one of the respondents relates to the infrequency of a major investment being made into an entirely new Billing System – a decision made possibly once or twice in the lifetime of an operator. This trend may change and the relevance of analysing whether a particular investment should be made at all might increase as Billing Systems age and initiatives around Application and System Consolidation, Application Modernisation and Convergence become more prolific as pressure to reduce operational costs at the operator's increases.

5.2 Research Question 2: What evaluation criteria are adopted by the industry regarding investment in Billing Systems and are these based on the organisation's strategies, goals and objectives?

A range of evaluation criteria has been mentioned by the respondents covering the broad categories outlined in the literature as well as the metrics highlighted by TMForum Business Benchmarking Metrics Framework (2010).

Analysing the criteria highlighted by respondents based on the broader categories highlighted in the literature, it is evident that operators do cover the broad range of criteria from Strategic, Tactical, Operational, Financial, Tangible and Intangible criteria as

outlined by Gunasekaran (2006). There is also evidence of the ability to make adjustment to this criteria based on organisational strategy and economic environment, as some respondents showed how the evaluation criteria of an operator had drastically changed as their organisational strategy had changed i.e. from competing by offering a broad range of functionality to their customers at the start-up phase of their operation, to competing by ensuring that products are built as simple and cost effectively as possible even at the expense of functionality, so that they become more competitive.

5.3 Research Question 3: What level of awareness exists in the industry about formal techniques for evaluating intangible benefits of Billing Systems investments, and to what extent have these been adopted in practice?

Respondents felt that more formal evaluation and sophisticated methods may not be better as suggested by Thomas et al. (2007); however it also did not suggest introducing more effective governance structures and leadership behaviours as done by Thomas et al. (2007). Reasons cited included their perception of complexity of some the models and techniques, with reference to time and effort necessary to carry out the evaluation, compared to the actual benefit achieved; and education regarding the range of techniques available. The lack of initiative to investigate and understand alternative investment evaluation techniques suggests that respondents may not value the advantages that consistent and objective IT investment evaluation and decision making could have on the organisation. On the other hand, it may suggest that training in and examples of practical implementation of alternative techniques may not be sufficiently emphasised by IT practitioners in the industry.

At the same time respondents did acknowledge the fact that politics and power struggles played a role in decision making in the organisation around Billing Systems investment. The current informal methods adopted for a change of Billing System, or upgrade of existing systems, focus on convincing key decision makers such as Group Architects and Chief Technology Officer's (CTO) to proceed with a particular investment, and providing the required information necessary to substantiate the recommendation. This approach

relies heavily on human perception and which Currie (1989) suggests characterises IT justification as a ritual of legitimacy, not one of really assessing benefits.

In the context of new product and services which impact Billing Systems, the nature of the products and the financial techniques adopted for the evaluation of investments based predominantly on metrics such as revenues and profitability, the pressure to show a return on investment in the form of hard numbers, while these products may or may not have achieved less tangible benefits such as an improvement in customer perceptions, responding to competition, etc. According to the respondents, these factors are however then included in the evaluation through a method of “decision by consensus” with management from across the organisation, based on the intangible nature of these benefits, however the reliance on management judgement and experience and their consistency may introduce subjectivity into the process. While most respondents seemed to have a good understanding of the intangible and non-financial nature of the benefits related to IT investments, there is a strong bias towards reliance on managerial judgement around evaluation of investments, and confidence in managerial decision making based on experience rather than adoption of IT investment evaluation techniques that factor in these types of benefits.

There does seem to be an opportunity to introduce formal multi-criteria decision methods to play a role in addressing intangible benefits more objectively by explicitly incorporating each of these benefits into the evaluation criteria before an evaluation exercise begins and weighting these criteria along with tangible benefits. The results of such a method could help guide the discussion and debate among management to a greater degree of objectivity, while they may continue to retain their authority to over-rule any outcome of the evaluation method if necessary.

5.4 Research Question 4: What is the industry practices regarding post-implementation evaluation of Billing System investments?

There seems to be little, if any, evaluations either during or after the implementation of Billing Systems projects. Kumar (1990) indicates that the implementation stage of the Systems Development Lifecycle (SDLC) should not be ignored and that evaluation exercises (called feasibility studies in the formal SDLC) should take place before every

stage which determines whether to proceed to the next stage or abandon the project. Respondents acknowledged that this may hamper the learning process for future investment evaluation exercises. Opportunities to evaluate the necessary revisions to existing business processes around introducing a new Billing System are then also potentially lost.

