The business value of information technology in local government: case studies from Sedibeng and Emfuleni

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ABSTRACT

Organisations spend between five and ten percent of their revenue on information technology (IT). With this capital expenditure, there is a growing demand for IT to produce measurable business value. A recent survey by the Society of Information Management shows that the successful alignment of business and IT is a concern to top management. The inability to see fact-based views of IT activities frustrates management. An IT management solution should provide the visibility to bridge the gap between business and IT and should deliver transparent, integrated decision-making processes to allocate IT resources wisely.

Information technology is a resource that should be aligned with business objectives in order to benefit an organisation. In an attempt to improve our understanding of IT payoffs, this study uses a process-oriented model to assess the impacts of IT on key business activities within the value chain of the Sedibeng and Emfuleni local governments. The model includes corporate goals as an important context within which to evaluate IT payoffs.

Executives play an increasing role in IT decisions and in recognition of these roles the objectives of this study are to:

- survey executives in the Sedibeng and Emfuleni municipalities on their goals for IT and their perceptions of realised IT payoffs, and
- evaluate executives' perceptions of payoffs from IT within the value chain to identify a relationship between corporate goals, IT and perceived IT payoffs.

It is clear from the results obtained in this research that Sedibeng and Emfuleni are unfocused organisations. This means that current goals for IT are not critical to any aspect of their business strategy. This study presents a graphical overview of perceived IT payoffs within the value chain for Sedibeng and Emfuleni municipalities. Customer relations activities appear as the lowest focus of IT business value whereas process planning and support activities are the primary focus.

OPSOMMING

Besighede spandeer tussen vyf en tien persent van hul inkomste aan inligtings tegnologie (IT). Met so 'n groot uitgawe is daar 'n toenemende aanvraag na IT om sigbare besigheidswaardes te lewer. Navorsing deur die Vereniging van Inligtingsbestuur dui aan dat 'n suksesvolle verhouding tussen besigheid en IT van belang is vir top bestuur. Die onvermoë van IT om feite-gebaseerde inligting te lewer frustreer bestuurders. IT planne moet die gaping tussen besigheid en IT oorbrug en deursigtige, geïntegreerde besluitnemingsprosesse lewer om IT hulpbronne maksimaal te allokeer.

IT as 'n hulpbron, moet in lyn wees met besigheidsdoelwitte om 'n organisasie te bevoordeel. Om die voordele van IT beter te verstaan, gebruik hierdie studie 'n proses-georiënteerde model wat die impak van IT op belangrike besigheids-aktiwiteite in die waardestelsel van die Sedibeng en Emfuleni munisipaliteite meet. Die model sluit besigheidsdoelwitte in wat 'n konteks voorsien waarin IT voordele ge-evalueer kan word.

In erkenning van die al groter rol wat bestuur speel in IT besluitneming, is die doelwitte van hierdie studie om:

- 'n ondersoek in die Sedibeng en Emfuleni munisipaliteite te doen wat bestuursdoelwitte vir IT bepaal, asook persepsies oor die verwagte IT voordele, en
- bestuur se persepsies van IT-voordele in die waardestelsel te evalueer en te bepaal of daar verwantskap is tussen besigheidsdoelwitte, IT en die persepsuele voordele.

Dit blyk uit die resultate van hierdie navorsing dat Sedibeng en Emfuleni ongefokuste organisasies is. Dit wil se dat hul doelwitte vir IT nie krities is vir enige aspek van hul besigheidstrategieë nie. 'n Grafiese voorstelling van die siening van IT voordele in die waardestelsel van Sedibeng en Emfuleni munisipaliteite word gebruik wat wys dat kliënte-verhoudings onder aan die lys van die IT besigheidswaarde is, terwyl prosesbeplanning en ondersteunings aktiwiteite primêre aandag geniet.

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CHAPTER 1

1 CONTEXTUALISATION OF THE STUDY

1.1 Introduction

Information systems (IS) were introduced to business as a means of improving operational efficiency. It was then treated only as a tool for performing an organisation's operations. Now, however, it is an essential component of an organisation's survival. Almost no operations of an organisation can be performed without information systems. Organisations have become so dependent on IS that even a relatively short interruption in the availability of a critical system can lead to total failure of the business. The emergence of e-business accelerated this trend. Information systems managers, therefore, have to place an emphasis on risk analysis and management (Suh & Han, 2003:149).

Organisations are continually seeking better ways of achieving competitive advantages to meet their goals. The threat of a new entrant into the market is an important factor in acquiring a competitive advantage. In order to achieve such advantages, literacy in both computers and information systems is needed to enable the use of information systems to meet personal and organisational goals (Shelly *et al.*, 1997:15).

Decision making requires input from numerous sources, a factor of which should be an understanding of the competition and their probable strategy in the marketplace. One of the most urgent concerns of enterprise today is a need for the organising of information systems, thus creating procedures and models to support the decision-making process in order to get accurate answers when a method of operation is not known or the user is inexperienced (Newman, 1995:44).

The business sector has expanded tremendously and information technology has fueled much of the growth. The technology explosion includes the enormous growth

of the Internet, more on-line financial services and the emergence of powerful tools for telecommuting and mobile computing. These forces have created new industries that are reshaping the global economy (Shelly *et al.*, 1997:15).

Effective management information systems allow the decision maker (i.e. line-manager) to combine his or her subjective experience with computerised, objective output to produce meaningful information for decision making (Thierauf, 1984:12). A powerful resource available to the public and private sectors is the availability of useful information that enables employees and their line-managers to make decisions for directing their organisation. The availability of such information is a great asset and may determine the success of a company in extra-ordinary ways. However, the lack of effective management information systems may be one the main factors with negative impact on an organisation.

Before the information age, the principle economic resources of business were capital and labour, but now information has been added as a further resource. Lack of information in an organisation means that decision making is intuitive, inexpedient and not necessarily economically rational. Management information systems (MIS) and decision support systems (DSS) are the computer's contribution to answering questions and solving problems speedily and accurately, improving decision making and helping management to realise objectives that were unattainable in the past.

Effective management information systems and decision support systems allow decision makers, managers and executives to achieve a better understanding of their businesses, and enable them to respond quickly, with better decisions (Schulthesis & Sumner, 1995:539). In this age of information organisations need to be beneficiaries of management information and decision support systems in order to have competitive advantages in their organisations (business sector). Conversely, the lack of management information systems and decision support systems will have a negative impact on the business of an organisation.

1.2 Background

With five to ten percent of an organisation's revenue spent on information technology (IT), there is a growing demand for IT to produce measurable business value. According to a recent Society of Information Management survey of 300 senior IT leaders, the successful alignment of business and IT is a top management concern (PlanView, 2005).

"IT management is frustrated with its inability to see fact-based views of IT activities. This includes demands on resources and plans for new initiatives, the cost and effort expended to maintain existing applications, and the performance and consumption of infrastructure resources on which the applications operate" (Visitacion, 2003).

An IT management solution should provide the visibility to bridge the gap between business and IT. The solution should deliver transparent, integrated decision-making processes to allocate IT resources wisely.

One of the major challenges facing Chief Information Officers (CIOs) today is maximising the business value of IT investments. CIOs know that business value means shareholder value, and increased shareholder value means revenue growth and/or improved operating margins. Previously, this type of goal was left to business managers to accomplish through business initiatives. Now business is increasingly looking towards IT to not only be linked with these initiatives, but also to enable it to accomplish these goals.

Investing in quality is imperative. "*With more than half of all software projects considered failed or challenged and with support costs for defective software running as high as 50 percent of the total development cost, companies must invest in quality*" (Visitacion, 2003). IT infrastructure is a key area for CIOs to look at. Any investment in infrastructure is one return on investment (ROI) cycle away from actually making a visible impact on the end-user.

1.3 Problem statement

"*Across the board, organizations are seeking ways to provide more people in the organization with better access to business information so they can gain deeper insights, make better decisions and take more effective action. They are keen to improve their ability to anticipate, manage and respond to changes in the market place in order to maximize opportunities*" (Muckleston, 2005:5).

Nolan (1973:98) was one of the first to examine the importance of information as an organisational resource. "*Management*", he said, "*should begin to think of data as a basic resource. It should accept this idea as a natural consequence of functional specialization of the general management function*". His approach provided the foundation of a new discipline called information resource management; its philosophy advocates applying sound management principles to information.

Information is a resource that should be aligned with a business's objectives in order to benefit the organisation. This includes sharing information among those who can make profitable use of it. Yet, employees seldom share information (Kolekofski & Heminger, 2003:521-532). Why does this happen? Several researchers contend that an employee's information ownership attitude (i.e. the tendency to treat information as a personally owned resource as opposed to a corporate resource) may limit his or her desire to use information to benefit the organisation. As a desired alternative, researchers have proposed an information stewardship attitude (English, 1993:54-59; Plant, 1996:23-32; Weldon, 1986:54-57). It is therefore important to explore employees' beliefs and attitudes to see whether there are significant factors that can be controlled in the workplace in order to maximise this impact.

Despite significant progress in evaluating the productivity payoffs from information technology, business executives remain critical of IT performance. In an attempt to improve our understanding of IT payoffs, this study uses a process-oriented model (Kraemer & Tallon, 1999:2) to assess the impacts of IT on key business activities within the value chain. The model includes corporate goals as this provides an important context within which to evaluate IT payoffs.

1.4 Objectives of the study

Fishbein and Ajzen (1975:54), in their theory of reasoned action, proposed a relationship that links beliefs, attitudes, intentions, and behaviours. In recognition of the increasing role that executives play in IT decisions, the objective of this study is to:

- survey executives in the Sedibeng and Emfuleni municipalities on their goals for IT and their perceptions of realised IT payoffs, and
- evaluate executives' perceptions of payoffs from IT within the value chain to identify if there is a relationship between corporate goals, IT and perceived IT payoffs.

The executives' goals and perceptions of IT are divided into the following categories:

Business strategy	**Internal**
Efficiency	Reduced costs, increased productivity and speed
Effectiveness	Enhance overall organisational effectiveness
Strategic positioning	**External**
Reach	Extend existing market and geographic reach
Structure	Change industry or market practices

Table 1: Goals and perceptions of IT

1.5 Methodology

Corporate goals or strategic intent for IT were measured using four items. Executives were asked to rate the extent to which they agreed with each item using a 5-point Lickert scale where "1" indicates "do not agree" and "5" indicates "agree completely" (survey items are listed in Appendix A). Based on the responses of executives to these items, the organisations were classified as being one of the following: operationally focused, dual focused, market focused, or unfocused.

1.6 Demarcation of the study

As indicated by the title of this study, it was decided to limit this study to the Sedibeng and Emfuleni local governments.

1.6.1 Vision of Sedibeng and Emfuleni local governments

The Sedibeng and Emfuleni municipalities are innovative, dynamic, developmental local governments that consistently meet and exceed the expectations of the communities and the various stakeholders they serve.

1.6.2 Mission of Sedibeng and Emfuleni local governments

The Sedibeng and Emfuleni municipalities' mission is the creation of a local government dedicated to the provision of quality services in an effective, efficient and financially sound manner by:

- promoting the Batho Pele principle
- ensuring cost effective and affordable service delivery
- monitoring and developing staff to ensure consistently high work output
- adhering to good governance and sound management practices, and
- developing a culture of accountability and transparency.

1.7 Layout of the study

Chapter 1 *Contextualisation of the Study*

This chapter defines the research problem and the research objectives of the study.

Chapter 2 *Management Information Systems*

A literature study of management information systems is discussed in this chapter.

Chapter 3 *Decision Support Systems*

A literature study of decision support systems is discussed in this chapter.

Chapter 4 *Data Analysis*

This chapter represents the analysis of the data that was used for this research. Graphical representations are given where necessary.

Chapter 5 Conclusions and Recommendations

The final conclusions, recommendations and future studies are described in the final chapter.

Appendices

The questionnaire and grouping of questions for analysis purposes are given in the appendices.

1.8 Conclusion

Information technology systems are designed to assist organisations to achieve their objectives, reduce costs and to increase the capabilities of organisational processing.

In the next chapter management information systems are defined as systems that generate information for monitoring performance, maintaining co-ordination and providing background information about the organisation's operation.

CHAPTER 2

2 MANAGEMENT INFORMATION SYSTEMS

2.1 Introduction

Information is a major tool with which the management process is accomplished (Lazzaro, 1968:425). The management process can be as simple as indicated in Figure 1: The management process:

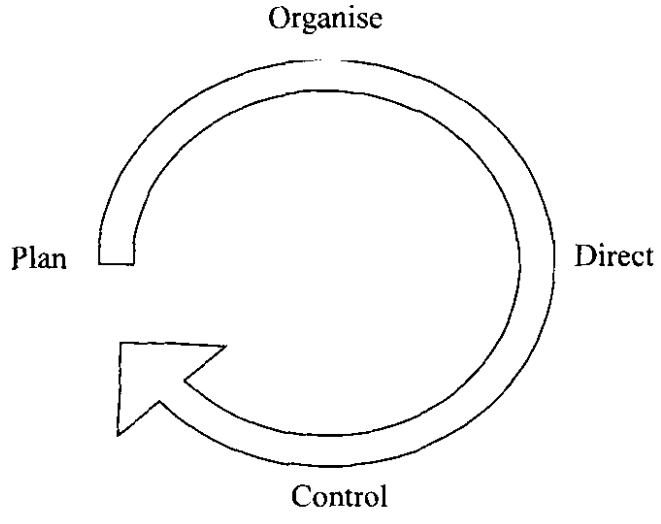

Figure 1: The management process

- Plan — determine what to do, how to do it and establish policy.
- Organise — obtain the necessary facilities, equipment, personnel and material.
- Direct — set the time and cost framework for what to do and make operating decisions.
- Control — measure performance against the plan and take necessary actions.

