A CONCEPTUAL FRAMEWORK FOR INFORMATION MANAGEMENT

by

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Crescat Scientia, Vita Excolatur

(Let knowledge grow and life be enriched)

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Nay, be a Columbus to whole new continents and worlds within you, opening new channels, not of trade, but of thought. Every man is the lord of a realm beside which the earthly empire of the Czar is but a petty state, a hummock left by the ice" - Henry David Thoreau (1817-1862)

Doing this study was similar to being at a new and beautiful place for the first time. There is a new discovery, a new surprise, around each corner and down each alley. One stands in wonder and experiences with all the senses. But while one pauses in admiration, other life goes on and, life being what it is, one cannot be at two places at the same time, nor can one do two things at the same time. It calls for a compromise; sacrificing one thing to gain another.

I would like to mention the following people who contributed in some way or another to make this study possible:

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- During the course of the study, two of my employers, the Development Bank of Southern Africa and Nissan (South Africa) Pty. Ltd. provided me with appropriate computer equipment at home to prepare the document. Their contribution is appreciated. It is hoped that this study will contribute to improved information management at their institutions.

Above all, I owe everything to the Lord, Jesus Christ, who, mercifully, gave me this opportunity and provided me with the strength and abilities to complete it. To Him be all the glory.

EXPLANATORY NOTES

The following notes are provided to explain some of the conventions used in this study:

1. The use of "he" and "his" does not denote gender, but infers "anyone".

2. Quotations are enclosed in quotation marks.

3. Words in square brackets enclosed in quotations have been inserted by the author to improve readability, or applicability of the quote.

ABSTRACT

A CONCEPTUAL FRAMEWORK FOR INFORMATION MANAGEMENT

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Popular writers and experts say that we are living in an "Information" era, that we have become an "Information" society with an "Information" economy. Businesses have come to realise the importance of information for the survival of the enterprise in a business world which is becoming increasingly complex. This realisation led to the concept of "managing information as a resource".

This concept has the underlying assumptions that we know what information and information resources are, that information is indeed a resource and that information can indeed be managed. The purpose of this study is to evaluate these assumptions and to propose a framework for information management.

Information is strongly linked to data, knowledge and wisdom. These terms are often used interchangeably in ordinary language. For the purposes of this study more accurate definitions were proposed. Data are unevaluated attributes, information is data put into perspective and context while knowledge is justified, true beliefs. Wisdom is a special ability of a person to make meaningful "connections" between his own knowledge and information thereby exhibiting insight into a given situation.

Information can only exist in the human mind as that is the only place where meaning can be added. Information can be made tangible by putting it on paper or through verbal expression, but, once outside the mind, it can, at most, be called information resources. The process of transforming data into information resources and transforming information resources into information and knowledge is called the information process. This process is reversible and iterative.

Every single human being needs information in order to survive. It is a basic human need. It plays an important role in learning and in communication with an equally important role in society. It has strong implications regarding the individual's rights to privacy and access to information. The use of information by society has an influence on culture and it shapes a new economy which is based on services and knowledge. It has the ability to replace capital and becomes "capital" in itself. Because of its importance to individuals, business, on a national and international basis, information needs to be managed.

Information management means the cost-effective management of the information process, the information resources and the information infrastructure in pursuit of predetermined goals. It is a centralised function within the organisation with the purpose of facilitating and providing the framework needed within which to manage information. The management of information means that the information resources allocated to individuals are managed prudently and is the responsibility of each individual. The management of information takes place within the framework provided by the information management function.

Information *is* a resource and a manageable one. Considering that a change in a person's knowledge occurs when presented with information, another dimension becomes evident, namely, that of a process; the process of informing. Both these dimensions need an infrastructure in support. Information management is the management of the resource dimension, the process dimension and of the infrastructure and calls for an holistic management approach. The aim of information management is to mobilise the data, information and knowledge resources into productive action. That is the challenge facing individuals, organisations and governments.

SAMEVATTING

'n KONSEPTUELE RAAMWERK VIR INLIGTINGSBESTUUR

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Populêre skrywers en deskundiges beweer dat ons in 'n "inligtings"-era leef en dat ons 'n "inligtings"-samelewing geword het wat op 'n "inligtings"-ekonomie gebaseer is. Ondernemings het lankal reeds die waarde van inligting vir hul oorlewing besef in 'n sakewêreld wat toenemend kompleks geword het. Hierdie besef het gelei tot die konsep: "Die bestuur van inligting as 'n hulpbron".

Hierdie konsep berus op die aannames dat ons weet wat inligting is, dat ons weet wat inligtingshulpbronne is, dat inligting weliswaar 'n hulpbron is en dat dit inderdaad bestuur kán word. Die doel van hierdie studie is om die aannames te toets en om 'n raamwerk vir inligtingsbestuur voor te stel.

Die begrip "inligting" staan in noue verband tot die begrippe data, kennis en wysheid. In die gewone omgangstaal word hierdie begrippe dikwels as sinonieme gebruik. Vir die doeleindes van hierdie studie moes meer akkurate definisies gevind word. Data is ongeëvalueerde eienskappe, inligting is data wat in perspektief en binne konteks geplaas is en kennis is geregverdigde, ware oortuigings. Wysheid is a spesiale eienskap wat iemand besit om betekenisvolle "verbindings" te maak tussen die kennis en inligting wat hy reeds besit om sodoende besondere insig in 'n gegewe situasie te toon.

Inligting kan slegs in die menslike brein bestaan aangesien betekenis slegs daar toegevoeg kan word. Inligting kan wel tasbaar gemaak word deur dit op papier te plaas of deur verbale uitdrukking, maar sodra dit buite die brein is, kan dit hoogstens as inligtingshulpbronne beskryf word. Die proses waardeur data tot inligtingshulpbronne en inligtingshulpbronne tot

inligting en kennis omvorm word, word die inligtingsproses genoem. Hierdie proses is omkeerbaar en iteratief.

Elke enkele mens het inligting nodig om te lewe. Dit is 'n basiese menslike behoefte. Dit speel 'n belangrike rol in die leerproses en in kommunikasie en is derhalwe belangrik in die samelewing. Dit het sterk implikasies vir die individu se reg tot privaatheid en sy reg van toegang tot inligtingshulpbronne. Die gebruik van inligting deur die samelewing het 'n invloed op kultuur en skep 'n ekonomie wat op dienste en kennis gebaseer is. Dit het die eienskap dat dit kapitaal kan "verplaas" en dat dit "kapitaal" op sigself kan word. As gevolg van die belangrikheid vir individue, sakeondernemings en regerings, moet inligting bestuur word.