This is also closely linked to the concept of a post-evaluation assessment regarding the implementation of a new product or service for which a Billing investment may have been necessary. As the respondents indicated, the overall business case for the introduction of a new product or service is often under the control of the marketing and finance teams, which would have had to consider costs and benefits across other areas of the network other than billing. This may suggest that an exercise in evaluating such an investment into a Billing System(s), in isolation from the rest of the IT systems involved is not a fair assessment. The complexity of the apportionment of project benefits individually to every IT system involved may be extremely high, and this may explain the reason for regarding IT domains as being cost centres in which IT managers simply provide costs for developing and implementing a change required for a product or service, to business case owners who evaluate investments based on overall costs and benefits.

On the other hand, other respondents suggested that data is collected and presented based on the patterns of questions and issues individuals who evaluate business cases ask. While these decision makers may have a wealth of experience, the risk of this approach is whether a consistent evaluation will take place at all times, or whether there will be continuity if experienced individuals leave the organisation.

6 CONCLUSION

This study has shown that, while industry acknowledges the importance of Billing Systems to operators, and believes in the need for investment evaluation of billing systems, the extent of adoption of available investment evaluation techniques has been restricted, due to awareness and perceived complexity of these techniques. Based on the interviews, the study has seen that although industry has adapted its existing evaluation techniques and criteria, it seeks improved methods for evaluating intangible benefits of IT investments. The study also found that the evaluation during and after implementation is not a common practice in the industry, with resource constraints and a lack of emphasis on the importance of these evaluations being the major reasons.

For further research in this area, it is suggested that evaluation techniques be contextualised for specific industries and technologies to make it easier to understand how these could be used in a specific context. It is also suggested that case studies be conducted for particular investment evaluations using these methods to demonstrate potential benefits to industry of objective investment evaluation.

6.1 Summary of the study

Four themes have been emphasised in this study, throughout the literature review and review of the information provided by respondents, within the context of Billing Systems investments: the importance and benefits of IT investment evaluation; the techniques used in IT investment evaluation; the evaluation criteria used; and the evaluation of the implementation of IT projects.

Regarding the need for investment evaluation, of the four objectives of IT investment evaluation described by Farbey et al. (1992), the industry placed emphasis on the need to justify its IT investments and to enable organisations to make comparisons of the merits of a number of different projects competing for the same resources. Industry did not see specific benefit in providing a set of measures which enable the organisation to exercise control over the implementation of a project, nor to provide a learning experience necessary for organisations to improve their system evaluation capability for the future.

Regarding evaluation techniques, while business cases are often based on financial appraisal techniques, the industry uses its own scoring models to evaluate intangible benefits, while ultimately making decisions based on a consensus approach amongst a cross-functional management team, with strong reliance on intuition and the objectivity of individuals. Industry experts have acknowledged shortcomings in their existing techniques, and would be open to improving their methods if the barriers around complexity and awareness of alternative methods could be overcome. Trust and confidence in evaluation techniques is one of the major areas of concern for industry regarding the adoption of new techniques.

The findings have also shown that the industry has adapted their evaluation criteria for their specific context i.e. organisational strategy, economic and competitive pressures. Criteria adopted by industry cover the seven groups of criteria identified by Gunasekaran et al. (2001). The industry group TM Forum has also made valuable contributions in the form of the Performance Benchmarking metrics for Billing Systems, to assist operators in evaluating their investments more effectively. Evaluation during and after the implementation of IT projects has been an area which industry has placed little emphasis on with the major difficulties for carrying these out being: length of payback period for many investments; the difficulty in attributing benefits to particular systems; and the lack of time and resources to conduct this. The difficulties of the evaluation of the IT implementation identified by Farbey et al. (1992) and Kumar (1990) may be an explanation for the lack of emphasis of this in practice.

6.2 Recommendations to Management

It is recommended that management re-consider the benefits of IT investment evaluation to their organisation. Some of the benefits as highlighted from this study include: less reliance on management intuition and therefore improved consistency in investment evaluation decisions; decision-making processes that support the optimal use of the available IT budget; the ability to evaluate and prioritise IT investments relative to each other regardless of difference in their scope i.e. operational enhancement and introduction of a new product or service.

Management should consider introducing controls for evaluating the implementation of IT investments during and after IT projects. By doing so, management will be able to assess the extent to which their current investment evaluation practices are achieving the desired outcome for their organisations, and can continuously improve their investment evaluation methodology.