Management needs information. In relation to information needs, management is anyone who plans, decides, or exercises control on an area. This definition tends to

include as part of management almost everyone in an organisation. Data that flows through an organisation is "management information" in one form or another.

Reports designated for higher levels of management are not always simple summaries of data contained in reports designated for lower level management. New factors or information may be added or interpretations of data may be made, such as comparisons of relative sales growth with that of other companies in the same industry, while sales managers are more interested in comparative sales by salesman and sales territories. Lazzaro, (1968:425) defines a management information system (MIS) as the total process by which raw data is collected, summarised, or processed and reported, with the emphasis on the ultimate reporting to management. A management information system may be a simple manual process, or may involve the use of off-line or real-time computers or a combination of several systems and methods.

In a management information system, we are primarily concerned with information, rather than the method used to collect, accumulate, or interpret the data. "*Management Information System predates the computer age*" (Alter, 1992:132). For example, as long ago as the middle 1500s the Fugger family in Augsburg, Germany, had business interests throughout Europe and even in China and Peru. To keep in touch, they set up a worldwide news reporting service through which their agents wrote letters about critical political and economic events in their areas of responsibility. The letters were collected, interpreted, analysed and summarised in Augsburg and sent out with conclusions and instructions to each of the business agents. This information strategy helped the family advance more rapidly in the mercantile than their rivals. This paper-based system was a feedback loop encompassing planning, execution and control. The instruction went out to the agents who executed their work and reported their results.

A management information system generates information for monitoring performance, maintaining co-ordination and providing background information about an organisation's operation. Finally, apart from an organisation's formal control

mechanisms, a management information system provides some structure for the comparatively unstructured task of management's measuring of performance.

According to Thierauf (1984:19), a management information system goes beyond just using the capabilities of the computer. It also relies on the decision maker's insight and judgement at all stages of problem solving; from problem definition, to choosing the relevant data for analysis, to selecting the approach to be used in generating solutions, and on to evaluating the solutions presented to the decision maker. In essence, a management information system represents a comprehensive approach to problem solving. By integrating the talents of the decision maker with computing capabilities, one adds a new dimension to the decision making process for planning and controlling organisational activities. Management information systems allow the decision maker to combine his or her subjective experience with the computerised objectival output in order to produce meaningful information for decision making.

Before computers, management information system techniques existed to supply managers with the information that would permit them to plan and control operations. Computers have added one or more dimensions, such as speed, accuracy and increased volumes of data that permit the consideration of more alternatives in decision making (Murdick *et al.*, 1984:5).

2.2 Management information systems

The scope and purpose of a management information system (MIS) are better understood if each part of the term is defined separately.

- **Management**

  Management has been defined in a variety of ways, but for this purpose management comprises the processes or activities that describe what managers do in the operation of their organisation; plan, organise, initiate and control operations:

- Management plans by setting strategies and goals and selecting the best course of action to achieve the plan.
- Management organises the tasks necessary for the operations plan.
- Management sets the tasks into homogeneous groups and assigns authority delegation.
- Management controls the performance of the work by setting performance standards and avoiding deviations from standards.

Since decision making is such a fundamental prerequisite to the aforementioned processes, the task of a management information system becomes that of facilitating decisions necessary for planning, organising, and controlling the work and functions of a business.

- **Information**

Data must be distinguished from information. Data is facts and figures that are not currently being used in a decision process and usually takes the form of historical records that are filed without the immediate intent to be retrieved for decision making. An example would be the supporting documents, ledgers, and so on, which comprise the source material for profit and loss statements. Such materials would only be of historical interest to an external auditor. Information consists of facts that have been retrieved, processed, or otherwise used for informative or inference purposes, arguments, or as a basis for forecasting or decision making.

- **Systems**

A system can be described to be as simple as a set of elements joined together for a common objective. A subsystem is part of a larger system with which we are concerned. All systems are part of a larger system. For our purposes the organisation is the system, and the parts (divisions, departments, functions, units, etc.) are the subsystems.

> Whereas we have achieved a very high degree of automation and joining together of subsystems in scientific, mechanical, and factory (manufacturing) operations, we have barely scratched the surface in applying systems principles to organisational or business systems. In short, management information systems have only one objective: providing information for decision making on planning, initiating, and controlling the operations of an organisation and to provide a synergistic organisation in the process.

Emery (1987:22) states that the term Management Information Systems has been around for a long time, and adds that even now, though, there is no general agreement as to its meaning. One can find support for any of the following viewpoints:

- The management information system deals only with the management or decision–oriented parts of an information system.
- The management information system combines decision-making and transaction-processing components.
- The management information system involves only the transaction-processing part of the system.

Alter (1992:132) adds that in view of the changing role of information processing within organisations, the following definition of a management information system is not unreasonable: "*An organization's Management Information System is a set of functions that should be included within the purview of its Chief Information Officer*". It is therefore clear that in accordance of Emery (1987:22) "*It is not sufficient to define the term Management Information Systems in one or more paragraph. One rather outline the role that Management Systems is playing in an organization will be more precise that defines the term*". Gordon & Gordon, (1999:404) define management information systems as the systems that give managers at all levels of an organisation the ability to collect, analyse and summarise the types of information they need to perform effectively. They add the following facts:

- Management information systems support top-level managers in formulating strategy and policies.

- Management information systems help middle-level managers to implement long-range plans by providing information that helps to increase employees' performance, product quality and customer service.
- Management information systems give first-line supervisors ready access to information that ensures the effective conduct of the organisation's daily activities.

Ralph *et al.*, (1999:392) briefly explain the term Management Information Systems as an organised collection of people, procedures, software, database and devices used to provide routine information to managers and decision makers. They add that management information systems provide standard reports generated with data and information from the transaction processing system and the focus of management information systems is primarily and operational efficiency in functional areas such as marketing, production, finance, etc. They conclude that management information systems provide managers with information and support for effective decision making as well as feedback on daily operations. In doing so, management information systems add value to processes within an organisation. Ralph *et al.*, (1999:392) conclude their definition of a management information system by providing the characteristics of a management information system. Management information systems:

- provide reports with fixed and standard formats
- produce hard copy and soft-copy reports
- use internal data stored in the computer system
- enable end users to develop their own customer reports, and
- require formal requests from users.

This argument clearly indicates that management information systems can be defined as an organised assembly of resources and procedures required to collect and process data and distribute information for use in decision making. It serves the management level of an organisation, providing managers with reports and, in some cases, with on-line access to the organisation's current performance and historical records. Finally, a management information system is a tool to be used by all commercial, private and

public business sectors, to represent facts, concepts or instructions in a formalised manner suitable for communication, interpretation, or processing by humans or by automatic means.

2.3 The advantages of management information systems

Emery (1987:290) explains the benefits of management information systems with the following example: John Rocket and his colleagues at M.I.T have developed and successfully applied an extensive methodology for eliciting successful factors from management. They actually use the semi-structured interviews with managers throughout the organisation. Analysts develop a hierarchy of self-consistent critical success factors appropriate for each organisational unit. To concentrate a unit's efforts on the really important matters, each manager should generally limit the number of critical success factors to half a dozen or so. He also adds that these critical success factors serve as the basis for defining critical information needs. He supports his statement by making the following example: Suppose that product quality is defined as a critical success factor for a manufacturing company. This triggers a detailed analysis of how the information system can contribute to improved quality. He adds that management information systems are designed to do the following:

- maintain detailed records of the quality of material received from each supplier as a basis for supplier selection and negotiating
- capture inspection process data at each stage of the production process with the view of identifying and correcting sources of quality problems — for example a defective product design or a faulty manufacturing process
- analyse defective items returned under a warranty programme to improve product design and manufacturing techniques, and
- analyse orders for replacement parts to identify usage patterns that indicate abnormal wear or breakdown.

Emery (1987:291) emphasises that management information systems have the competitive strategies in the market, which are both in the private sector and in the

public sector. He adds that administrators of hospitals and colleges, for example, certainly recognised that they face, at best, a genteel competition for clients and funds. He emphasises that even organisations formerly immune to direct competition, such as regulated monopolies, are at risk of growing competition from substitute products or new entrants in increasingly unregulated markets. Management information systems add the elements of competitive markets. Even though different organisations may choose quite different ways to compete, the motivation is much the same. Emery (1987:291) mentions Michael Porter's seminal work on competitive strategy, which provides a sound starting point in understanding how management information systems can contribute to an organisation's competitive position. In brief, Porter identifies the following characteristics, which indicate that management information systems govern an organisation's competitive position:

- efficiency and effectiveness of the organisation's internal operations
- relationship of the organisation to its suppliers (in terms of bargaining power, degree of co-ordination etc.)
- relationship of the organisation to its customers (bargaining power, degree of co-ordination, cost of switching to a competitor, etc.), and
- exposure of the organisation to the entrance of new competitors.

Emery (1987:292) suggests that with this competitive structure, an organisation could choose to compete through a combination of price and product/service differentiation.

Management information systems may contribute in the following possible ways:

- use of telecommunication links with major suppliers to provide economies with more stable production levels and reduced buffer inventories
- analysis of supplier prices, delivery costs, quality, reliability and credit terms to lower overall material costs
- more efficient production scheduling to lower the cost of direct labour and increase effective capacity

- use of on-line order entry from the field (possibly by the customer personally - directly from their own premises) to reduce processing lags, thus allowing fewer regional warehouses while maintaining or improving coverage and delivery times
- analysis of data derived from the operational system to develop tactical and strategic plans dealing with such matters as plant locations, capacity planning, produce or buy decisions and the cost savings from long-term sales contracts that stabilise production, and
- sophisticated analyses of a product's cost structure and price elasticity to recommend more effective pricing strategies.

Emery (1987:295) argues that management information systems play a vital role in the value chain. He explains that it is difficult to identify the most attractive areas in which to pursue a competitive advantage through information technology. Valuable insight can be gained by examining a product's value chain - stages by which value accumulates on the way from suppliers through to the final consumer. He also explicates that this identifies where value is added in the process, thereby allowing management to concentrate attention on the high value areas and to consider possible ways to gain a competitive advantage by shifting functions to different parts of the value chain.

A value chain analysis reveals where substantial leverage can be achieved. He makes the following example: A company producing a bulk of chemical commodity found that out-bound truck deliveries accounted for 15% of the value added. Determining a delivery schedule involved many producing sites, many customers, high storage costs, and complex constraints on the timing of deliveries. Given the complexity of the task, human dispatchers were able to do an astonishingly good job by using management information systems. A mathematical model, however, improved the plan by as much as 10% by considering many more variables and alternatives than a human dispatcher could. A 10% saving in a 15% value adding function is a saving of 1.5% of the total. This starts to get management's attention. If an organisation started with a beginning profit of 10%, a 1.5% saving on gross sales amounts to an increase in net profit of over 13%. That is a fairly strategic gain by most reckonings, especially

in view of the fact that the saving was accompanied by improvement in customer service that further enhanced the company's competitive position.

"*Most executives find it difficult to view the information system as an integral part of their decision and management process*" Emery (1987:303). Acquiring information and effecting action through a comprehensive management information system, rather than through people, calls for a systematic and abstract approach to problem solving that most of us find unfamiliar and uncomfortable.

Suppose, for example, that management suddenly judges that inventory levels are dangerously excessive, one can and probably should take immediate, direct action to deal with the problem by cutting back on production and purchases. If those were the only steps taken, however, the organisation would be committing itself to similar fire-fighting crises in the future. The ideal would be to change the management information system in ways that reduce the probability and severity of future problems. A number of ideas that may come to mind are:

- to develop an exception-reporting system that sends earlier signals of impending problems and identifies their source
- to speed up the logistics system so that production schedules can be modified quickly to respond to forecast errors
- to improve the forecasting system, and
- to build in a mechanism that allows management to choose an aggregate inventory level and have the system translate this into the detailed actions necessary to achieve the specified total.

The management information system serves as a filter between the raw operational data and human consumers of information. Many operational matters may be handled without direct human intervention, for example, through robots in the factory and automatic distribution over a network (such as a purchase order transmitted directly to a supplier). Information displayed for a human decision maker will come through a filtering process that transforms a vast database into highly selected information (using summary reports, *ad hoc* queries, exception reporting, and graphic

representations). Decision makers contribute to the adoptive process by controlling the filter and amplifying the system. Management information systems ensure that managers can access, analyse, and report current and comprehensive information (Gordon & Gordon, 1999:404). Management information systems facilitate organisational integration and the absolute need for the system approach will continue to accelerate in coming years (Murdick *et al.*, 1984:5).

2.4 Management reporting systems

Management reporting systems help managers to monitor the operations and resources of their organisation and the environment in which the organisation operates. Management reporting systems contain the following types (Murdick *et al.*, 1984:5):

- **Detail reports:** Detail reports provide managers with information useful in overseeing the day-to-day operation of a department's working group.
- **Summary reports:** Summary reports or statistical reports show totals, averages, maximums, minimums, or other statistical data aggregated over time.
- **Exceptional reports:** Exceptional reports alert managers to potential problems by showing only data that fall outside an accepted or expected range, for example an accounts receivable exception report at a particular organisation may show only seriously overdue accounts or accounts with outstanding payments later than usual based on an account history.

2.4.1 The increased complexity of business

The complexity of business will be discussed under the following topics:

- The technological revolution.
- Research and development.
- Product changes.

- The information explosion.