Inligtingsbestuur beteken die koste-effektiewe bestuur van die inligtingsproses, die inligtingshulpbronne en die inligtingsinfrastruktuur ter bereiking van voorafbepaalde doelwitte. Dit is 'n gesentraliseerde funksie binne die onderneming met die doel om te fasiliteer en die raamwerk daar te stel waarbinne inligting bestuur moet word. Die bestuur van inligting, daarenteen, beteken dat die inligtingshulpbronne wat aan individue binne die onderneming toegedeel is, met omsigtigheid en verantwoordelikheid bestuur moet word. Laasgenoemde is die verantwoordelikheid van elke individu. Die bestuur van inligting vind plaas binne die raamwerk wat deur inligtingsbestuur verskaf word.

Inligting *is* 'n hulpbron en dit *is* bestuurbaar. As daar in ag geneem word dat 'n verandering in 'n persoon se kennis plaasvind wanneer hy met inligting gekonfronteer word, word 'n ander dimensie duidelik, naamlik, dié van 'n proses; die proses van "om ingelig te word". Beide hierdie dimensies benodig 'n infrastruktuur ter ondersteuning. Inligtingsbestuur is die bestuur van die hulpbrondimensie, die prosesdimensie en van die infrastruktuur en verg 'n holistiese bestuursbenadering. Die doel van inligtingsbestuur is om die data, inligtings- en kennishulpbronne te mobiliseer tot produktiewe aksie. Dit is die uitdaging aan individue, ondernemings en regerings.

CHAPTER 1

1 PURPOSE, RESEARCH PHILOSOPHY AND STRUCTURE

1.1 Introduction

This chapter serves to introduce the subject of the research to the reader. For any research to be meaningful, it has to serve a purpose and for that reason the first part of this chapter deals with the purpose of the study. It gives the background against which the research takes place and justifies the research based upon an identified problem. The problem thus defined then guides the research and unless an answer is obtained for, or, at least, proposed to address this problem, the research cannot be said to be successful.

It is then explored in the chapter what the objectives of the study are. These become the parameters within which the study takes place. The objectives define what is going to be researched and what is being excluded. Once the objectives have been defined, the contribution of the study is explored.

Any researcher does his research from a certain viewpoint and especially in the ambit of the social sciences, such viewpoints can be from various schools of thought. The philosophical points of departure for this particular study are described in this chapter.

Lastly, this chapter describes the structure of the thesis.

1.2 Purpose of research

1.2.1 Background

Water, land, minerals, etc. are the oldest resources and have been utilised by early man in its natural form. First, man lived off the land, using what was freely available. He soon, however, invented artifacts and started to produce goods, slowly evolving from an agriculturally-based society to an industrially-based society, in the process realising a need for financial resources to facilitate the marketplace. This utilisation of financial resources in the production process eventually led to the birth of a discipline called "Financial Management", that is, the management of the firm's financial resources.

Whereas previously, human resources were seen as a means to an end only, more emphasis was being placed in the 20th century on man himself. Man emerged as one of the most important resources utilised in the production process. This led to the discipline called "Human Resources Management", that is, the management of the firm's human resources (Horton, 1979: ix).

Today we have complete disciplines for the management of natural, physical, material, financial and human resources. For each of these disciplines there is a set of rules, principles, doctrines, standards and practices. "Each of these has a body of knowledge surrounding it and a set of principles devoted to its management" (Ross, 1970: 11). The shelves of libraries are full of literature on these disciplines and, by far, most of these sources of literature agree with each other on the subjects. Nobody questions the validity of the management of financial and human resources any more and by now everyone accepts that they are resources to be managed according to well-established theories and practices.

Relatively recently information became of major importance to the individual in his daily life as well as to business. Information is necessary for just staying in business - a ticket to the game, so to speak - but also to gain a competitive edge over the competition. Man has evolved from the early agricultural age, through an industrial age into an "information age". Information emerged as the newly discovered resource. Sunter (1987: 39), having taken part in an exercise for the Anglo American Mining House to set different scenarios for the year 2000 and beyond, writes the following: "The future war in the world, in terms of trade, will be fought more on knowledge and less on raw materials". He finds the proof in the world situation where (at that time) the US and the USSR were locked in star wars programs while Japan has passed both of them in terms of per-capita income and yet spending virtually nothing on weapons. The success of Japan can, *inter alia,* be contributed to its economic success which is based on effective decision making by leaders. Without information, decision making becomes guesswork.

Information is not only important to commerce and industry, but also to the individual. As Norman Wiener puts it: "To live effectively is to live with adequate information" (Hussain and Hussain 1984: 589). Man, as will be shown later on, needs information as one of his most basic needs.

It is best summarised in the report (in Horton, 1979: 64) by the US "National Commission on Libraries and Information Science": "Information, whether in the raw form of empirical data, or in a highly processed form we call 'knowledge', has become to be regarded as a national resource as critical to the Nation's well-being and security as any other natural resource, such as water or coal".

Despite the growing importance attached to information over the last few years, even to the point where it has become popular to talk and write about "information management", no uniformly accepted discipline is available for such management. Worse, there is not even general agreement on the question of what information is. This stands in sharp contrast to the management of the other resources which, as was pointed out, all have well-established theories and practices.

It is easy to say and write that information should be managed as a resource and that information as a resource must be put on par with the other resources: Human resources and financial resources. It is far more difficult to define what is meant by it and to put it into practice.

1.2.2 Problem definition

The information age is facilitated by the use of computer technology. Naisbitt (1984:28) remarks: "Computer technology is to the information age what mechanization was to the industrial revolution". Yet, despite all the billions of computer printouts being produced each day, the information needs of the decision makers are not always fulfilled. "What is needed ...is not more paper or raw data, but distilled, summarized information that can be accessed, assimilated, and used more effectively, particularly by managers" (Synott and Gruber, 1981: 3).

The problem is not that information is not available, but that it is available in the wrong form, is made available at the wrong time or that it is not accessible and digestible to the user. It seems as if it is hidden away somewhere. Technology, and more specifically, computer technology, helps in handling the huge masses of information, but technology "...*per se* is not the answer: technology alone ...is 'dead metal'" (Cronin, 1985: 7). Information technology alone is therefore definitely not the answer to the information glut, on the contrary, through its vast capabilities and capacities, it is adding to the glut. "We are drowning in information but starved for knowledge", writes Naisbitt (1984: 24).

The solution proposed by many is to manage information as a true resource of the organisation. "The time has come for managers to reassert control over their information and their organisation" (Tricker, 1982: 1). Diebold (1979: 41) puts it even stronger: "The organisations that will excel in the 1980's will be those that manage information as a major resource". Embedded in these statements are two factors: Firstly, that information *is* a resource and, secondly, that it *can* be managed.

The emphasis, therefore, does not so much lie on the collection or the production of information as it does on its management. A statement like "information must be managed" may appear unnecessary because of its obviousness and because it seems like common sense. Bryce (1987: 90), however, warns: "Common sense, it seems, is not very common" and then gives various examples where things that should be done, are in fact not being done despite the fact that it makes "common sense" to do it.