Management theory offers a wealth of information regarding the evaluation of the intangible benefits associated with IT investments, and this is clearly an area in which industry seeks solutions. The existing base of management theory regarding IT investment evaluation can be leveraged to improve evaluation techniques and criteria used in practice. This will help management to ensure that their evaluation decisions are objective regarding the choice and priority of IT investments.

6.3 Recommendations for further research

It is recommended that more research be undertaken to address IT investment evaluation for businesses in specific industries and for specific Information Technology investments. The impact a particular technology has on organisational performance depends on the importance of its role within the context of the industry that organisation belongs to.

For the Telecommunications Industry, models for investment evaluation of technologies across the Telecommunications Applications Map (TAM) should be developed. Examples of the implementation of techniques such as Analytical Hierarchy Process should be included in the research, using a weighting of factors based on input from management in industry for specific applications in the TAM. A similar exercise should be conducted with other available techniques such as Multi-attribute Utility Theory and Expert Systems.

Further research into the assessment of intangible benefits of IT against management theory should be conducted. These benefits range across all areas of organisational management disciplines from Strategic Management, Financial Management, Operational Management, Marketing Management, and Human Resource Management. Using concepts such as Customer Lifetime Value from Marketing Management theory for

example, the cost of subscriber churn can be calculated and included into the business case for a product or service requiring a particular IT investment.

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APPENDIX A - QUESTIONNAIRE

Key Interview Questions – Prompt Sheet

1. What are some of the important reasons for the evaluation of investments in Billing Systems in general?
 - a. Prompt: Cost Saving initiatives in the organisation
 - b. Prompt: IT expenditure volumes in the organisation
 - c. Prompt: Success rate of IT projects
2. Which techniques are you familiar with for the evaluation of investments in Information System Technologies?
 - a. Prompt: Financial techniques
 - b. Prompt: Non-financial
 - c. Prompt: Balanced Scorecard
 - d. Prompt: Multi-dimensional approaches
3. Which techniques have been used and are currently used for the evaluation of investments in Billing Systems in your organisation and why?
 - a. Prompt: Generic IT techniques
 - b. Prompt: Telecommunications or billing domain specific approaches
4. What are the current challenges experienced in the current techniques used and would you suggest as far as improvements of the techniques used or the adoption of alternative techniques for investment justification in billing system?
5. What are the critical reasons that prevent organisations from adopting more sophisticated techniques for the evaluation of Information Systems and Technologies investments?
 - a. Prompt: Ease of use and understanding
 - b. Prompt: Time and effort