2.4.1.1 The technological revolution

We need only look around the home and workplace to witness the fantastic changes brought by the technological revolution of the past few years. We have walked on the moon and returned. Time and space have been dwarfed. Transportation, communication, agriculture, and manufacturing are among the many industries undergoing vast changes in products, techniques, output, and productivity. The technological revolution is not a continuation of the industrial revolution; it brought vast and fundamental changes in its own right as advanced mechanisation and automation techniques were adopted and improved across a broad range of industries. The future of this revolution is not entirely clear, but two things are quite certain: change will continue at an accelerated pace, and these changes will demand giant steps in improved management. It is imperative that in order to cope with these changes, the manager of the future will require large amounts of selective information for the complex tasks and decisions that will be demanded. Thus, the technological revolution will require a managerial revolution (Murdick *et al.*, 1984:5).

2.4.1.2 Research and development

The breathtaking rate of the technological changes racing through all types of industry is due to increasing expenditures for research and development. Despite the fact that relatively few firms engage in research and development, and that the research and development concentrate on few areas, the impact of this expenditure is felt by all. Charles Kettering, a General Motors executive, once commented: "*...by its very nature research is a gamble... but the only risk that is greater than doing research is not doing it*". However, this comment was not intended to imply that all companies should perform research. However, they should all be aware of its impact on their operations and should provide for better planning, better management, and better information to accommodate the effects (Murdick *et al.*, 1984:5).

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2.4.1.3 Product changes

Product changes happen partly from research and development and partly from growing customer sophistication. Whereas the manager of the past could depend upon a high percentage of his or her product ideas becoming marketable, today's manager must deal with an enormously high product mortality rate. Moreover, modern organisations face the necessity to optimise returns from a given product in a much shorter time. This complexity contributes to the forming of another element that calls for better management and the systems approach — the lengthening time span required between decisions and realisation of commitments. These commitments involve such large amounts of money and such long periods of time that the manager cannot afford to make mistakes. For example, major oil companies plan 20 years ahead for acquisition sources. They emphasise that these acquisition requirements demonstrate the need for proper design of management information systems, particularly with regard to an environment that includes competitors who are themselves using up-to-date methods (Murdick *et al.*, 1984:5).

2.4.1.4 The information explosion

The information explosion has impacted on the complexity of the managing of organisations. As a decision-maker, the manager is essentially a processor of information. The modern manager knows that the ability to obtain, store, process, retrieve, and display the right information for the right decision is vital for better decisions.

Various estimates have been made concerning the information explosion. For example, people's knowledge doubles every 5 to 10 years and this rate of knowledge accumulation is accelerating. It is estimated that 85 to 90 percent of scientists of past and present times are now living - an indication of the accelerated growth of knowledge and information in recent years (Murdick *et al.*, 1984:5).

2.4.2 The increased complexity of management

Murdick *et al.* (1984:6) mention that there are four developments that, when integrated with what we already know about managing, may give a breakthrough in improving the management process. These four developments are:

- the theory of information feedback systems
- a better understanding of the decision-making process
- operations research or management science techniques that permit an experimental approach to complex problems, and
- the electronic computer.

2.4.2.1 Information feedback systems

The basis to the understanding of the systems approach and the design of management information systems is in the concept of information feedback systems (Murdick *et al.*, 1984:7). These information feedback systems explain the goal-seeking and self-correcting interplay between the parts of a system, whether the system is business, mechanical, or otherwise. Essentially, feedback systems are concerned with the way information is used for the purpose of control, and they apply not only to business or management systems but also to engineering, biological, and many other types of systems. Examples of information feedback systems include: thermostat-furnace-temperature system, the automobile, the body, the economic system, the inventory control system, and countless others. These systems have a vital trait in common: the output of the system leads to a decision resulting in some type of action that corrects the output, which in turn leads to another decision.

2.4.2.2 Decision making

The concept of decision making is at the very core of systems design. Murdick *et al.* (1984:7) mention that to some extent this improved understanding of automatic decisions and the decision-making process. The notion of programming decisions by

decision rule is now a basic consideration of management and information system design. If decisions can be based upon a policy, a procedure, or a rule, they are likely to be made better and more economically. However, if the decision rule can be programmed for computer application, the potential exists for faster, more accurate, and more economical operations. Common decision rules that have been programmed for computer solutions are payrolls, inventory control, customer billing, and purchasing.

2.4.2.3 Management science

Management science is closely related to programmed decision rules. Indeed, one of the primary purposes of management science techniques is the design of programmed decision rules. Another purpose, often overlooked, is that of assisting managers to make complex decisions. Linear programming, system simulation, the Monte Carlo technique, queuing, gambling, probability theory, and other quantitative approaches are available to management scientists. Management scientists are not so much interested in specific tools or techniques as in the management science approach to problem solving.

Murdick *et al.* (1984:8) emphasize that simulation is a powerful tool used in management science. Although simulation was used relatively infrequently prior to 1970, it offers great potential to breakthroughs for the application of the systems approach. The technique involves the construction of mathematical models of systems (e.g., business or function) being studied. The behaviour of the model under manipulation simulates the behaviour of the real system to the extent that the consequences can be forecast prior to a final decision.

2.4.2.4 The electronic computer

Without the electronic digital computer, the vast amount of data handling connected to storage, processing, and retrieval of information would not be possible, nor could the mathematical computations required in many problem-solving situations be economically undertaken. Despite the fact that the computer is nothing more than a

tool for processing data or making computations, many managers view it as the central element in management information systems. This attitude tends to overrate and distort the role of the computer. The vital element in the management information system is the human being; it is the managerial talent that designs and operates the system!

According to Murdick *et al.* (1984:14) the purpose of management information systems is to raise managing from the level of piecemeal spotty information, intuitive guesswork, and isolated problem solving to the level of system insights, system information, sophisticated data processing, and system problem solving. Managers have always had "sources" of information; the management information system provides a system of information. It is a powerful aid to managers in solving problems and making decisions.

2.5 The disadvantages of management information systems

One of the biggest disadvantages of management information systems is the cost of data entry (Emery, 1987:27). The data entry function is one of the most critical parts of the management information system. For one thing, it is expensive and often one of the larger components of cost, in some cases accounting for the bulk of continuing operating expenses. In fact, in the retail industry, for example, collecting transaction data on individual items sold, may be so expensive that less precise means have to be used such as estimating retail sales on the basis of the bulk delivery of merchandise to the store from a warehouse.

According to Emery (1987:27), another disadvantage of management information systems is accuracy, which is generally achieved through some form of redundancy. The traditional means is through a verification process, which involves a comparison of the data entered with the original source of the data (a handwritten sales order, for example). An exceedingly important aspect of error reduction is an editing programme in which various automatic checks are applied to the data to determine its accuracy and completeness. In editing the data to establish an employee record for a

newly hired person, for example, the computer might perform the following error checks:

- the name of the employee is checked to see that it consist of only alphabetic characters (to guard against, say, the erroneous entry of the number zero in place of the letter o)
- the social security number is checked to see that it has the format NNN-NN-NNNN where each N is a digit
- the date of birth is checked to determine that it falls between a reasonable range of dates (after 1920 and before 1985, for example), and
- the year of the employee's graduation from college is checked to verify that it exceeds the date of birth by at least 12 years.

According to Schulthesis (1989:712) little is known about the disadvantages of management information systems. However, the following disadvantages are known in centralised data processing:

- lack of user control over systems developments and operations
- limited responsiveness to small development projects, and
- frustration with corporate changes for data processing services.

Decentralised data processing has the following disadvantages:

- loss of central management information system management control
- failure to follow standard systems for development practices, and
- duplication of staff and effort.

Lazzaro (1968:428) emphasises that inadequate management information systems have major indications in the following symptoms:

- Operational indications:
    - large physical inventory adjustments
    - capital expenditure overruns

- inability of executives to explain changes in operating results from year to year
- inexplicable cost variance or inadequate cost of information
- unawareness of order backlogs
- lack of communication among management personnel, and
- insufficient knowledge about changes.

- Psychological symptoms:
  - surprise at financial results
  - poor attitude of executives towards usefulness of information
  - lack of understanding of financial information by executives, and
  - lack of concern for environmental changes

- Report content symptoms:
  - excessive use of tabulations of figures or details
  - multiple preparation and distribution of identical data
  - conflicting information generated from different sources
  - lack of periodic comparative information and trends, or standards for comparison
  - tardiness of information
  - inaccurate information, and
  - inadequate externally generated information.

The symptoms of information deficiencies are the same in both growing and mature organisations, whether large or small, and regardless of the state of electronic data-processing developments within the organisation.

2.6 Conclusion

According to Thierauf (1984:17) the need for an effective management information system is of paramount concern to an organisation now and in the future. Because the organisation does not operate in a vacuum, it must co-ordinate its operation with the

business world. Of prime importance is information about the markets in which it operates, current knowledge of its customers and competitors, availability of capital, capabilities of available personnel and the source of supply. Increasing prices of purchased materials, rising labour costs, and foreign competition signal the need for an information system that describes the organisation's economic environment and co-ordinates the external environment with internal factors to provide management information. The changes taking place inside and outside the organisation generally do not stand alone. Advancements inside and outside tend to affect and overlap one another. As a result, an effective management information system, capable of integrating these advances with the needs and capabilities of the organisation is needed. More frequent and more accurate information leads to better decisions thereby enhancing managerial and operational efficiency.

CHAPTER 3

3 DECISION SUPPORT SYSTEM

3.1 Introduction

According to Gordon & Gordon (1999:411) a decision support system is a system that helps managers to make more effective decisions by answering complex questions such as:

- Should a newer, more powerful machine replace two older pieces of equipment?
- Should the company sell directly to the retail market, continue to sell through distributors or both?
- Should the company order parts more frequently and in smaller lots?
- Will lower marketing and sales expenses offset the revenue loss of a price decrease?

"*Middle and upper-level managers use decision support systems to reach decisions in ambiguous and complex environments. Unlike a management reporting system, which provides managers primarily with current data to use in problem analysis, a decision support system offers forecasts of future conditions*" (Gordon & Gordon 1999:411).

A decision support system is designed to aid human decision making and provides productivity tools for knowledged workers. "*Transaction processing, in contrast, deals with routine operation matters. The decision support can thus be defined as all of the Management Information System except for transaction processing*" (Emery, 1987:100).

It is useful to draw a distinction between transaction processing and decision support systems, even though in practice the boundary between them may be quite fuzzy. Increasingly we are likely to see each manager and professional staff member, along

with clerical and operational personnel, equipped with a multifunction workstation linked to a corporate network. The system that serves the user's needs for decision oriented information can also be used to enter transactions, selectively retrieve information from a database, or facilitate a variety of office functions such as word processing and electronic mail.

Before learning about the purpose and features of decision support systems and defining a decision support system, one should become acquainted with the decision making process, the type of problems addressed in decision making, the attributes of decision makers, and strategy for decision making (Schulthesis 1989:456). The decision support system involves three phases, namely:

- **Intelligence.** The decision maker searches for conditions calling for a decision.

- **Design.** During design, the decision maker develops and analyses alternative courses of action by either searching for ready-made alternatives or develops custom made solutions.
- **Choice.** During this phase, the decision maker selects the best alternative.

Schulthesis (1989:458) declares that decision support systems are systems designed to support semi-structured and unstructured decisions in situations where information is incomplete and does not satisfy the goal.

According to Alter (1992:133) a decision support system is an interactive system that helps people to make decisions, use judgement, and work in areas where no one knows exactly how a task should be performed. Decision support systems help decisions to be taken in semi-structured and unstructured situations, and they provide information, models or tools for manipulating data. Decision support systems solve part of the problem and help to isolate instances where judgement and experience are required, instead of having professionals or managers waste their time and effort transcribing data, doing calculations or drawing graphs. Decision systems automate clerical chores to an extent, which helps professionals and managers to focus on real business problems and support repetitive or non-repetitive decision making.

3.2 The advantages of decision support systems

The advantages of decision support systems, according to Gordon & Gordon (1999:411) include the following:

- improved decision making through better understanding of business
- increased number of decision alternatives can be examined
- the ability to implement *ad hoc* analyses
- fast response to unexpected situations
- improved communication
- more effective team work
- better control, and
- time and cost savings.

Decision support systems are designed and implemented for managers as the end users (Mittra, 1996:8). Its impact is on decisions in which there are insufficient structures for computer tools and analytical techniques to be useful but where the manager's judgement is essential. The real payoff from the manager's point of view is in the degree to which the decision support system extends the range and the capability of his or her decision-making process to make it more effective. The manager sees the decision support system as a supportive tool, under his or her own control, that does not attempt to automate the decision process with predefined objectives, or impose solutions. It accepts input from the manager, processes it, and then provides the output for review. If the output is not satisfactory, the manager can repeat the process until the solution is satisfactory.

It must be clearly understood that no decision support system can ever take the decision-making authority away from its users. Many managers, especially those who are not familiar with computer technology, have an inherent fear of a decision support system. They fail to realise that information technology is just a tool to be used for making better and quicker decisions. While managers play the role of end users in a decision support system, analysts and designers are involved in the actual building of the system. These two groups comprise technical persons who usually belong to the

middle-management level in a company, or are outside consultants from suppliers of decision support systems.

Decision support systems are most useful, however, when it is not obvious what information needs to be provided, what models need to be used or even what criteria are most appropriate (Sauter, 1997:19). Decision support systems are most useful when:

- managers and their staff spend significant time locating and analysing data that is already stored electronically
- management meetings are stalled because people challenge the validity of the data
- management is frequently surprised by the data when end–of–month–type reports are generated, and
- decisions are frequently made based on anecdotal evidence instead of on appropriate data, even when data might be collected regularly.

Sauter (1997:19) further states that if data is collected electronically but is not used to its full potential, a decision support system is warranted. Sauter (1997:19) also mentions that decision support systems might be developed for other reasons. Sauter's study notes that the primary reason for using a decision support system is to obtain accurate information, but many users develop such systems to obtain timely information or because new information is needed. Others may develop decision support systems because they are viewed as "organisation winners" and because management has mandated the use of a system. In these cases managers believe that the image created by using a decision support system affects their clients' views of their products.