If the solution is so obvious, why is it that information is not managed? Amongst others, the reasons could be one or more of the following:

- The nature and character of information is not understood. There are important differences between data, information and knowledge. These differences and the relationship between them, are apparently not always taken cognisance of.

- Information is not treated as a scarce resource and managed as such, that is, information is a "free good", like air.

- Taking the literature on the subject of information alone, one finds many different and sometimes downright conflicting views on the same aspect of information and its management, as will be shown in the later chapters. Experts, usually representing different schools of thought on the subject, even differ on what information really is. Considering the wide range of disciplines interested in information as a concept, eg. information and library science, computer science, linguistics, philosophy and others, as well as the different schools of thought within these disciplines, these differences are hardly surprising. This must lead to confusion to the manager who is trying to understand the subject or sell the idea to senior management.

- People *want* to manage information, but they simply do not know *how* to manage information. One's intuition convinces one that information is important and that it should be managed, however, when sitting down to actually do it, one finds that one does not know where or how to start. Books and articles on the subject also do not provide straight answers and recipes.

Underlying the proposition that information must be managed as a resource, is the assumption that it is indeed *possible* to manage it. This aspect is not getting much attention. Numerous writers contend that information must be managed, fewer writers address the question of *how* it should be managed and even fewer address the question of whether it *can* be managed.

The problem that will be addressed in this thesis is the paradoxical phenomenon that information is seemingly available in abundance on the one hand, while the need for information is, on the other hand, not satisfied. The proposition that information must be managed and, more specifically, be managed as a resource, will be evaluated as a solution to the problem.

1.2.3 Objectives of the study and research questions

The first objective is to research critically and evaluate the proposition that information can be classified as a resource. Information and information management mean many things to many people and often, explicitly and implicitly, conflicting views on these subjects are found.

This objective leads to the following research questions:

- In order to evaluate this proposition, it will be necessary, first and foremost, to address the question of what the nature and characteristics of information are. A stand will have to be taken regarding what information is, what data is, what knowledge is and what wisdom is and, very importantly, what the relationship between these concepts is.

  In order to add more clarity, the definition of information needs to be enhanced by exploring other related and often confusing terms and disciplines dealing with the subject. What is meant by the terms information resources, information sources, information assets and information systems? Disciplines to be investigated and their viewpoints evaluated would include information and library science, information theory and computer science.

- Secondly, where does information manifest itself in a narrow context? What are the uses of information, what is its value, its cost, its uniqueness, its empowering nature and finally, its role in the decision-making process? In the process of obtaining answers to these questions, it will be important to look closely at the life-cycle of information.

- All of the above will lead to the definition of information and the other related terms. The third research question will be to look at information in a broad framework, that is, the different contexts where information manifests itself. Where does information fit into the world around us? This will be done in terms of information and the individual, information and society, information and the economy, information and business, information in national context and information in global context. This will provide a broad, contextual framework for information.

- Having analysed information in the way described above, the question posed in the first place can be answered: Is information a resource and if found to be true, is it perhaps more than a resource?

The second objective is to research the proposition that information is something which can, in fact, be managed. This objective leads to the following research questions:

- Firstly, what is "information management" and, what is "the management of information"? As will be shown, information management means many things to many people. Librarians, as an example, have something specifically in mind when they talk about information management. A computer scientist may have something completely different in mind when he uses the same term. None of them may be right and yet, all of them may be right, depending, naturally, on their definitions of information management. Clarification of this term is essential as much confusion seems to exist.

- Secondly, can a conceptual framework or model be developed (if it is found not to exist) to show the relationship between information and its related terms (data, knowledge, wisdom) and aspects such as information technology and information systems which obviously must stand in some relationship to each other.

- The third research question to be answered is whether the general principles of management can be applied to information. An answer is necessary to resolve the issue of whether information can in fact be managed. This will be done taking into consideration the special characteristics of information and the conceptual model of what information management is.

- The above three questions will lead to the fourth, crucial question: Can information be managed? As will be shown, information is something elusive and, even though it may be possible to define and describe it accurately, it does not follow automatically that it can be managed.

It is therefore important to realise that the study will focus on the "what", rather than the "why" or the "how" of information management. It is felt, and will be proven in the study, that the "what" has not been sufficiently addressed before by taking into account the viewpoints of the majority of disciplines. Even though it could possibly be argued from within a single discipline that the "what" is well understood *in that discipline,* it becomes an open question once again when the different disciplines are considered together,.

The research will provide guidelines for the "how to (manage information)" issue, but the scope will not be extended to cover it in detail. This will broaden the scope too much. It is acknowledged that the "how to" question is a relevant and important one and that it is a logical extension to the research proposed in this study. It is felt, however, that it warrants a study on its own.

1.2.4 Contribution of the study

Regardless of the fact that we have been living in the so-called information age for years now, we are still having the same problems as before, debating the same issues. One can say that unclarity about many aspects of information and its management exists and even that confusion often reins.

By satisfying the two objectives, it will be attempted to critically test the statements often made so glibly that information "must be managed as a resource". A fair amount has been written about the subject, but very few of these literature sources deal with the fundamental questions raised above. What is more, the available literature sources often portray conflicting views. This study will attempt to systemise the literature and to synthesise from it.

1.3 Research philosophy and approach

1.3.1 Introduction

Management studies clearly fall in the realm of the social sciences but information has been approached by researchers from both the natural and from the social sciences. Introna (1992) used a philosophical point of departure in his research on management information systems where he defined information. Shannon and Weaver (1949) on the other hand, approached information from a scientific (mathematical) point of view in their research on messages (information) being transmitted between a source and a receiver.

Clarity on the point of departure is of crucial importance as it influences the entire study.

1.3.2 Information Management: Natural science or social science?

Various disciplines address the concept of information. Firstly, there is the field of information science. This field concerns itself with the study of communication of information in society (Vickery and Vickery, 1987: 1). It is obvious that the point of departure of information science (and the related library science), is from a social point of view.

Computer scientists also address the concept of information. Their definition, as will be shown later on in the thesis, differs from the one used by the information scientist. In fact, computer scientists make little distinction between data and information: To most of them information is but processed data and therefore something very tangible and concrete. To the computer scientist and the information theorist, information can be made to obey all kinds of mathematical laws. The natural sciences connection is obvious.

A field halfway between information science and computer science, is the field of (management) information systems or informatics, as it is sometimes called. Du Plooy, Introna and Roode (1994: 5 *et seq.*) in their research on the nature of information systems draw the conclusion that information systems "are developed by people for people. [It] supports and facilitates human and social processes through technology, while preserving the balance... The [view] that information systems consist of technology supported by humans and human processes, is not valid". They define the field of informatics as "an inter-disciplinary field of scholarly inquiry, where **information**, information systems and the integration thereof with the organisation is studied in order to benefit the total system (technology, people, **organisation** and society)". According to this definition, the field of information management falls right into the field of informatics. Their approach (strongly supported by other researchers such as Boland (1987) and Lyytinen *et al.* (1992)) to the information concept is strongly social.