OPERATIONS SUPPORT & READINESS	FULFILLMENT	ASSURANCE	BILLING
<h2 style="text-align: center;">CUSTOMER MANAGEMENT</h2>			
<h3>CUSTOMER INFORMATION MANAGEMENT</h3> <ul style="list-style-type: none"> Customer Name Contact Details for this Customer Account Managers for this Customer Customer Interaction History Customer Address Customer Contact Phone Numbers Customer Organizational Hierarchy Customer's Billing Accounts Customer's Product/Services Customer's Data History Customer's Trade/Trade History 	<h3>CUSTOMER SELF MANAGEMENT</h3> <div> <h4>CUSTOMER SELF EMPOWERED FULFILLMENT</h4> <ul style="list-style-type: none"> Product Catalog and Offerings Showcase Guided Selling Screen View for Offer Eligibility Tracking Self Order Order Management Assigned Products Management Self Plan Amendment Service and Notifications Setting Accounting Management Screen Access to Self Service Agents Reports on Fulfillment and SLA Alerts Corporate Customer Support </div> <div> <h4>CUSTOMER SELF EMPOWERED ASSURANCE</h4> <ul style="list-style-type: none"> Access to Self Service Agents Service Requests and SLA Reporting Corporate Customer Support </div> <div> <h4>CUSTOMER SELF EMPOWERED BILLING</h4> <ul style="list-style-type: none"> Self View Unlinked Changes View Payment Calendar Payment Status and Notification Usage and Charges Computation Account Block/Unblock Self Statement for Generation Between Cuts Self Account for Classification of Usage Corporate Customer Support Reports on Usage and Charges </div>		
<h3>TRANSACTIONAL DOCUMENT PRODUCTION</h3> <div> <h4>TRANSACTIONAL DOCUMENT FORMATTER</h4> <ul style="list-style-type: none"> Bill and Order Template Formatting Template Usage Business Rules Usage Data Template Definition Invoice Template Definition </div> <div> <h4>DOCUMENT ARCHIVING</h4> <ul style="list-style-type: none"> Compression and Storage of Transactional Documents Data Storage Mechanisms for External Systems Archive Maintenance and Administration Functions </div> <div> <h4>TRANSACTIONAL DOCUMENT GENERATOR</h4> <ul style="list-style-type: none"> Documents Information Formatting Marketing Information Incorporating Apply Reporting Requirements Layout Formatting Send to Overlapping Incentive </div> <div> <h4>DOCUMENT DELIVERY</h4> </div>	<h3>CUSTOMER SERVICE REPRESENTATIVE TOOLBOX</h3> <p>Single Sign-on • Controlled Data Entry • Customer Information Dashboard • In-Context Configuration, Workflow-driven Navigation • CRM Dashboard • Conversational Scripting • Embedded Alerts • Search in Context Common Actions</p> <div> <h4>CSR FULFILLMENT</h4> <ul style="list-style-type: none"> Product Catalog and Offerings Showcase Order Capture & Negotiation Assigned Products Management CSR Access to & Specific Order Summary/Financial/Operational Reporting Error Resolution Inventory Notifications Order Take Down & Rebuild Order Administration </div> <div> <h4>CSR ASSURANCE</h4> </div> <div> <h4>BILLING INQUIRY DISPUTE & ADJUSTMENT MANAGEMENT</h4> </div>		
<h3>CUSTOMER SERVICE REPRESENTATIVE TOOLBOX</h3> <p>Single Sign-on • Controlled Data Entry • Customer Information Dashboard • In-Context Configuration, Workflow-driven Navigation • CRM Dashboard • Conversational Scripting • Embedded Alerts • Search in Context Common Actions</p> <div> <h4>COLLECTION</h4> <ul style="list-style-type: none"> Collection Inquiry Perform Manual Collection Activities Payment Arrangement Settlement with the Customer </div> <div> <h4>PAYMENT</h4> <ul style="list-style-type: none"> Immediate Payment of Balance/Partial Invoice Prepaid Exchange </div> <div> <h4>INVOICE WRITE-OUT</h4> <ul style="list-style-type: none"> Manual Information in Collection Treatment Collection Agent Reassignment </div>			
<h3>CUSTOMER CONTACT, RETENTION & LOYALTY</h3> <p>VERIFY CUSTOMER RELATIONSHIP • INTERACTION MANAGEMENT • BUILD CUSTOMER INSIGHT • ANALYZE & MANAGE CUSTOMER RISK • PERSONALIZE CUSTOMER PROFILE FOR RETENTION & LOYALTY • VALIDATE CUSTOMER SATISFACTION</p>			
<h3>CUSTOMER ORDER MANAGEMENT</h3> <div> <h4>CUSTOMER ORDER ESTABLISHMENT</h4> <ul style="list-style-type: none"> Channel Customer and Data Capture Customer & Product Data Collection Product Offering Availability Customer Order Validation </div> <div> <h4>CUSTOMER ORDER PUBLICATION</h4> <ul style="list-style-type: none"> Order Generation Ordering Business Rules Ordering Activity Governance </div> <div> <h4>CUSTOMER ORDER BROKERIZATION</h4> <ul style="list-style-type: none"> Customer Order Distribution Customer Order Tracking & Alerts </div> <div> <h4>CUSTOMER ORDER TRACKING & MANAGEMENT</h4> </div> <div> <h4>CUSTOMER ORDER LIFECYCLE MGMT.</h4> <ul style="list-style-type: none"> Tracking Order Maintenance Order Inventory Management Tracking & Logging Order Change Management Order Generation Ordering Business Rules Ordering Activity Governance </div> <div> <h4>CUSTOMER QUALIFICATION</h4> <ul style="list-style-type: none"> Customer Credit Eligibility Offering Availability </div>			