In very few cases (only about 6 percent of those that Hoque and Watson studied) the decision support system (DSS) is used because it reduces cost. The industrial revolution provided machinery to make jobs easier. The information revolution is supposed to provide the same level of help to the knowledged worker. Just as the automobile did not replace the human, the decision support system does not replace

the human; similarly, the availability of automobiles did not solve all the transportation and transshipment problems, just the problem of how to get one or more people or one or more items somewhere else faster, more comfortably, and using less energy. Likewise, a decision support system will not solve all the problems of any given organisation. It is accepted that decision support system technology is warranted if the goal is to help decision makers:

- look at more facts in a decision
- generate better alternatives
- respond to situations quickly
- solve complex problems
- consider more options for solving a problem
- brainstorm solutions
- utilise multiple analyses in solving a problem
- have new insights into problems and eliminate "tunnel vision" associated with premature evaluation of options
- implement a variety of decision styles and strategies
- use more appropriate data
- utilise models better, and
- consider what-if analyses.

Stair & Reynolds (1999:438) suggests that decision support systems have the following consecutive stages:

- **Intelligence stage.** This is the first stage during which potential problems and opportunities are identified and defined. Information related to the cause is gathered and the scope of the problem is set out. During this stage, resources and environmental constraints are investigated.
- **Design stage.** In this stage, alternative solutions to the problem are developed. In addition, the feasibility of these alternatives is evaluated.

- **Choice stage.** The last stage of the decision-making phase, which is the choice stage, requires selecting a course of action. The choice stage would conclude with the selection of the actual solution.

Sauter (1997:20) insists that the final stage of problem solving is the monitoring stage, whereby decision-makers evaluate the implementation to determine whether the anticipated results were achieved and to modify the process in the light of new information. This can involve a feedback and adjustment process.

Information systems could play an important role in all the phases of decision making and problem solving. Computer analysed surveys and questionnaires can be used during the intelligence phase to determine overall problems and opportunities. Decision support systems help decision makers to make a selection of solutions, whether it is a programmed or a non-programmed decision.

3.3 Programmed decisions

Programmed decisions are made using rules, procedures or quantitative methods, for example, to say that inventory should be ordered when inventory levels drop to 100 units is to set a rule. Programmed decisions are easy to computerise by using traditional information systems; for example, to programme a computer to order more inventory when inventory levels for certain items reach 100 units or less.

3.4 Non-programmed decisions

Non-programmed decisions deal with unusual or exceptional situations. In many cases these decisions are difficult to quantify; for example, determining the appropriate training programme for a new employee, deciding whether to start a new type of product line, and weighing the benefits and disadvantages of installing a new pollution control system.

Decision support systems are used to solve a variety of non-programmed decisions, where problems are not routine and rules and regulations are not well defined (unstructured or ill-structured problem). According to Alter (1992:418) decision support systems have the following important themes that are common in information systems:

- they can improve also effectiveness rather than just efficiency
- they can support, rather than replace processes and managers
- they should be flexible and useful in various situations
- people other than computer experts can become useful in more situations
- systems should be interactive, and
- systems should not excessively contain what people do.

The early works on decision support systems focus on the interactive use of computers to support management decision making for semi-structured and unstructured decisions. According to Schulthesis (1989:713) decision support systems have strategies for decision-making. The type of decision problems and the attributes of the decision maker will determine whether the decision maker will use a maximising and satisfying strategy.

3.5 Maximising

When the outcome of a decision is clear, and the alternatives are well established, the decision maker will make the decision that maximises the desired outcome; for example, let's say that one is faced with a choice between two alternatives. One of these alternatives offers a 1% chance of winning R20-00 and the other alternative offers a 50% chance of winning R500-00. If you multiply the probability of each alternative by its outcome, you will see that the second alternative has a higher expected value (probability x outcome = expected value). A rational decision maker will select the second alternative to optimise the expected value. The maximising

approach assumes that the decision maker is rational and is aware of the probability of each alternative.

3.6 Satisfying

Because many decisions are made in a situation of uncertainty, decision makers are willing to settle for less than maximum results. Schulthesis (1989:713) mentions that decision makers display rationality only within the limits imposed by their experience, background and awareness of alternatives in a given decision situation. A decision maker will set up a reasonable aspiration level and search for possible alternatives until he finds one that achieves this level.

3.7 Incrementalising

In the third decision-making strategy, the decision maker attempts to take small steps away from the *status quo* towards a desired state. This approach may neglect important outcomes, because the alternatives considered are generally familiar to the decision maker.

According to Stair & Reynolds (1999:439) decision support systems have three basic models:

- optimisation model
- satisfying model, and
- heuristic model.

Aspects of optimisation models and maximising strategies are basically the same, satisfying models and satisfying strategies are basically the same and heuristic models are basically the same as incrementalising strategies.

Schulthesis (1989:527) mention that decision support systems are designed to support semi-structured and unstructured decisions in situations where information is

complete and satisfaction is a goal. They are developed to support decisions that are so divergent that it would be difficult to develop a standard set of procedures to apply to them; such decisions may be specific and may relate to a singularly occurring situation.

A decision support system should enable the decision maker to apply the right decision rules to a problem rather than using standard rules that may not apply because of changing conditions. As an example, it would be ineffective to apply an inventory re-order model designed for slow-moving items to a problem situation involving fast-moving items. An effective decision support system needs to incorporate the following features (Schulthesis 1989:527):

- support for structured decisions, and
- support for unstructured decisions involving a decision-making process that cannot be defined before actually going through the process of making the decision.

3.8 Support for structured decisions

The type of decisions and the degree of decision structures for both structured and unstructured decisions are described in Table 2: Structured and unstructured decisions.

	Operations	**Tactical**	**Strategic Planning**
Structured decisions	Accounts receivable	Budget analysis	New market planning
	Inventory control	Short term forecasts	Site location
	Production scheduling	Long term forecasts	Mergers
Unstructured decisions	Cash management	Budget preparation	New product planning

Table 2: Structured and unstructured decisions

At the operational level the accounts receivable application is a highly structured system with well-defined procedures and outputs. However, cash management is a

much more complex, unstructured problem because of the range of money management alternatives and judgement factors.

Another example is the difference between budget analysis and budget preparation - two tactical applications. Budget analysis is a much more structured procedure than budget preparation. Budget analysis requires knowledge of possible factors, alternative resource requirements and future needs. Although budget analysis can be easily accomplished with current or cumulative budget data with a spreadsheet or database programme, budget preparation is considerably more challenging. Those responsible for budget preparation tend to be managers with substantial experience in managing projects and knowledge of possible cost factors to be considered on a long-term basis.

3.9 Support for database access and modeling

Decision support systems attempt to combine the use of models or analytic techniques with traditional data access and retrieval functions. Managers can overcome some of the problems associated with traditional information systems by determining what database can be used, by defining what data analysis techniques are required, and by identifying what output is meaningful.

3.10 Support for communication among decision makers

Decision support systems must support decision making at all levels of an organisation. Because some decisions require communication among decisions makers at all levels, decision support systems need to support group decision making. In some cases decisions are made sequentially, with each decision maker responsible for part of the decision before passing it on to the next decision maker. Other decisions require pooling knowledge and results from negotiating and inter-action among decision makers.

3.11 Availability of memory aids

In making decisions, managers constantly have to recall information or results from operations performed previously. Decision makers need memory aids, which a decision support system should provide. For example, monthly budget data stored in spreadsheets from a prior month could be used as a reference. Triggers reminding a decision maker to perform certain operations are also useful. A trigger, for example, may tell the user that before a cash flow analysis can be completed the costs of various investment alternatives must be calculated and projected (Schulthesis 1989:527).

3.12 Availability of control aids for decision making

A decision support system should support all phases of the decision-making process, have short and long-term memory aids, provide effective control aids and support semi-structured and unstructured types. It should also support data access and modeling and should facilitate communication among decision makers. The design of the decision support system creates opportunities for managers to determine their information needs, to select appropriate tools, and to develop outputs they can use. The following systems support a decision support system (Schulthesis 1989:527):

- a production planning system
- a financial control system, and
- an international loan system.

A financial control system is a decision support system developed at a commercial bank. A cost measurement system is designed to provide unit cost data for each of the bank's services and is designed by a functional specialist within the corporate controller's office. These cost measurements were originally created and used to determine how to price the bank's products. The third instance depicts a decision support system designed to monitor existing international loan portfolios.

According to Post & Anderson (2000:342) a decision support system provides the following in any business sector:

- support for tactical-level decisions
- features to query data
- support in analysing and storing models, and
- features designed for specific problems.

Other systems are used for standard components, for example: database management systems, spreadsheets and graphics packages.

According to Emery (1987:22), a decision support system provides computer-based assistance to human decision makers. This offers the possibility of combining the best capabilities of both humans and computers with decision support systems to supplement the decision-making powers of the human with the data manipulation capabilities of the computer.

Emery (1987:22) & Schulthesis (1989:527) agree on the advantages of decision support systems. However, Emery maintains that decision support systems must, from a technical standpoint, provide aid for a given decision; its expected payoff might be too low to justify the cost of implementation. The payoff depends on the stakes involved in a decision, the likely improvement that can be achieved with the aid of a decision support system and the frequency with which the decision is made.

Duffy & Assad (1989:37) suggests that the purpose of a decision support system is to:

- assist managers in their decision processes in semi-structured tasks
- support rather than replace managerial judgment, and
- improve the effectiveness of decision making rather than its efficiency.

Decision support systems can increase managerial effectiveness by:

- improving personal efficiency
- expediting problem solving
- facilitating interpersonal communication
- promoting learning, especially about how the system works, and
- increasing organisational control.

Duffy & Assad (1989:40) distinguish between the following three levels of technology:

- specific decision support systems: systems that actually accomplish the work
- decision support system generators: a package of related software and hardware, which provide a set of capabilities to build specific decision support systems quickly and easily, for example: a fourth generation language or a financial modeling package, and
- decision support system tools: hardware and software, which facilitate the development of specific decision support systems or decision support system generators, for example: Java or C++.

Duffy *& Assad* (1989:41) explain that decision support system tools can be used to develop specific decision support system applications, but this is likely to be costly and inflexible. It was substantiated that these three levels of technology involve managers and technicians in the following various roles:

- the manager or user who is faced with the decision
- the intermediary, who helps the user either by operating the terminal or as an advisor
- the decision support system builder, who develops the specific decision support programme from decision support system generators for interaction with the user

- the technical supporter, who develops additional capability for the decision support system generator, for example: new databases or new analysis models, and
- the tool smith, who develops new languages or new hardware.

Roles may of course be combined in one person and required skills may be found to range from high-level business people to management to tool smith.

3.13 Development and implementation

Approaches taken to the development and implementation of decision support systems are very different to those generally applied to traditional data processing. The information provided by decision support systems is only one element of the decision process. Schulthesis & Sumner (1995:539) summarise some of the benefits decision support systems can provide:

- The ability to examine more alternatives. Spreadsheet tools make it possible to analyse alternative ways of allocating resources in a business and to visualise the impact of these options on cash flow. Scenarios that would have taken days to construct and analyse can be viewed in minutes.
- The ability to achieve a better understanding of the business. A decision support system can help managers to analyse the long-range impact of a new marketing venture or a potential acquisition decision in a reasonable time, making it possible to foresee possible pitfalls and avoid future problems.
- The ability to respond quickly to unexpected situations. Confronted with new tax legislation, many companies have to analyse the impact of new requirements on profitability. Without decision support system tools, this type of analysis would be time consuming and limited, whereas with these systems, business models can be constructed and quickly adapted to changes in business policy and market share, and new results can be generated in days, not weeks.

- The ability to carry out *ad hoc* types of reporting and analysis. Many managers want to ask questions of existing databases and extract data relevant to current business operations, for example: a marketing manager can extract data of sales of a new product line to department store customers in Northeast Province within minutes rather than waiting for a monthly report that over-aggregates the sales data and fails to highlight important market trend.
- The ability to provide timely information for control of ongoing operations. Information from a decision support system, for example, can provide a better picture of detailed expenses by company, by division and by department. A report of energy expenses broken down by division, enable managers to spot deviations from previous years more quickly and to take remedial action to conserve resources.
- The ability to save times and costs. If a manager takes 5 hours to make a budget forecast using a spreadsheet when this analysis would have taken 20 hours to complete using a calculator, the time effectiveness of accomplishing this task improves substantially. The ability to perform "what if" analyses improves the quality of a budget forecast.
- The ability to make better decisions. Decision support systems make it possible to consider issues and alternatives that may have otherwise not been explored. Increased depth and sophistication of analyses are made possible. Complex issues, such as marketing strategy and personnel productivity, can be explored using relevant data analyses. Access to this data provides managers the opportunity to make better-informed decisions and to substantiate the decisions they have made.

Duffy & Assad (1989:40) mean that in a recent study of attitudes towards decision support system implementation, end users from a variety of industries expressed satisfaction with their decision support system and identified the criteria by which they judge a decision support system to be successful as:

- the computer information being used successfully by the end user
- the decision-making process being improved

- the system providing a permanent record of data, which supports major decisions made by the organisation
- the expectations of the end user being met
- the decision support system being flexible and able to cater for changes
- the end user being satisfied with the quality of input and output
- the fear of making errors in decision making being reduced to a certain extent
- end users perceiving the system as being cost effective, and
  the system being technically sound.

3.14 The disadvantages of decision support systems

According to Duffy & Assad (1989:40), measuring the cost of decision support systems is usually not too difficult, but measuring the benefits often is very difficult. The fundamental problem is establishing the value of a decision or set of decisions. To apply the standard cost/benefit approach to decision support systems is not possible.