The management discipline can only be social in nature. Management is done by people. Even if resources other than humans are managed, it is still done by people. It is therefore clear that information management is a social sciences matter and any research approaching it solely from a different point of departure should be seriously questioned.

The fact that information management will be studied from a social angle even though elements of the concept have their roots deeply embedded in the natural sciences, must not distract from the relevance of such research. Boland (1987: 371) uses the terms "scientism" to describe the phenomenon whereby the methods and techniques normally used by the natural sciences are perceived to be the only valid research methods. He goes to great length to show how certain concepts are being described in natural sciences terms just so that the natural scientific methods can be applied. An example of this is the view that information is simply structured data (the computer scientists' view). By taking meaning out of the definition of information, it can be dealt with from a natural sciences viewpoint and the scientific methods of the natural sciences can be applied. However, this reduces and limits the information concept so severely that it becomes unacceptable to the researcher.

Scientism has no place in the study of information and even less of information management. The human element is too strongly present in the concepts of information and management in order to make it a natural sciences only issue.

1.3.3 Social research

The social sciences, other than the natural sciences, are not exact sciences. There are very few, if any, hard and fast "rules" or "laws" as one typically finds in the natural sciences. The social sciences deal mostly with people issues and the behaviour of people, as we all know, is not always predictable. Man has the ability to think and to make choices for himself. This is an area which the social sciences address and unless an ideal situation is being studied, it can never be as exact as the natural sciences. Any issue can be approached from various philosophical angles. Being philosophical in nature (and subjective most of the time), the arguments cannot be proven unqualified, neither can they be disproved without qualification. It is therefore important to clearly spell out the points of departure upon which this thesis is based.

1.3.3.1 A taxonomic framework

The work of Burrell and Morgan (1979) provides us with a taxonomic framework for research in the social sciences. They contend that social theorists operate from one of four mutually exclusive paradigms. They firstly distinguish between subjectivity and objectivity with regards to the social world, as in table 1.1.

Table 1.1

The Subjective - Objective Dimension

The **subjective** approach to social science		The **objective** approach to social science	
Approach	Explanation	Approach	Explanation
Nominalist	Assumes that the social world external to individual cognition is made up of nothing more than names, concepts and labels which are used to structure reality. The nominalist does not admit to there being any real structure to the world which these concepts are used to describe. The names used are regarded as artificial creations whose utility is based upon their convenience as tools for describing, making sense of and negotiating the external world.	Realist	Believes that the social world external to individual cognition is a real world made up of hard, tangible and relatively immutable structures. For the realist the social world exists independently of an individual's appreciation of it and it is not something the individual creates.
Anti-positivist	Is firmly set against the utility of searching for laws or underlying regularities in the world of social affairs. One can understand by occupying the frame of reference of the participant in action. One has to understand from the inside rather than from the outside.	Positivist	Seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between constituent elements and is in essence based upon the traditional approaches applied in the natural sciences.
Voluntarist	Regards man as completely autonomous and free-willed.	Determinist	Regards man and his activities as being completely determined by the situation or environment in which he is located.
Ideographic	Assumes that one can only understand the social world by obtaining first hand knowledge of the subject under investigation. Emphasises the analysis of the subjective accounts which are generated by getting inside situations and involving oneself in the everyday flow of life.	Nomothetic	Methodology emphasises systematic protocol and technique. Prescribed technique centers on the scientific testing of hypotheses, the construction of scientific tests and the use of quantative techniques for the analysis of data.

Source: Burrell and Morgan (1979:1-7), as adapted by Tromp, 1993

Secondly, Burrell and Morgan distinguish between what they call regulation and radical change. The regulation theorists' point of departure is the underlying unity and cohesiveness of society whilst the radicalists' concern is to find explanations for deep-seated structural conflict and contradictions which characterise society. They summarise these two opposing views as in table 1.2.

Table 1.2

The Regulation - Radical Change Dimension

Sociology of Regulation is concerned with:	**Sociology of Radical Change** is concerned with:
The *status quo*	Radical change
Social order	Structural conflict
Consensus	Modes of domination
Social integration and cohesion	Contradiction
Solidarity	Emancipation
Need satisfaction	Deprivation
Actuality	Potentiality

Source: Burrell and Morgan (1979:18) as adapted by Du Plooy, Introna and Roode (1994: 9 - 10)

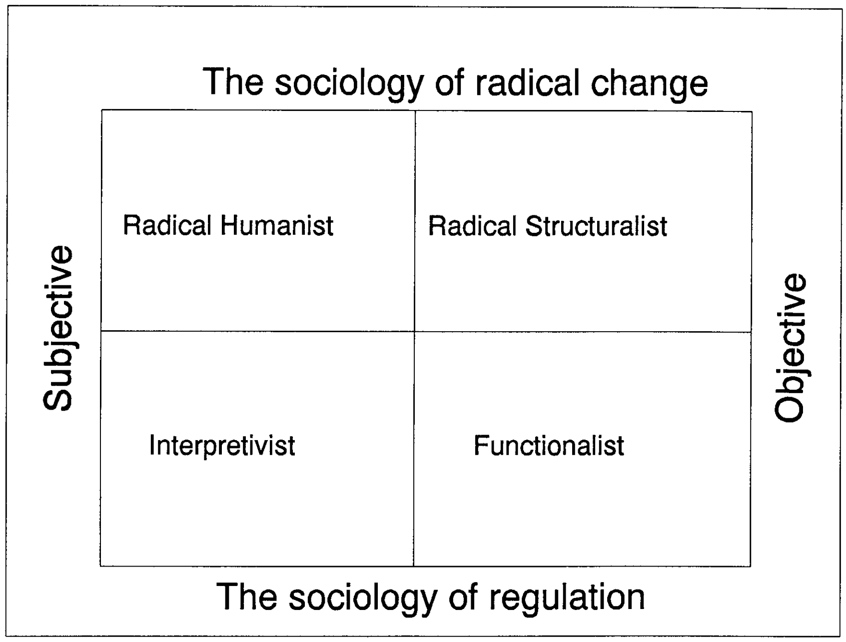
With subjectivity/objectivity as the one dimension and regulation/radical change as the other, Burrell and Morgan propose a taxonomical framework as in figure 1.1. Each one of the four paradigms represents an alternative view of society. These paradigms are mutually exclusive.

It is clear that the study of information management must fall within the subjective realm: It addresses the world of the "softer issues" of humans. Information management is something that humans do, or should do. It can never be the exact world of the natural scientist. Human behaviour is far less predictable than the behaviour of a free falling object under the "laws" of gravity, or a nucleus being bombarded by electrons.

To determine the second realm in the taxonomy in which information management falls, is more difficult. Is society today one where the status quo prevails, where decisions are based upon consensus and where there is solidarity, or is it where radical changes are taking place and where conflict and contradiction is the order of the day?