<h3>SERVICE MANAGEMENT</h3>			
<h3>SERVICE SPECIFICATION MANAGEMENT</h3> <h4>SERVICE INVENTORY MANAGEMENT</h4> <ul style="list-style-type: none"> Service Inventory Retrieval Service Inventory Update Notifications Service Inventory Details Service Inventory Reconciliation Service Inventory Information Mask 	<h3>SERVICE ORDER MANAGEMENT</h3> <div> <h4>SERVICE DATA COLLECTION</h4> </div> <div> <h4>SERVICE ORDER VALIDATION</h4> </div> <div> <h4>SERVICE DESIGN/ASSIGNMENT</h4> <ul style="list-style-type: none"> Design Solution Assign/Assign Network Resources Provision Access Provision CPE </div> <div> <h4>SERVICE ORDER PUBLICATION</h4> </div> <div> <h4>SERVICE ORDER DISSEMINATION</h4> <ul style="list-style-type: none"> Provision/Service Order Dissemination Service Order Tracking & Management </div> <div> <h4>SERVICE CONFIGURATION MANAGEMENT</h4> <ul style="list-style-type: none"> Service Parameter Allocation Service Parameter Generation Update Service Inventory Compare a Service Configuration Plan Service Configuration Order Service Orderline </div> <div> <h4>SERVICE ASSIGNMENT MANAGEMENT</h4> <ul style="list-style-type: none"> Plan Service Activation Service Configuration Activation Activation Notifications Update Information in Service Inventory </div> <div> <h4>SERVICE AVAILABILITY</h4> <ul style="list-style-type: none"> Service Activity Validation Service Availability Validation Service Termination Process Determination Determination of Access Provider Determination of Access Interval </div>		
<h3>SERVICE QUALITY MONITORING & IMPACT ANALYSIS</h3> <ul style="list-style-type: none"> Monitor Service Quality Analyze Service Quality Improve Service Identify & Report Service Complaints 			
<h3>SERVICE PERFORMANCE MANAGEMENT</h3> <ul style="list-style-type: none"> Collection of Service Performance Data Map the Performance Data to Service Topology Calculate Service Related KPIs, QoS Long Term Performance Analysis Service Topology Short Term Performance Repository Map to Service Planning & Forecasting Applications Identification of Service Related Problems Statistical Trending Service Performance "Dashboard" 			
<h3>COLLECTION MANAGEMENT</h3> <p>COLLECTION POLICY DEFINITION AND CONFIGURATION • Collection Rules Definition • COLLECTION POLICY EXECUTION AND MONITORING • Collection Process Engine • Collection Treatments Management • COLLECTION SETTLEMENT • Build Payment Plan • Payment Plan Monitoring</p>			
<h3>RECEIVABLES MANAGEMENT</h3> <div> <h4>AR MANAGEMENT</h4> <ul style="list-style-type: none"> Invoice Change from Billing Payment Management Invoice AR Management Bill Presentation </div> <div> <h4>JOURNALIZATION</h4> </div> <div> <h4>FINANCIAL REPORTING</h4> </div>			
<h3>BILLING INQUIRY, DISPUTE & ADJUSTMENT MANAGEMENT</h3> <p>BILL INQUIRY • Request statement • All of invoices • View open bill usage • All of charges • View unbilled charges • Invoices bill on demand • View usage summary and details</p> <p>DISPUTES MANAGEMENT • ADJUSTMENTS</p>			
<h3>BILLING ACCOUNT ASSOCIATIONS MANAGEMENT</h3> <p>BILLING ACCOUNT ASSOCIATIONS MANAGEMENT • Billing Plan Determination • Shared Allowance Community • Billing Statement Association • Billing Distribution to the Users • Billing Account Configuration Management</p>			
<h3>BILL CALCULATION</h3> <div> <h4>CUSTOMER BILL CHANGE CALCULATION</h4> <ul style="list-style-type: none"> Split Bill Change and Level Calculation Support/Prohibit Bill Split Definition Discounts and Promotions Items Requirements and Compliance Accounting Requirements, Accounting, and Billing Customer Information Customer Billing Cycle Run </div> <div> <h4>QUOTATION ENGINE</h4> <ul style="list-style-type: none"> Order Company Customer Information Customer Information Customer Information </div> <div> <h4>DISCOUNTS CALCULATION</h4> <ul style="list-style-type: none"> Customer Information Customer Information Customer Information </div> <div> <h4>TAX APPLYING</h4> <ul style="list-style-type: none"> Customer Information Customer Information Customer Information </div> <div> <h4>COMBINING TRACKING</h4> <ul style="list-style-type: none"> Customer Information Customer Information Customer Information </div>			
<h3>PRODUCT / SERVICE RATING</h3> <ul style="list-style-type: none"> Charge Calculation Charge (over/Under) Bill Taxes Arithmetic Mathematical Functions The Rating of Accounting Charges Fixed Accumulation of Usage Data Threshold Notifications Adjust of Charge Adjust of Rate New Functional Rating High Throughput Small Charge Precision 			
<h3>ONLINE CHARGING</h3> <ul style="list-style-type: none"> Real Time Rating Service Consumption Realization Adjust of Charge/Rate of Rate Real Time Charging New Functional Rating Multi Region Support Pre-paid/Post Paid Low Latency High Availability High Throughput 			

67