Duffy & Assad (1989:40) mentions that the information provided by a decision support system is partially dependent on the personality, cognitive characteristics and information-processing skills of the person using it as well as other situational factors such as the organisational culture or belief. It is also partially dependent upon where this person directs his or her attention. The interaction of many human and organisational factors, such as these, makes a decision situation unique and sometimes extremely complex.

According to Schulthesis & Sumner (1995:538) users are given the tools to develop their own systems and system designers must respond by providing consultation, training and ongoing support. They mention that not only must most system analysts be retrained, but that user-developers within functional areas must also take on the responsibility of encouraging learning among their peers in maintaining critical departmental systems.

According to Schulthesis & Sumner (1995:539) investment in decision support system technology, development efforts and support are growing substantially. Because new versions of decision support systems are constantly evolving, the cost is difficult to quantify. Measuring the benefits of decision support systems is difficult because many of the benefits are qualitative.

There are many risks in decision support systems (Schulthesis & Sumner, 1995:541):

- Lack of quality assurance. Quality assurance refers to procedure for data validation and testing, documentation, backup and recovery that are integral parts of a good system. Without adequate validation of input data, output printed in reports may not be correct. Inadequate documentation may result in loss of hours spent designing a system. In one organisation, for example, a user spent six months developing a system for sales analysis that everyone began to depend on for weekly reports. When the developer suddenly left the organisation, the application was lost because no documentation existed. Lack of backup and recovery may result in the loss of critical data or time-consuming manual operations to re-build these files.
- Lack of data security. Lack of data security is another issue affecting user-developed decision support systems. Password security for microcomputer-based data management systems may be inadequate or non-existent.
- Changes in logic. Analysis of requirements generally involves validating the logic of a model or calculation used in data analysis. In the design of decision support systems, outputs are constantly modified and the logic used in data analysis often changes. These changes introduce the possibility of errors occurring, especially if the logic used is not continually reviewed and documented. If their logic is not validated, computer-based decision support systems may be no better than their paper-and-pencil counterparts of the past.
- Failure to understand the design alternatives. One of the common problems in user developing is a mismatch between software and design requirements. Users in one office, for example, designed a microcomputer database to store information about prospective students without anticipating the growth in file size. After six months, the prospect-data file had expanded to close to 100,000

records and simple operations such as sorting records by zip codes were no longer feasible to run on a microcomputer. If a systems analyst had assessed the short and long term needs of the user in advance, the feasibility of various design options, including a microcomputer, minicomputer and main-frame approaches could have been considered.

According to Stair & Reynolds (1999:440) there are a number of disadvantages to the decision support system approach. The decision support system by definition requires its builder to make simple assumptions. If the assumptions cause the model to deviate too much from reality, the results obtained from the model would be highly suspect. With numerous choices of models, decision-makers may spend a great deal of time deciding what model to use. In some cases, models do not accurately predict real systems, so results and conclusions may be false or misleading. Some decision support systems require a high degree of mathematical sophistication, making them extremely difficult to build and the results are very difficult to interpret. Lastly, decision support systems can be expensive to develop if they are used only once.

3.15 Conclusion

It is reasonable to state that the advantages of decision support systems (including management information systems) far outweigh the disadvantages. It becomes clear that no organisation will achieve its goals and objectives without the use of good management information and decision support systems.

CHAPTER 4

4 DATA ANALYSIS

4.1 Introduction

The available literature continues to report evidence of positive and, in some cases, excessive returns on investment in information technology (IT). Despite these positive reports, there is still a great deal of scepticism surrounding the issue of whether IT creates value for individual organisations. The issue of IT payoffs is far from resolved (Compass, 1999). While the views of some executives might be tainted by cost overruns and expensive project terminations, not all executives are equally scathing in their assessment of IT payoffs.

Opposing views complicate the task of comparing IT payoffs across organisations. In order to make sense of different viewpoints, Kraemer and Tallon (1999:4) have developed a framework within which to evaluate IT payoffs. They argue that strategic intent or goals for IT provides such a context. Porter (1996:61-77) argues that organisations focus on two key business objectives: operational effectiveness and strategic positioning. Kraemer and Tallon (1999:4) developed a set of goals for IT using contrasting areas of strategic emphasis. The resulting framework provides a useful context for evaluating the business value of IT.

Figure 2: Conceptual model of IT business, presents a conceptual overview of the relationship between strategic intent or goals for IT and realised IT payoffs, with management practices acting as a moderating variable. In order to evaluate the model a survey was conducted of executives in several departments from the Sedibeng and Emfuleni local governments:

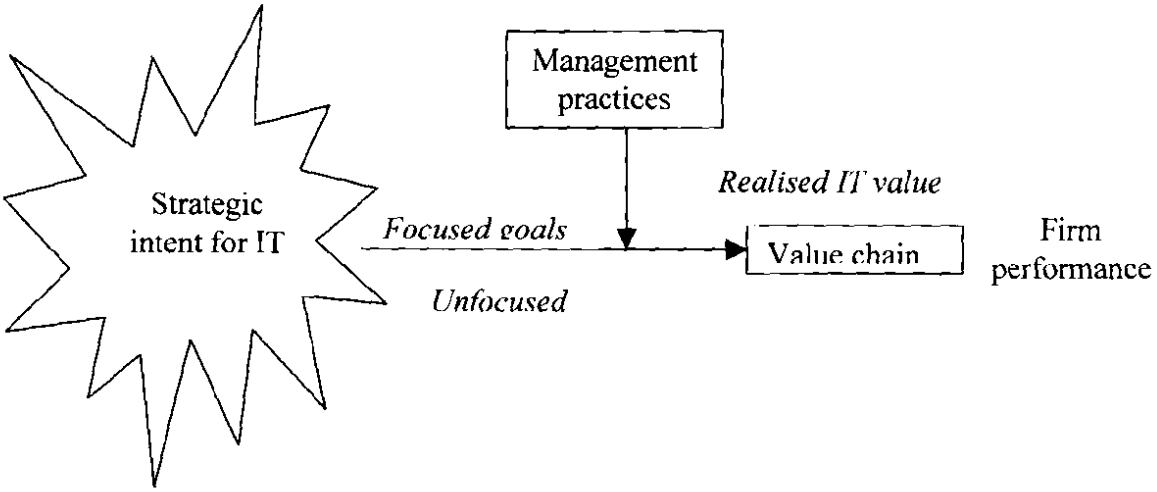


Figure 2: Conceptual model of IT business

(*Adopted from* Kraemer & Tallon, 1999:1)

In this chapter the data collection, research environment and data analysis are discussed. Basic statistical methods were used to analyse the data and the results are presented.

4.2 Data collection

A questionnaire, adopted from Kraemer & Tallon (1999:16), (see Appendix A) was used to collect data for this survey. Data was collected using a five-point Lickert-type score:

Do not agree 1 2 3 4 5 Agree completely

where the numbers represent the following meanings:

1. do not agree
2. disagree to some extent
3. uncertain
4. agree to some extent
5. agree completely

This type of questionnaire (5-point scale) can be answered quickly and enhances the possibility of the respondents completing the questionnaire.

An interactive process involving personal interviews with senior managers was conducted to explain the aim and purpose of the research. A cover letter that explained how the questionnaire should be answered, accompanied the questionnaire.

Data was collected from several departments in the Sedibeng and Emfuleni local governments. Participation was voluntary and participants were assured that their individual responses would be treated confidentially. A total of sixty-four people are employed in the different departments and questionnaires were sent to all of them. After one week the questionnaires were collected but not all were completed. Another week was allowed for employees to complete the questionnaires. After various attempts a total of forty-three completed and usable questionnaires were returned. This represents a 67% response and it was decided to continue with the data analysis.

In the next section the context variable, namely, the different goals that organisations espouse for their IT investments, is explored. Using these goals, executives' perceptions of payoffs from IT within the value chain, is evaluated to identify if there is a relationship between corporate goals for IT and perceived IT payoffs.

4.3 Corporate goals for information technology

Executives are empowered to make strategic choices that can propel their organisations toward any of several goals for IT that mirror their strategic choices. For example: corporate goals for IT could be highly focused or there might be a notable absence of focus, with IT investments lacking overall direction and a sense of shared purpose. Among those organisations with focused goals, there could be further differences in that some of them might decide to focus more on internal operational issues, while others might focus on strategic positioning and issues involving

customers and competitors, both of which might be considered external to the organisation.

The distinction between operational effectiveness and strategic positioning can be translated directly into corresponding goals for IT, as shown in Table 3: Linking business strategy with organisational goals for IT. In definitional terms, operational effectiveness entails performing similar activities better than rivals, while strategic positioning entails performing different activities or performing similar activities, but in strategically different ways. Organisations that focus on operational effectiveness "*...get more out of their inputs than others because they eliminate wasted effort, employ more advanced technology, motivate employees better, or have greater insight into managing particular activities. Operational effectiveness includes, but is not limited to, efficiency.*" (Porter, 1996:62):

Business Strategy	**Goals for IT**
Operational effectiveness	*Internal*
Efficiency	Reduced cost, increase productivity and speed
Effectiveness	Enhance overall organisational effectiveness
Strategic Positioning	*External*
Reach	Extend existing markets and geographic reach
Structure	Change industry or market practices

Table 3: Linking business strategy with organisational goals for IT

(*Adopted from* Kraemer & Tallon, 1999:4)

"*While operational activities allow some flexibility in response to market needs, they are not as capable as activities that create and enhance strategic positioning within the industry. Organisations can improve their performance by extending their access to customers in existing markets or by changing the prevailing structure or practices within the industry. Consequently, strategic positioning includes elements of reach – using IT to extend market or geographic reach, and structure – using IT to change industry or market practices*" (Kraemer & Tallon, 1999:4).

This association between business strategy and goals for IT is used in Figure 3: Corporate goals for IT, to develop an *a priori* classification of organisations based on whether their goals for IT emphasise operational effectiveness or strategic positioning, or both:

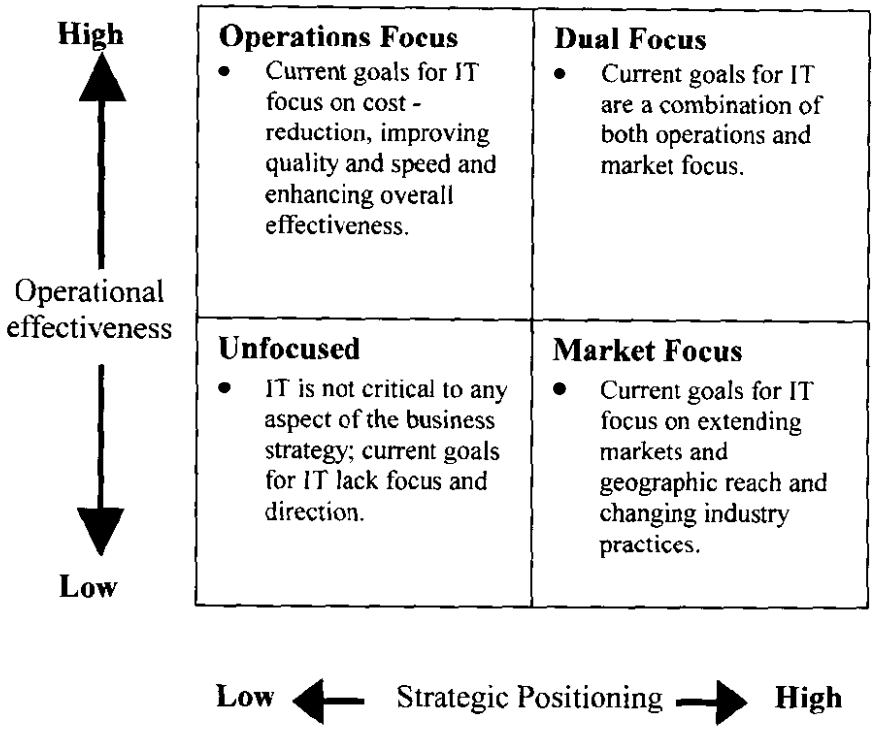


Figure 3: Corporate goals for IT

(*Adopted from* Kraemer & Tallon, 1999:5)

Organisations with no clear goals for IT fall in the lower left quadrant, which is labeled as "unfocused". This sense of indifference often leads to a situation in which IT spending is regarded as an expense to be minimised rather than an investment to be managed. It is likely that for business executives in these organisations, past experiences with IT have been largely negative. As a result, they will in all probability adopt a wait-and-see attitude to technology investment, preferring to delay investment to a point beyond which there is no alternative.

Organisations in the upper left "operations focus" quadrant have clearly defined goals for IT, centered on operational effectiveness. Operations focus organisations use IT to

reduce operating costs and enhance the overall effectiveness of business operations by focusing on quality control over their internal processes.

"Market-focus" organisations, in the bottom right quadrant, use IT to enhance their strategic positioning. These organisations use IT to create or enhance a value proposition for their customers. This does not imply that market focus organisations are deficient at using IT for operational purposes. The notion that some organisations might assign greater weight to external issues in their goals for IT might seem like an anomaly. It is argued that highly innovated organisations are likely to focus on carving out a market niche and offering superior customer services before turning to more operational issues.

While some organisations choose between operational effectiveness and strategic positioning, a growing number of organisations recognise that IT can support both foci simultaneously. Organisations that embrace this "dual focus" approach extend their use of IT beyond operational effectiveness to include market reach and new market creation. In contrast to unfocused organisations, dual focus organisations are fully convinced that IT is the key to their current and future success.