The standpoint of the interpretivist is that "the world of human affairs is cohesive, ordered and integrated" (Burrell and Morgan, 1979: 31). It can

Figure 1.1
Four paradigms for the analysis of social change



Source: Burrell and Morgan (1979: 22)

indeed be said that there is strong evidence of such a world: Democracy is being accepted worldwide as the norm for leadership on a national level; participative and collaborative management replaced autocratic management; workers are recognised by management as a force to be taken into consideration, workers who are at the same time shareholders and where minority views are being listened to.

The other side of the coin, the radical side, is also evident: The entire world is undergoing major change. In many cases these changes did not take place in an evolutionary way but in a radical way. Cases in point are the dismantling of the Soviet Republics and, more closer to home, the dismantling of apartheid. Although there is a genuine attempt at reaching consensus with regards to decision making both on a political and corporate level, it goes hand in hand with conflict. Again the South African political scene is a case in point. It goes further than politics only: Nothing is apparently taken as sacred any more. The status quo, the "establishment", religion and authority are all being questioned, people are not willing any longer to succumb to censorship, the press must be free and all must have a freedom to sexual preferences.

Regarding business, a premium is placed upon creative and innovative ideas. Peters (1992: 143) writes the following about McKinsey, a company having offices in 25 countries: "...there's no traditional hierarchy. There are no organizational charts. No job descriptions. No policy manuals. No rules about managing client engagements... And yet all these things are well understood - make no mistake. McKinsey is not out of control!" MicroSoft approached the market totally different from, then enormously powerful and successful, IBM and managed to take away the lead from IBM in more than one way. Toyota used an entirely different way to design, develop and market its Lexus than was the case at the successful General Motors and Ford. It caused a paradigm shift in the motor car industry. By being totally different, the stockbroker Milken "rattled the entire structure of smokestack power in America" by introducing junk-bonds (Toffler, 1990: 51). Being different - radically different - is the name of the corporate game.

Cohen (in Burrell and Morgan, 1979: 16) tried to reconcile the two paradigms by claiming that they were not really opposites but rather mirror-images of the same thing and therefore not mutually exclusive. Burrell and Morgan differ from this viewpoint by pointing out that such a viewpoint "ignores the fundamental differences which exist between [the two paradigms]" (1979: 16). One therefore has to take a stand - there is no middle-road.

Even though there are signs in society which point to the interpretative paradigm, there are overwhelmingly more which point to the radical humanistic paradigm. Life today, be it political, corporate or personal life, means change, conflict and contradiction. This study will therefore be approached from the radical humanistic paradigm (see figure 1.1) as the paradigm best suited to describe society today.

1.3.4 The research approach followed

Du Plooy *et al.* (1994) propose a meta framework for research in the information systems arena. It is based upon the following four questions:

- What is?
- How does?
- Why is?
- How should?

The first question, "what is?", usually is first addressed in the development of a study field and is directed at the "fundamental nature or essence" of the research problem (Du Plooy *et al.*, 1994: 14). It aims to dismantle the issue to its fundamentals to describe it precisely and unambiguously.

The "how does?" question addresses the way in which the problem or phenomenon manifests itself in reality while the "why is?" question tries to explain the real-life behaviour of the problem.

The "how should" question addresses the conclusions reached in the research and may open new areas for further research.

Although the concept of information management can be found in the literature since around 1979, it is still used to describe dissimilar phenomena. The term is being used by librarians, computer scientists and by communication scientists. Yet it goes back to the early philosophers who argued about knowledge (epistemology). It is more than often used synonymously with management information by laymen and academia alike. Therefore, the "what is [information]?" question must be explored to its fullest extent.

To a certain extent, various attempts have been made to describe and define "what [information] is". The outcome has not been consistent, mainly because of the different points of departure. This study will take all these points into consideration and argue from a puristic, fundamental viewpoint.

The concept of the management of information as a resource is a relatively young concept. It only emerged in the 1970's and businesses and governments are still not exactly sure what to make of it. Academia still have to come forward with a "recipe" for information management based on solid theory. A research methodology based on empirical results (the proving of relationships) appears futile. Information management is presumably done in a haphazard and *ad hoc* way, if it is done at all. A positivistic, empirical methodology is therefore seen as inappropriate for this thesis as it will only prove what is generally known and accepted.

Deductive reasoning, where outcomes are postulated, also seems infeasible as little exists in terms of generalised explanations.

The only research methodology which seems feasible is inductive reasoning where the literature is studied and systemised and then integrated with the researcher's own experience so as to expand existing knowledge. This implies that the research will be qualitative rather than quantitative and, hence, a move away from a pure positivistic approach. Smith (1990: 124) points out that such an attempt has some inherent risks built in as the researcher leaves the well accepted framework of positivism where data integrity is high, but currency is low and enters the qualitative realm where currency is high and data integrity low. Currency in this sense pertains to the ability to generalise results whereas data integrity is the ability to test results through statistical and other methods.

No single research method provides both currency and data integrity at the same time. High data integrity (quantative) methods are not particularly applicable to theory-building and exploratory research whereas qualitative methods lend themselves to this kind of research (Smith, 1990: 125 *et seq.*). The research methodology in this study will therefore lack data integrity, but this will be compensated for by being high in currency.

1.4 Structure of the thesis

Chapter 1 is devoted to the background to the study; the purpose, problem statement and research philosophy and design.

In chapter 2 the nature of information is analysed. It starts with various definitions of data, information, knowledge and wisdom. Despite the many connotations attached to these familiar terms, an attempt is made to systemise and synthesise from the existing definitions a definition for each one which clearly distinguishes the one from the others. The relationships between them are also established. Once information has been defined, a closer look is taken at the origins of information, its life-cycle and the two main dimensions, namely information as a resource and information as a process.

Information has very specific characteristics, for instance, the same "piece" of information can be owned by more than one person at the same time. Another characteristic is the dependence on time and situation. It is shown that these characteristics make information a resource different from other resources in many respects. It is also shown that measuring the quality and quantity of information is evasive, as is determining value and cost of information.

Lastly, the disciplines dealing with information are investigated. Information and library science, information theory and computer science are all scientific fields dealing directly with information.

In chapter 3 information is explored further by analysing its sphere of influence. It is therefore put in a contextual framework. Firstly, there is the human being, or being human, context. It is shown that information plays an integral part of human life. It is then shown that information has a strong influence on society with the possibility of effecting a change to culture. The information society concept is explored in detail. Even the economy is not unchanged by information becoming more important to the point where the economy becomes dominated by information. The information economy is therefore explored. These contexts are expanded and information's role is analysed in terms of business, on national level and on global level.

Chapter 4 looks at the concept of information management and other related terms. The principles, objectives and benefits are explored leading to a definition. A model is developed for information management, based on the literature and the experience of the researcher. The model provides a conceptual framework for information management.

In chapter 5 the theory and model proposed in chapter 4 are evaluated with respect to what management is. The command-and-control model of management (planning, organising, leading and controlling) is used against which to test the theory. If the principles can be applied, it can be said that information management can be achieved.

Chapter 6 contains the summary, conclusion and suggestions for further research.

1.5 Conclusion

Information has established itself firmly in the 20th century. Having evolved from an agrarian to an industrial and then to a post-industrial society, information became pivotal in supporting society, the economy and even governments. To those who have accepted that information has become a major resource, the notion of having to manage it as such, is mostly taken for granted.

Accepting that information must be managed is one thing, describing what it is and doing it is something different. Some attempt it by focusing on information technology, other on data modelling, others look at information scientists and information theorists for answers. In the mean time, managers eagerly looking for information, find that they are drowning in data, despite or perhaps, because of, spending millions on information technology. The question, therefore, is: What do we mean by managing information and can it be done? Is there a difference between information management and the management of information? These are the questions that will be focused upon in this study.

The subject of information management will be approached from a social angle. Information itself has deep and strong social roots and so does management. The approach will be subjective; non-positivistic, non-nomothetic and non-deterministic. Personal, social, corporate and political life is perceived to be more radical than interpretative and this will be taken as another point of departure.

The study is divided into six chapters:

Chapter 1 is the first the purpose and methodology;
Chapter 2 is an exploration of the nature of information;
Chapter 3 puts information in context;
Chapter 4 defines and explores the information management concept;
Chapter 5 tests information management against the general management principles and
Chapter 6 contains the conclusions, implications and suggestions for further research.

CHAPTER 2

2. THE NATURE OF INFORMATION

2.1 Introduction

The term "information" is commonly used in everyday language and everyone seemingly know and understand exactly what is meant by it. It is a word that any child gets to know at a very early age and most people go through their entire life without ever seriously considering the meaning of the word. There is also nothing wrong with it: We all understand what is meant when we encounter the word, whether in writing or in verbal communication.

It is only when one tries to define the term when unforeseen problems arise. All of a sudden the obvious becomes the far-from-obvious. Especially when the "experts" are consulted, things really get complicated: The librarians have their opinion, the computer gurus, the psychologists, educationalists and philosophers all have their own interpretations. Buckland (1991: 3) writes: "An exploration of *information* runs into immediate difficulties. ...The definitions may not be fully satisfactory, the boundaries between these uses may be indistinct, and such an approach could not satisfy anyone determined to establish the one correct meaning of *information*".

It is impossible to determine without qualification who is right and who is wrong, as it depends entirely on the context in which the term is used, as we will see later on. Yet, for the purposes of this study, we need to define it. Furthermore, not only do we need to define "information", we need to define its family of related terms: Data, knowledge and wisdom.

2.2 Data, information, knowledge and wisdom

2.2.1 Data

Blumenthal (in Duffy and Assad, 1980: 13) defines data as follows: "A datum is an interpreted raw statement of fact". Davis and Rush (in Broadbent, 1984: 211 - 212) write that data are "the result of measurement or observation."

Diener (in Horton, 1979: 59) defines data as "sensory and perceptual phenomena" and information and knowledge as "conceptual phenomena" which is therefore aimed "at the cognitive level of perception". McInerney (1992: 172) describes data as "What is given. What is perceived with the senses and the results of experiments...".

Sippl and Sippl (1981: 126) describe data in their "Computer Dictionary" as "A general term used to denote any or all facts, numbers, letters and symbols that refer to or describe an object, idea, condition, situation, or other factors. It connotes basic elements of information which can be processed or produced by a computer". In "Webster's New world Dictionary" (Guralnik, 1984: 360), the term "datum" is described as "...something known or assumed; fact from which conclusions can be inferred".

Scharf (1984: 40) views information along a continuum where data are the lowest (and least expensive) and knowledge is the highest (and most expensive).

Taggart and Silbey (Rabin and Jackowski, 1988: 178), defining data as "...raw facts or impressions", offer an example of data. The sentence "It is raining" is understandable to anyone, but it does not have an obvious meaning. Likewise the characters "$*6" appears to be a random group of characters.

Introna (1992: 2.37) describes data as "basic facts, facts that can be shown to be true if they correspond to reality". He bases this viewpoint on the correspondence theory of truth which claims that truth is a correspondence between what is believed and an independent reality (McInerney, 1992: 172).

Introna's definition and also those defining data in terms of "facts", have a subtle but important implication. Facts, by definition, must be real and true; if not true, they cannot be facts. This "truth" factor severely limits the scope of data as it excludes all non-facts, theories and hypotheses. Data must be broader in scope than only truths. For example, writings on the supernatural or quarks, although neither real nor factual, must also qualify as data.

To overcome the limitation of a definition in terms of "facts", it is suggested that a definition in terms of "attributes" be considered. An attribute is a quality or characteristic of someone or something and does not necessarily have to be true.

Data are therefore defined as attributes with no apparent meaning. However, importantly, data have *potential* for meaning, analogous to a rock on top of a mountain having *potential* energy.

2.2.2 Information

We refer to information on a daily basis and in so doing we believe we know what we mean by it. It is only when we try to accurately define the term when we find that there are various fitting statements; all equally valid, but each one also not universally valid (Otten in Debons, 1974: 93). Broadbent writes: "Most efforts [of defining information] would appear to be contextual in nature" (1984: 211).

2.2.2.1 Current definitions

Put very simply, information is processed data which has meaning for the user (Ahituv and Neumann, 1982: 5). In this context "data" points to unprocessed and unevaluated attributes which do not have any meaning on their own. The attributes must first be put into context before it will have meaning or value and therefore become "information". Boland (1987: 371) calls the notion that information is structured data, a "fantasy". He rightly points out that "meaning" is something entirely different from "structured data" - by equating them, the importance of dialogue for all human understanding is denied.

Blumenthal (in Duffy and Assad, 1980: 13) defines information as "data recorded, classified, organized, related or interpreted within context to convey meaning". In a circular (number A-130) to the Heads of Executive Departments by the *Director of the Office of Management and Budget* of the United States, the term information is described as "...any communication or reception of knowledge such as facts, data, or opinions, including numerical, graphic, or narrative forms, whether oral or maintained in any medium, including computerized data bases, paper, microfilm, or magnetic tape" (Miller, 1985: 52741).

Porat, who undertook the study on the information economy, proposes the following definition of information: "Information is data that have been organised and communicated" (Broadbent, 1984: 209). Taggart and Silbey (1988: 178) describe information as offering "more meaning" than pure data and "...data that has usefulness (value) to a decision maker in a current situation". They take the example "It is raining" (an example of data) a step further: "It is raining and my car windows are open". This sentence forces the person into a decision making situation, namely whether or not to go out and close the windows to prevent damage to the seats. The fact that it has meaning and can be useful, transforms data into information.