4.4 Data Analysis

The questions in the questionnaire were grouped into eleven categories (see Appendix B for the groupings). The results from each category are introduced by a table that presents the median, average, standard deviation and variance for each question in a particular category (see Appendix B for the meaning of the codes that distinguish each question):

- **Median.** The median is that point on a scale, which is exceeded by only 50 per cent of the scores in the population.
- **Average.** The average is the sum of all the scores divided by the number of scores.
- **Standard deviation.** The standard deviation is the square root of the variance.

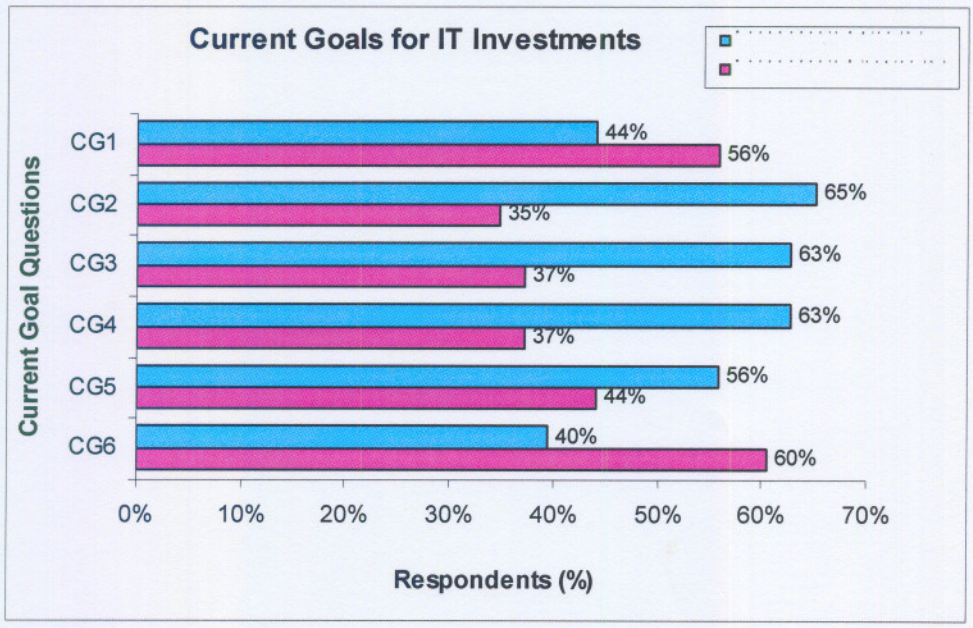
- **Variance (var, σ^2).** The variance is where each score is expressed as a deviation from the mean.

This is followed by graphical representations indicating the agreement levels of the respondents to the questions in that specific category. It is important to note that questions were answered on a five-point scale where 1, 2 and 3 are grouped together and taken as disagreement with the specific statement while 4 and 5 are grouped and taken as agreement with the statement.

4.4.1 Measuring current goals for IT in Sedibeng and Emfuleni local governments

	Median	Average	Std dev	Var
CG1	3	3.40	1.09	1.20
CG2	4	3.79	1.12	1.26
CG3	4	3.79	1.06	1.12
CG4	4	3.67	1.13	1.27
CG5	4	3.70	1.12	1.26
CG6	3	3.30	0.99	0.98

Table 4: Current goals for IT investments



Graph 1: Current goals for IT investments

Corporate goals for IT were measured using the four items derived from Table 3: Linking business strategy with organisational goals for IT. Executives were asked to rate the extent to which they agree with each item (using a 5-point Lickert scale). Based on executives' responses to these items, the two local governments of Sedibeng and Emfuleni were assigned to one of the four quadrants shown in Figure 3: Corporate goals for IT

The result is shown in Table 5: Focus of Sedibeng and Emfuleni local gogernments. It is clear from these results that the Sedibeng and Emfuleni municipalities are unfocused organisations, which means that their current goals for IT are not critical to any aspect of their business strategy; current goals for IT lack focus and direction.

What are your current goals for IT investments?	Unfocused	Operational Focus	Market Focus	Dual Focus
Operational excellence				
Reduced cost, increased productivity and speed	√			
Enhance overall organisational effectiveness	√			
Strategic Positioning				
Extend existing markets and geographic reach	√			
Change industry or market practices	√			

Table 5: Focus of Sedibeng and Emfuleni local gogernments

4.4.2 Evaluating IT business value of Sedibeng and Emfuleni local governments

Kraemer and Tallon (1999:16) compiled a set of thirty (30) items to assess the impacts of IT investments at multiple points along the value chain. These items were derived from an extensive review of literature on IT impacts and were validated by several researchers (Porter, 1995:45, Porter, 1996:76). The thirty items were grouped into six (6) process areas: process planning and support, supplier relations, production and operations, product and service enhancements, sales and marketing support, and customer relations. In this way, the 30 items (5 per process) span the value chain and capture a range of IT impacts. To measure the IT business value, executives were asked to evaluate the impact of IT on each item.

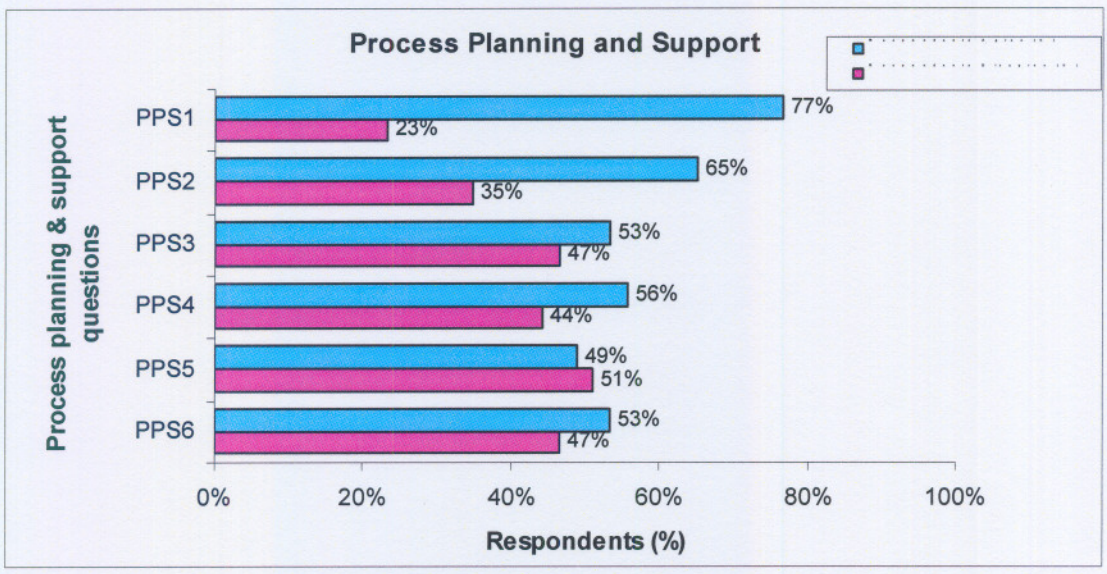
In the next six sections the results for these six process areas are displayed. Again the results from each process area is introduced by a table that presents the median, average, standard deviation and variance for each question in the particular area. This is followed by graphical representations indicating the agreement levels of the respondents for the questions in that specific area.

Following the graphical representations, is the realised IT business value for Sedibeng and Emfuleni local governments.

4.4.2.1 Process planning and support

	Median	Average	Std dev	Var
PPS1	4	4.12	0.88	0.77
PPS2	4	3.84	0.95	0.90
PPS3	4	3.60	0.98	0.96
PPS4	4	3.58	1.16	1.34
PPS5	3	3.58	1.05	1.11
PPS6	4	3.56	0.98	0.97

Table 6: Process planning and support

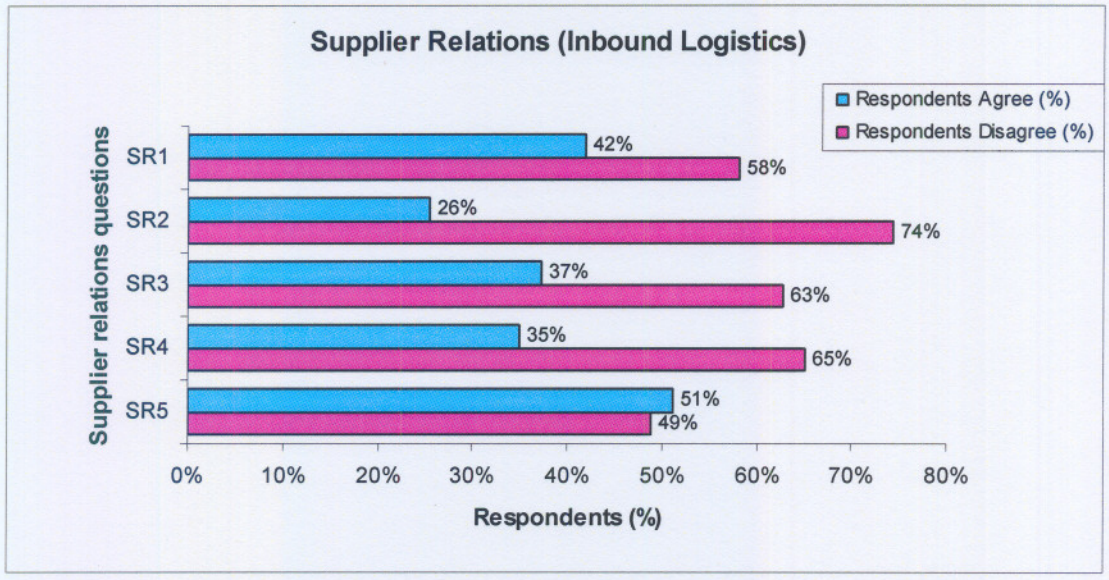


Graph 2: Process planning and support

4.4.2.2 *Supplier relations (Inbound logistics)*

	Median	Average	Std dev	Var
SR1	3	3.42	1.01	1.01
SR2	3	2.98	0.99	0.98
SR3	3	3.19	1.24	1.54
SR4	3	3.12	1.16	1.34
SR5	4	3.53	1.16	1.35

Table 7: Supplier relations

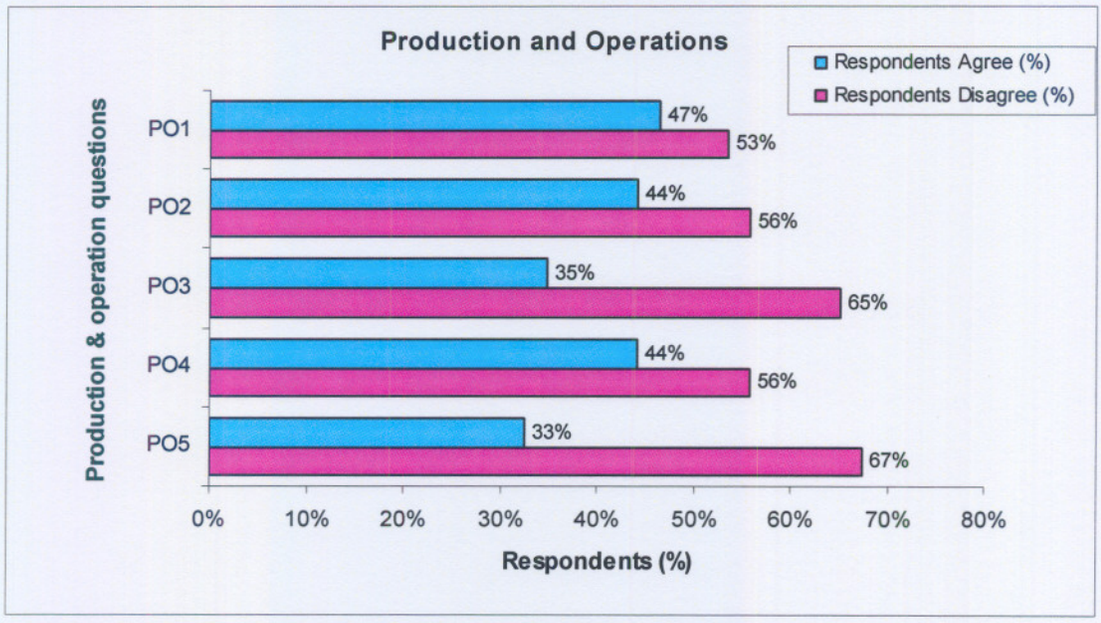


Graph 3: Supplier relations (Inbound logistics)

4.4.2.3 *Production and operations*

	Median	Average	Std dev	Var
PO1	3	3.35	1.04	1.09
PO2	3	3.42	0.96	0.92
PO3	3	3.12	1.12	1.25
PO4	3	3.44	0.93	0.87
PO5	3	3.16	1.00	1.00

Table 8: Production and operations

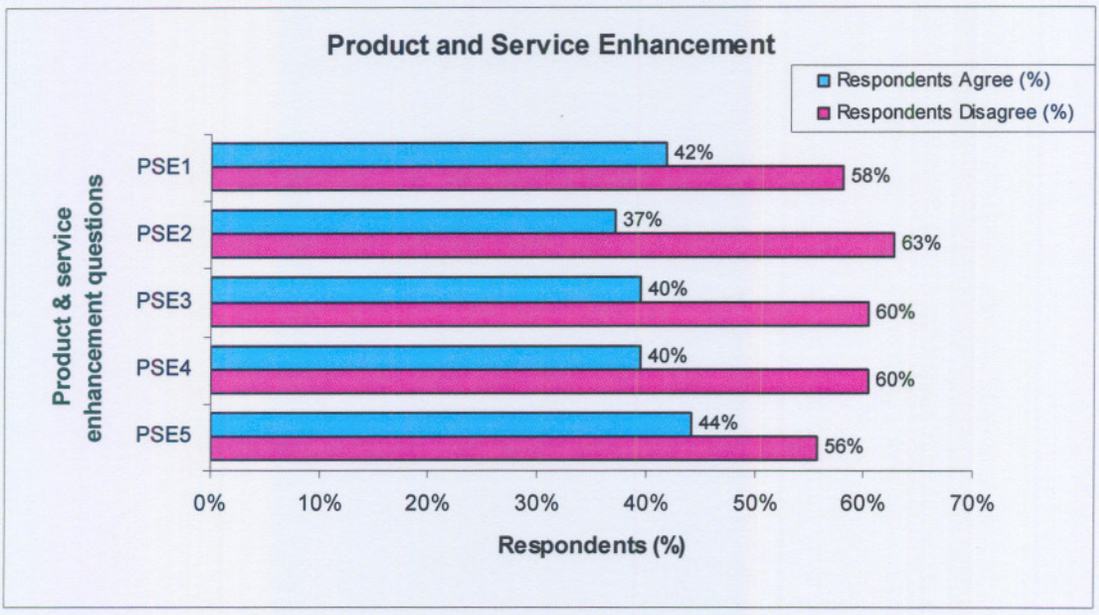


Graph 4: Production and operations

4.4.2.4 Product and service enhancement

	Median	Average	Std dev	Var
PSE1	3	3.30	1.06	1.12
PSE2	3	3.26	1.00	1.00
PSE3	3	3.37	0.93	0.86
PSE4	3	3.28	1.03	1.06
PSE5	3	3.40	1.05	1.10

Table 9: Product and service enhancement

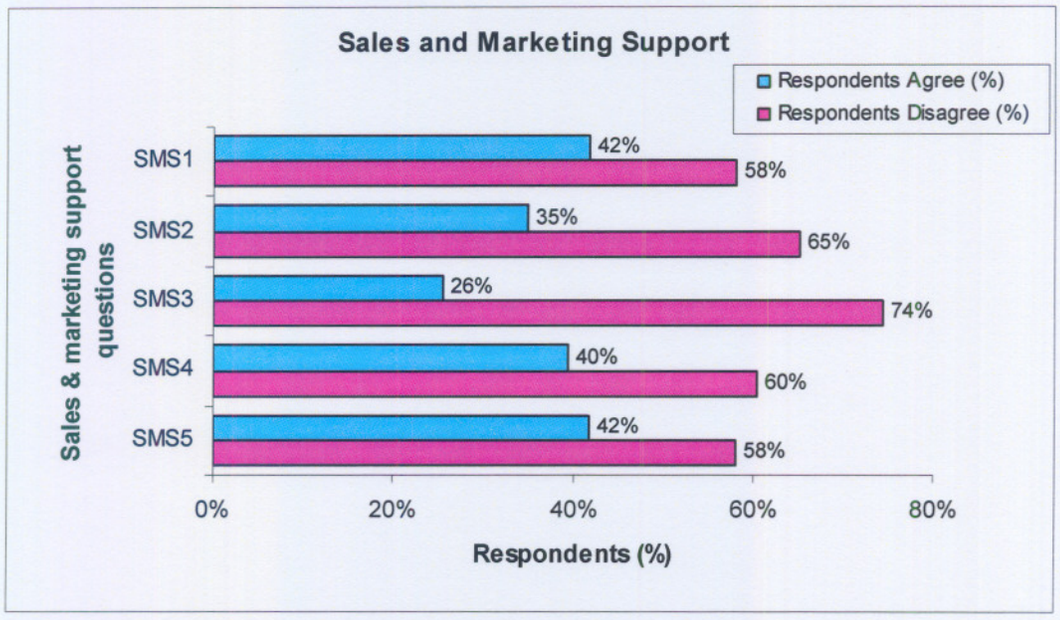


Graph 5: Product and service enhancement

4.4.2.5 Sales and marketing support

	Median	Average	Std dev	Var
SMS1	3	3.33	1.06	1.13
SMS2	3	3.14	1.08	1.17
SMS3	3	3.05	1.07	1.14
SMS4	3	3.23	1.11	1.23
SMS5	3	3.28	1.03	1.06

Table 10: Sales and marketing support

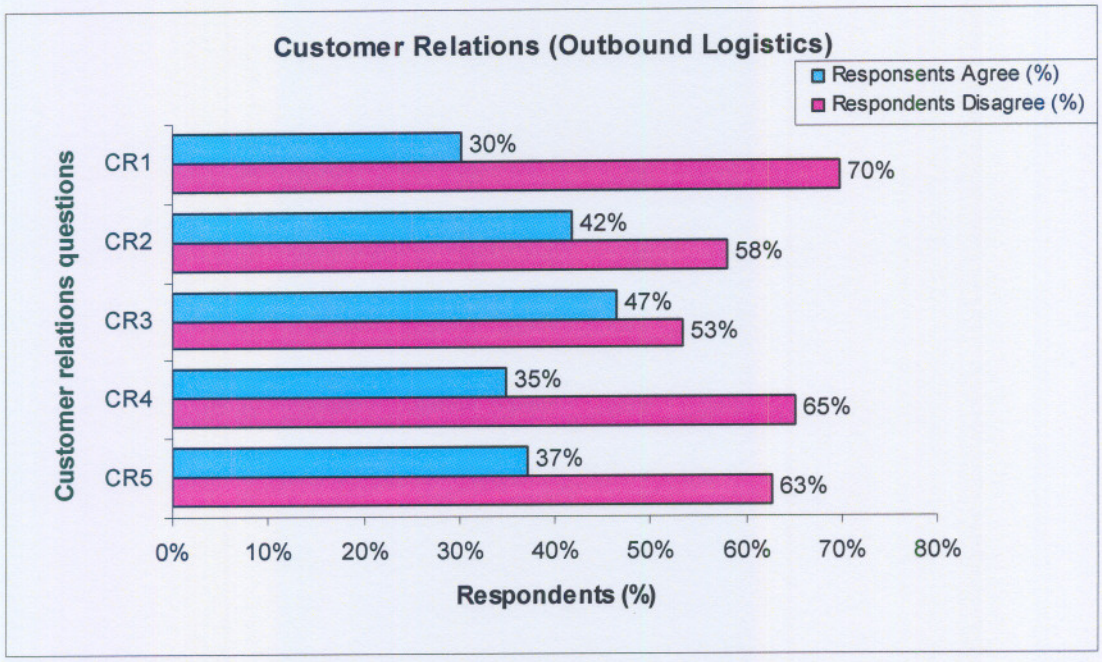


Graph 6: Sales and marketing support

4.4.2.6 Customer relations

	Median	Average	Std dev	Var
CR1	3	3.12	1.12	1.25
CR2	3	3.23	1.13	1.28
CR3	3	3.21	1.17	1.36
CR4	3	3.16	1.11	1.23
CR5	3	3.21	1.10	1.22

Table 11: Customer relations

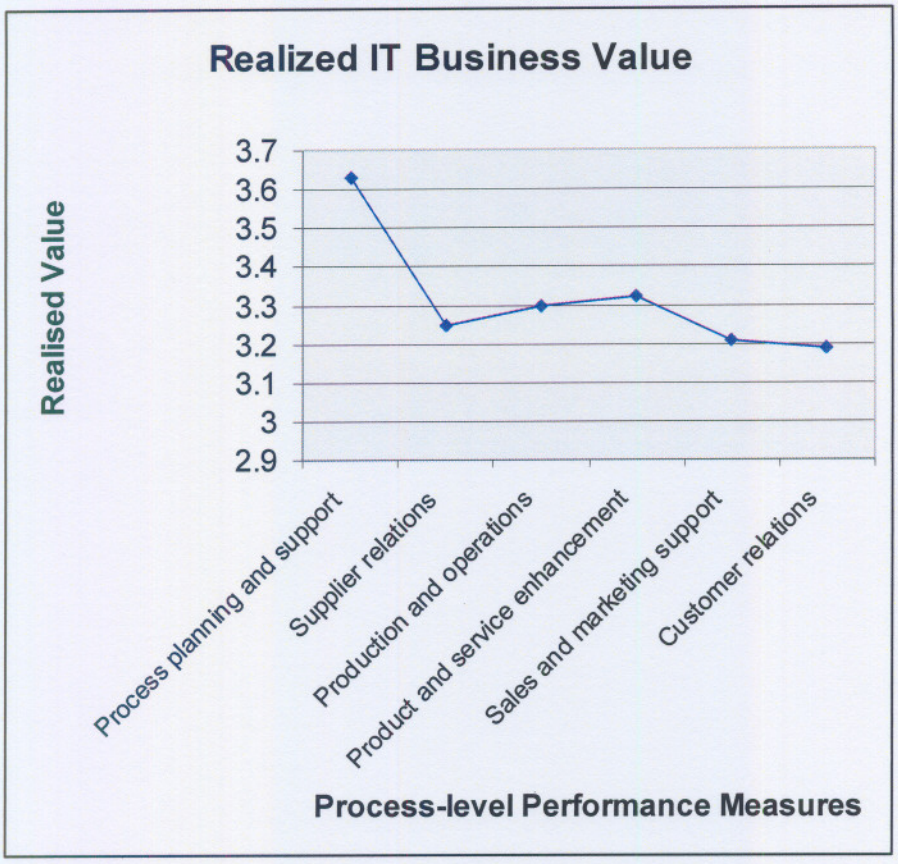


Graph 7: Customer relations (Outbound logistics)

4.4.3 Realised IT business value

An analysis of the peaks across each of the levels points to a link between the primary focus of IT business value within the value chain of goals for IT. As indicated in Graph 8, the primary focus of IT business value for Sedibeng and Emfuleni, as an unfocused organisation, is on process planning and support and support activities. Customer relation activities are last on the list of focus of IT business value.

Graph 8 presents a graphical overview of the data on perceived IT payoffs within the value chain for the focus type (unfocused) of Sedibeng and Emfuleni. Kraemer and Tallon (1999:8) mention that "*...there is evidence of distinct levels of IT payoffs that are consistent across the entire breadth of the value chain. Specially, dual-focus organisations realize the highest "level" of IT business value, followed by market-focused, operations-focused and finally unfocused organisations*".



Graph 8: Realised IT business value

4.4.4 Future goals for IT

Kraemer and Tallon (1999:9) suggest that one also consider changes in strategic capabilities in response to imposing market challenges and opportunities. This suggests that there should be some consideration of how IT competencies can be changed to meet this need. The following questions are relevant (Kraemer & Tallon, 1999:9):

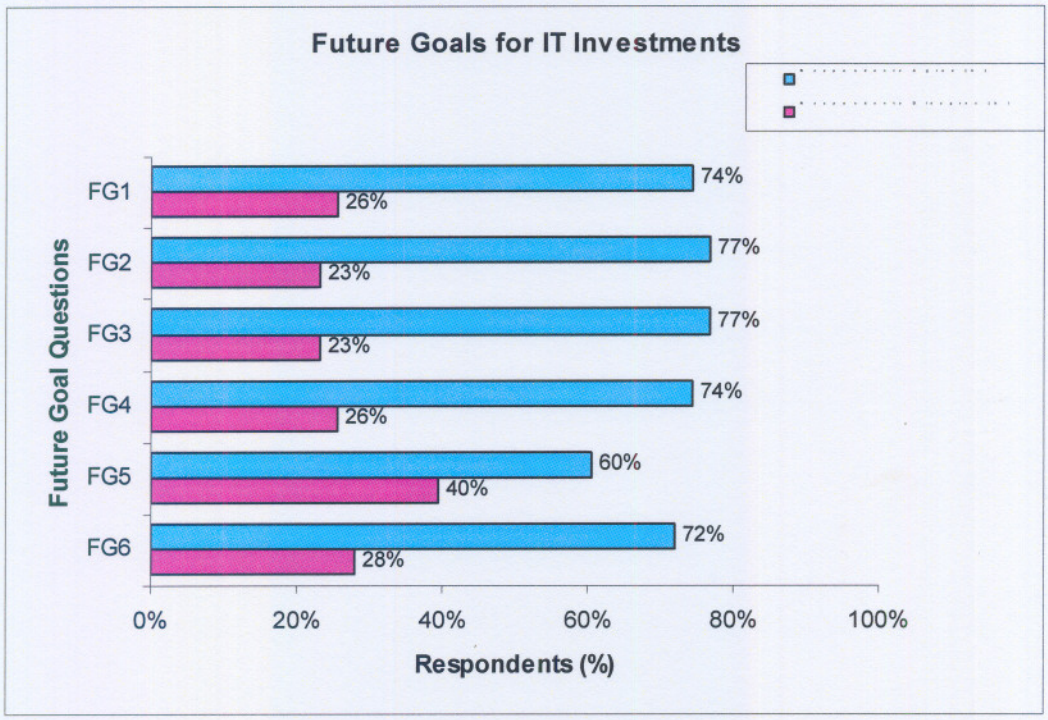
- What can we say about future goals for IT investment?
- Is there necessarily a relationship between current and future goals for IT, in that future goals constitute a logical extension of existing goals?
- How might an organisation's current level of experience with IT influence its choice of future goals for IT?

Perhaps the most important question is whether Sedibeng and Emfuleni local governments plan to become more focused in their strategic use of IT. The fact that organisations with more focused goals enjoy, at least in perceptual terms, greater payoffs from IT might be sufficient incentive for executives to consider reformulating their future goals to assign a more strategic role to IT.

To investigate this, we asked executives to identify their future goals for IT using the same type of questions used to measure the current goals for IT.