Farradane (1979: 13) defines information as "any physical form of representation, or surrogate, of knowledge, or of a particular thought, used for communication". He points out that "only the ultimate effects of communication, the actions of the recipients, will be identifiable as directly observable processes". He criticises definitions using phrases such as "usefulness", "an increment in knowledge", resolving uncertainty", "value in decision making", and others, as "to be only expressions of ignorance of the nature of thought" (Farradane, 1979: 13). Hoffmann (1980: 292) agrees with this view and points out that the "value in decision making" definition is situation-dependent. A definition of information, according to Hoffmann, cannot be conditional upon human reaction.

Economists have been studying information because of "the role that information plays in the functioning of competitive markets, the understanding of the increasing amount of resources devoted to the production and distribution of information, and the analysis of how more or better information may improve the market position of one or a group of economic 'players'" (Braunstein, 1981: 9). The identification of an information sector in the economy was done by Machlup and followed by Porat (in Braunstein, 1981: 10). According to Braunstein (1981: 10) economists view information as a commodity; either a good or a service.

Naisbitt (1984: 36) pragmatically states: "Information is an economic entity because it costs something to produce and because people are willing to pay for it".

Defining information in an economic sense as a commodity, is, according to Horton (1979: 58), an abstraction of the concept of information. The commodity view is adequate when information is viewed as "something", but is completely inadequate to describe the value that is derived from that information. In order to use this definition (as commodity) to convey meaning, a further level of abstraction must be piled onto an abstraction. This leads to confusion "which totally obscures the original problem" (Horton, 1979: 58).

Cronin (1985b: 129) makes the following interesting comment on information: "Information can be described as a commodity or good, but it may be more instructive to think of information as a social and economic lubricant. Information is a resource which conserves other resources: one which facilitates, integrates and enables".

Tricker (1982: 29) proposes that information can be considered at four levels, namely:

- Level one: Basic data. Tricker regards data on this level to be facts such as the height, weight and age of a person, the date or the amount and payee on a cheque. He further regards data on this level as raw data "which contains the potential information, but only after processing".

- Level two: Information as a message. If the level one data are aggregated or analyzed so that, for example, the personal characteristics become details of a class or the cheques drawn are totalled to show the effect on cash flow, then the level one data become level two information.

  This information can be made available in a report, a book, picture on a screen or as an announcement over a loudspeaker. It therefore can be looked at as a message. However, no concern is given to the needs of the recipient of the message, nor to any meaning he derives from it. Information, at this level, is a function of the message alone, or

  $I = f(d)$,
  where
  I = Information and d = data, or message.

  Tricker chooses to consider the level one and level two information as being data and not yet as information. The term information is reserved for the next level.

  In considering data at this level, it is clear to see why more data do not lead to better informed executives. "Many so-called information systems in the past concentrated on the handling of data - ignoring the information needs of the potential user" (Tricker, 1982: 31). Although Tricker sees this as "in the past" there is too much evidence that this is still happening today.

- Level three: Information in use. To become information, according to Tricker, the data received must be interpreted. The user is therefore essential for the information to acquire a value; before that, it is data. It is here where information acquires another dimension, namely information as a process: A human thought process. Boettinger (in Tricker, 1982: 32) puts it as follows: "..information has no meaning unless its final destination is in the cerebral cortex".

Information (I) on this level therefore becomes a function of the data (d) and the user (u), or

$$I = f(d,u).$$

The sender of the information must be aware of the needs of the user, such as language, semantics and symbols that are relevant to the user.

Tricker (1982: 32) points out that an identical message can have different meanings to different people. "Intelligence, education, training in the language or notation used in the data, previous relevant experience and perceptual abilities can all affect the meaning derived from the data". He quotes the example of the message that the patient's temperature is 104 degrees is likely to have a different meaning to the patient, his doctor and his accountant.

- Level four: Valuable information. To appreciate information in its totality, the meaning derived from the data by the user must also be taken in consideration. It is therefore important to determine to what extent the uncertainty of the recipient is reduced and/or his knowledge is increased.

  It is thus necessary to take the organisational role of the user into consideration. Information (I) on this level, therefore becomes a function of the data (d), the user (u) and the organisational situation(s) of the user, or

  $$I = f(d,u,s).$$

  The same message can have different effects on the same user if the organisational situation of the user is taken into consideration. Tricker gives the following example: The message that taxes are to be raised in order to give teachers an increase in salary, will have different information content for the same person when he thinks of himself as a teacher, a tax payer or a potential candidate for a political office.

By taking the organisational situation into consideration in the model of information, it is clear to see that organisational structure, management development and organisational development are closely related to the structure of management information systems (Tricker, 1982: 34).

Tricker makes an important point, namely, that information relies heavily on and is entirely dependent upon the user and his situation. Different users, all having different backgrounds and situations, may attach different meaning to the very same data. It can therefore be concluded that information is highly contextual and dependent on perspectives.

Langefors (1993: 150), like Tricker, also defines information in by using an equation. This equation became known as the "Infological Equation" and is as follows:

$I = i(D, S, t)$

where

I = Information (or knowledge) produced from the data, D and the pre-knowledge, S, by the interpretation process, i, during the time, t. This equation highlights two important elements. Firstly, there is the concept of an interpretation process and, secondly, by implication, that information can only be achieved by involving a human being.

Debons and others (in Broadbent, 1984: 213) suggest two definitions for information:

- Source-based definition: Information is a symbol or a string of symbols which have potential for meaning (the commodity of information). (This definition relates strongly to the definition of data in the previous section.)
- Receiver-based definition: Information is that which adds to or changes (my) picture of the universe (the process of informing).

Hoffmann (1980: 293) worked on qualitatively determining the information content of documents. He defines information as "an aggregate (collection or accumulation) of statements, of facts and/or figures which are conceptually (by way of reasoning, logic, ideas, or any other mental 'mode of operation') inter-related (connected)", or

$$I = f(n,e),$$

where I = Information, n = nodes for facts or figures (ie. data) and e = edges for meaningful connections between the facts/figures (Hoffmann, 1980: 293, 1981: 133). Another way of expressing the definition is: "Information is a function of facts/figures and of their meaningful connections" (Hoffmann, 1981: 133). It would appear that in Hoffmann's opinion, meaning is measured by the logic in which the facts and figures are connected. "Meaning", therefore, has a completely different meaning to "meaning" as attributed by a person to a message which he receives.

Hoffmann's definition does not contribute to the quest of what the difference between data and information is. A number of data elements (facts or figures in Hoffmann's terminology) can be logically connected, yet it may be entirely meaningless to a recipient for a variety of reasons. Hoffmann would classify this as information whereas our earlier definition would classify it as data ("attributes with no apparent meaning"). Hoffmann's view certainly helps to give one an idea of the informational content of a document - the higher the number of facts/figures and their logical connections in relation to the total number of words, the higher the informational content - but it still does not say anything about the meaning to the recipient.