	Median	Average	Std dev	Var
FG1	4	3.98	0.96	0.93
FG2	4	4.19	0.85	0.73
FG3	4	4.21	0.86	0.74
FG4	4	4.07	0.96	0.92
FG5	4	3.86	1.04	1.08
FG6	4	3.98	0.99	0.98

Table 12: Future goals for IT investments



Graph 9: Future goals for IT investments

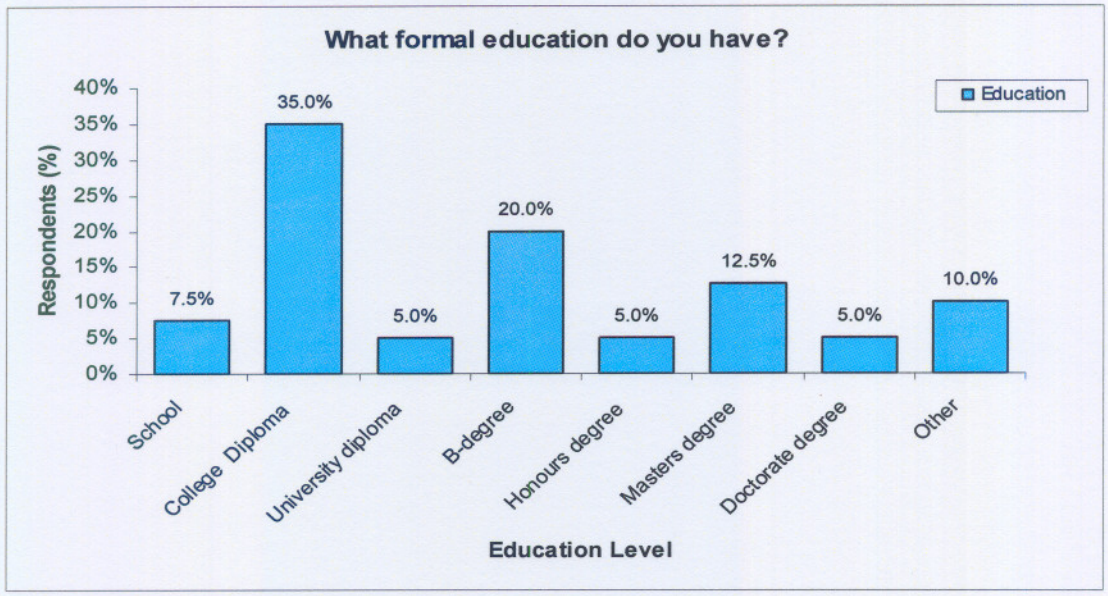
Using this information, Table 13: Executives' goals for future IT investments indicates the percentages by which executives in Sedibeng and Emfuleni local governments plan to increase their investments in IT in future. This information indicates that Sedibeng and Emfuleni local governments, as unfocused organisations, plan to make greater strategic use of IT.

What are your goals for IT investments?	Future
Operational excellence	
Reduced cost, increased productivity and speed	**28.0%**
Enhance overall organisational effectiveness	**8.0%**
Strategic Positioning	
Extend existing markets and geographic reach	**3.2%**
Change industry or market practices	
	13.6%

Table 13: Executives' goals for future IT investments

4.5 Formal education of executives in Sedibeng and Emfuleni local governments

For interest's sake we also asked the executives to indicate what formal qualifications they have. The result is shown in Graph 10: Formal qualifications of executives in Sedibeng and Emfuleni.



Graph 10: Formal qualifications of executives in Sedibeng and Emfuleni local governments

4.6 Conclusion

Changes in corporate goals for IT, as described by business executives, are significant for several reasons. Firstly, there is increasing recognition among business executives that IT can deliver strategic-level benefits, in addition to the more traditional cost-savings and productivity gains. Secondly, it appears that business executives are willing to revise their goals for IT to take these strategic capabilities into account. Thirdly, the existence of migration paths suggests that organisations tend to follow a particular pattern of IT development that is related to their previous experience.

CHAPTER 5

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Although executives, in any organisation, might accept the need to pursue a greater strategic orientation in their use of information technology, their ability to deliver the necessary capabilities is largely a function of the amount of additional resources directed to information technology.

5.2 Findings

According to Kraemer and Tallon (1999:13), business executives worldwide differ systematically in their goals for IT. These differences are important as they influence the scale and direction of IT investment decisions and ultimately, the extent to which these investments will impact firm performance. Their research found four distinct perspectives or goals for IT: unfocused, operations-focus, market-focus, and dual-focus. While executives in unfocused organisations are indifferent towards IT, those in operations-focus organisations emphasise IT investment for efficiency and effectiveness. Market-focus organisations focus on using IT for market expansion or market creation. Dual-focus organisations have a combined focus on operational and strategic issues.

Fishbein and Ajzen (1975:54), in their theory of reasoned action, propose a relationship that links beliefs, attitudes, intentions, and behaviors. In recognition of the increasing role that executives play in IT decisions, the objective of this study is to:

5.2.1 Aim 1

Survey executives in the Sedibeng and Emfuleni municipalities on their goals for IT and their perceptions of realised IT payoffs.

With regard to the first aim of this research the following deduction can be made:

- It is clear from the results obtained in this research that Sedibeng and Emfuleni local governments are unfocused organisations. This means that their current goals for IT are not critical to any aspect of their business strategy; their current goals for IT lack focus and direction. Graph 8: Realised IT business value presents a graphical overview of the data on perceived IT payoffs within the value chain for Sedibeng and Emfuleni local governments. Customer relation activities are lowest on the list of focus of IT business value.

5.2.2 Aim 2

Evaluate executives' perceptions of payoffs from IT within the value chain to identify if there is a relationship between corporate goals, IT and perceived IT payoffs.

With regard to the second aim of this research the following deduction can be made:

- An analysis of the "peaks" across each of the levels points to a link between the primary focus of IT business value within the value chain and goals for IT. As indicated in Graph 8: Realised IT business value, the primary focus of IT business value for Sedibeng and Emfuleni governments, as unfocused organisations, is on process planning and support activities.

5.3 Recommendations

Table 13: Executives' goals for future IT investments indicates the percentages by which executives in Sedibeng and Emfuleni local governments plan to increase their investments in IT in the future. This information indicates that Sedibeng and Emfuleni local governments, as unfocused organisations, plan to make greater strategic use of IT. Although the intention is to increase their investments in IT, the planned increase is not enough for a transition from an unfocused organisation to a dual-focus organisation.

- This research recommends that Sedibeng and Emfuleni local governments seriously consider their investments in IT and increase it far beyond the planned increase as indicated by executives in the organisations.
- Sedibeng and Emfuleni local governments must make the transition from unfocused organisations to dual-focus organisations.

5.4 Future Research

- Research is needed to determine exactly what is needed for Sedibeng and Emfuleni municipalities to make the transition from unfocused organisations to dual-focus organisations.
- Remaining issues that need to be addressed are competencies and management practices that Sedibeng and Emfuleni can use to help them to make a successful transition to new goals for IT.

5.5 Conclusion

In this chapter a summary of the completed research process was given.

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APPENDIX A: IT BUSINESS VALUE QUESTIONNAIRE

Please evaluate the following statements. In our organisation...	
IT reduces our costs	1 2 3 4 5 Do not agree Agree completely
IT increases quality	1 2 3 4 5 Do not agree Agree completely
IT increases speed	1 2 3 4 5 Do not agree Agree completely
IT enhances the effectiveness of our overall performance	1 2 3 4 5 Do not agree Agree completely
IT extends our market and geographic reach	1 2 3 4 5 Do not agree Agree completely
IT helps us to change services and practices where and when applicable	1 2 3 4 5 Do not agree Agree completely
IT should reduce our costs in future	1 2 3 4 5 Do not agree Agree completely
IT should increase quality in future	1 2 3 4 5 Do not agree Agree completely
IT should increase speed in future	1 2 3 4 5 Do not agree Agree completely
IT should enhance the effectiveness of our overall performance in future	1 2 3 4 5 Do not agree Agree completely
IT should extend our market and geographic reach in future	1 2 3 4 5 Do not agree Agree completely
IT should help us to change services and practices in future where and when applicable	1 2 3 4 5 Do not agree Agree completely
IT improves internal communication	1 2 3 4 5 Do not agree Agree completely
IT improves internal coordination	1 2 3 4 5 Do not agree Agree completely
IT strengthens strategic planning	1 2 3 4 5 Do not agree Agree completely
IT enables your company to adopt new organizational structures	1 2 3 4 5 Do not agree Agree completely
IT improves management decision making	1 2 3 4 5 Do not agree Agree completely
IT streamlines business processes	1 2 3 4 5 Do not agree Agree completely
IT helps your corporation gain leverage over its suppliers	1 2 3 4 5 Do not agree Agree completely
IT helps reduce variance in supplier lead times	1 2 3 4 5 Do not agree Agree completely
IT helps develop close relationships with suppliers	1 2 3 4 5 Do not agree Agree completely
IT improves monitoring of the quality of products/services from suppliers	1 2 3 4 5 Do not agree Agree completely
IT enables electronic transactions with suppliers	1 2 3 4 5 Do not agree Agree completely
IT improves production throughput or service volumes	1 2 3 4 5 Do not agree Agree completely
IT enhances operating flexibility	1 2 3 4 5 Do not agree Agree completely
IT improves the productivity of labor	1 2 3 4 5 Do not agree Agree completely
IT enhances utilization of equipment	1 2 3 4 5 Do not agree Agree completely
IT reduces cost of tailoring products or services	1 2 3 4 5 Do not agree Agree completely

IT enhances the value of products/services by embedding IT in them	1 2 3 4 5 Do not agree Agree completely
IT decreases the cost of designing new products/services	1 2 3 4 5 Do not agree Agree completely
IT reduces the time to market for new products/services	1 2 3 4 5 Do not agree Agree completely
IT enhances product / service quality	1 2 3 4 5 Do not agree Agree completely
IT supports product / service innovation	1 2 3 4 5 Do not agree Agree completely
IT enables the identification of market trends	1 2 3 4 5 Do not agree Agree completely
IT increases the ability to anticipate customer needs	1 2 3 4 5 Do not agree Agree completely
IT enables sales people to increase sales/service per customer	1 2 3 4 5 Do not agree Agree completely
IT improves the accuracy of sales/service forecasts	1 2 3 4 5 Do not agree Agree completely
IT helps track market response to pricing strategies	1 2 3 4 5 Do not agree Agree completely
IT enhances the ability to provide after-sales service and support	1 2 3 4 5 Do not agree Agree completely
IT enhances the flexibility and responsiveness to customer needs	1 2 3 4 5 Do not agree Agree completely
IT improves the distribution of goods and services	1 2 3 4 5 Do not agree Agree completely
IT enhances the ability to attract and retain customers	1 2 3 4 5 Do not agree Agree completely
IT enhances you to support customers during the sales/service process	1 2 3 4 5 Do not agree Agree completely
Does you organisation have a business strategy?	1 2 3 4 5 Do not agree Agree completely
Does you organisation have an IT strategy?	1 2 3 4 5 Do not agree Agree completely
Does the IT strategy support your business strategy?	1 2 3 4 5 Do not agree Agree completely

APPENDIX B: GROUPING OF QUESTIONS

Current Goals for IT investments	
Please evaluate the following statements. In our organisation...	
CG1	IT reduces our costs
CG2	IT increases quality
CG3	IT increases speed
CG4	IT enhances the effectiveness of our overall performance
CG5	IT extends our market and geographic reach
CG6	IT helps us to change services and practices where and when applicable

Future Goals for IT investments	
Please evaluate the following statements. In our organisation...	
FG1	IT should reduce our costs in future
FG2	IT should increase quality in future
FG3	IT should increase speed in future
FG4	IT should enhance the effectiveness of our overall performance in future
FG5	IT should extend our market and geographic reach in future
FG6	IT should help us to change services and practices in future where and when applicable

Process Planning and Support	
Does Information Technology...	
PPS1	IT improves internal communication
PPS2	IT improves internal coordination
PPS3	IT strengthens strategic planning
PPS4	IT enables your company to adopt new organizational structures
PPS5	IT improves management decision making
PPS6	IT streamlines business processes

Supplier Relations (Inbound Logistics)	
SR1	IT helps your corporation gain leverage over its suppliers
SR2	IT helps reduce variance in supplier lead times
SR3	IT helps develop close relationships with suppliers
SR4	IT improves monitoring of the quality of products/services from suppliers
SR5	IT enables electronic transactions with suppliers

Production & Operations	
P01	IT improves production throughput or service volumes
P02	IT enhances operating flexibility
P03	IT improves the productivity of labor
P04	IT enhances utilization of equipment
P05	IT reduces cost of tailoring products or services

Product & Service Enhancement	
PSE1	IT enhances the value of products/services by embedding IT in them
PSE2	IT decreases the cost of designing new products/services
PSR3	IT reduces the time to market for new products/services
PSE4	IT enhances product / service quality
PSE5	IT supports product / service innovation

Sales & Marketing Support	
SMS1	IT enables the identification of market trends
SMS2	IT increases the ability to anticipate customer needs
SMS3	IT enables sales people to increase sales/service per customer
SMS4	IT improves the accuracy of sales/service forecasts
SMS5	IT helps track market response to pricing strategies

Customer Relations (Outbound Logistics)	
CR1	IT enhances the ability to provide after-sales service and support
CR2	IT enhances the flexibility and responsiveness to customer needs
CR3	IT improves the distribution of goods and services
CR4	IT enhances the ability to attract and retain customers
CR5	IT enhances you to support customers during the sales/service process

Strategic Alignment	
SA1	Does you organisation have a business strategy?
SA2	Does you organisation have an IT strategy?
SA3	Does the IT strategy support your business strategy?

Education		
What formal education do you have? Please mark one.		
EDU1	School	
EDU2	College diploma	
EDU3	University diploma	
EDU4	B-degree	
EDU5	Honours degree	
EDU6	Masters degree	
EDU7	Doctorate degree	
EDU8	Other	