Introna (1992: 2.46) argues that information is "understanding based on experience (*Erlebnis*)." Information, in his view, can only exist in the mind and nowhere else. The moment that data are *appropriated* by a (receiving) person, it becomes information: "There is a point where appropriation is complete and one can say 'now I understand'. Data have now been transformed into information" (Introna, 1992: 2.48). Expanding this argument, the moment when such a person puts his thoughts (and thus his understanding) down on paper, it reverts back to data (until appropriated by someone when it may become information). Introna's view, therefore, is that only data can be a commodity, but information not. Even if a person should be able to sell the information he has accumulated in his mind, the person buying it, is buying data unless he then appropriates it himself when it becomes information.

Although Introna's definition cannot be argued against, it does place a restriction on the scope of information. Hoffmann (1980: 292) identifies information to appear in three "phases", namely, (i) the assimilated phase (in the human mind), (ii) the documented or recorded phase and (iii) the transmitted phase (communication). Introna's definition acknowledges only the first phase.

Buckland (1991: 3) identifies three uses of the term "information":

- Information-as-process. This refers to the process of being informed; when one's knowledge is expanded.

- Information-as-knowledge. During the process of being informed, something is imparted in the process. This "something" is commonly called information. This is something intangible, personal, subjective and conceptual.

- Information-as-thing. The term is also used to describe objects such as documents, books and data. When information-as-knowledge is expressed, communicated, described or represented in any way, such expression, description or representation would be classified as information-as-thing.

Buckland quotes many writers who have disagreed over many years with the notion that information can be some-"thing". He then concludes: "But language is as it is used, and we can hardly dismiss information-as-thing so long as it is a commonly used meaning of the term *information*" (Buckland, 1991: 4). He furthermore points out that the studying of information systems and information retrieval systems must be based upon the view of information-as-thing only. He writes: "The development of rules for drawing inferences from stored information is an area of theoretical and practical interest. But these rules operate upon and only upon information-as-thing" (Buckland, 1991: 4).

Buckland views information-as-thing and data (in the information systems sense) as synonymous.

From the above definitions, the following can be concluded:

- There is enough evidence that information can be viewed as a commodity or resource, implying that it is something tangible.

- Meaning is implicit in most, if not all, definitions. This leads to the implication that there must be an originator, a message (data) and a recipient.

2.2.2.2 Information and Meaning

The implicit "meaning" component in the definitions of information raises a new question: Where does one look for the meaning? Should two people, an originator and a recipient, have a verbal discussion, they can ensure that, through verbal discussion, the meaning is the same for both. Should, however, the recipient be studying a product on his own (e.g. a book or a piece of art), the meaning which the recipient attaches may be very different to that of the originator.

Introna (1992) thus argues that (only) the recipient has the ability to transform data into information (hermeneutically via appropriation). When data have meaning to the recipient so that the appropriation takes place, it becomes information. However, Farradane (1986: 14) writes: "We cannot ...look for any meaning in the orbit of the recipient. The only valid meaning must be sought in the originator's thought" as the message (data) could be interpreted/appropriated differently, or not even at all, by different recipients, all perhaps different to the originator's thought.

The imperfections of language (and our limited ability to properly use it), cultural and other differences - in short: Different frames of references - all play important roles in the transmission of a message from an originator to a recipient. But even looking for true meaning on the originator's side, does not guarantee that it is absolute. "Investigation of the originator by asking questions which will elicit further versions of the [original] thought, or explanations, cannot be reliable even if confined to 'yes' or 'no' answers. The originator's knowledge structure will change in reaction to questioning" (Farradane, 1979: 14). Farradane argues that the recipient's interpretation of the meaning is probably still the most reliable (provided he aims for objectivity). He goes to lengths, however, to show the complexities in determining meaning at the recipient.

This leads to the conclusion that meaning exists at both the originator and the recipient(s). Meaning can never be absolute - even mathematical and scientific facts may have a certain meaning to a person, apart from the mathematical or scientific factual side. This is to be expected because context and perspective are human characteristics that cannot be separated from the human.

It needs to be pointed out that meaning does not have to involve an originator in the form of another person. Meaning can also originate from observation by any of the senses. A falling apple (data) is observed by Newton leading through logical reasoning, interpretation and comparing with existing knowledge to the theory of gravitation. Thus the observation of a falling apple gets new meaning.

Another important point is that meaning is never complete. Because it is related directly to context and perspective, it is always possible for someone else to put it in a different or wider context (Introna, 1992: 2.34).

2.2.2.3 Information defined

Farradane (1979: 13) questions the definitions treating information as "some holistic 'system' concept involving people, their attitudes and needs, and the effects of information transfer on decision making, social behavior, etc., ...". He finds them not to be workable definitions and claims that such definitions make it impossible to study any isolated part of the system, and "lead to philosophic speculations which provide no reliable explanations since there are many different points of view" (Farradane, 1979: 13). He feels that his definition ("[a] ...representation ...of knowledge") is more explicit than simply treating it as a concept.

Hoffmann (1980: 291) stresses the fact that whenever the term "information" is used, it is used with reference to the conditions and circumstances under which it is used. Any concepts, conclusions or explanations which may evolve would relate to the context in which the term is used.

Baratz (in Horton, 1979: 57) notes that a great deal of work on the definitions of information has been done in the Social Sciences, particularly psychology. These definitions are univocal in that information is context-specific. While psychologists agree in some regards, they differ in the way they conceptualize the problem but they recognize the limits of their conceptions.

Hollnagel (1980: 183), a psychologist, thinks that the problem facing information scientists in defining information is "far less serious than many seem to think". Because of the fact that Information Science is a behavioural science, it deals with phenomena which are directly observable. This means that everyone experiences it and can therefore express his or her own interpretation in natural language. This, according to Hollnagel, is quite different from the natural sciences which often deal with phenomena for which special terms in the natural language have to be created. In such an environment, it is essential that terms are precisely defined whereas, in the environment in which the behavioural sciences operate, the terms are mostly familiar and "hence, we know what we are talking about without having to define it rigorously first" (Hollnagel, 1980: 184). Hollnagel certainly has a point. It is because the term information is used so commonly that we all attach a certain meaning to it. Yet, in order to truly understand information, we need to define it; we cannot but rely on intuition.

Hoffmann (1980: 293) postulates that a definition must meet the following three conditions:

- The definition and the concept must be self-contained, that is, they must not be dependent on the circumstances or situation in which they are used. Thus, "the definition 'information is data of value to decision making' is situation dependent" and therefore invalid (Hoffmann, 1980: 292).

- The definition must be as precise as possible.

- The definition must be applicable to all subject areas in which the concept is used.

Farradane's (1980: 77 and 1979: 13) definition of information, namely a physical representation of knowledge used for communication, looks the most promising. Tested to the three criteria proposed by Hoffmann above, all three are found to be satisfied. This definition agrees with many other definitions but not with the one proposed by Introna (1992: 2.43) ("Information is understanding"). Introna's definition implies that information can only exist in the mind and nowhere else. Information, according to Introna, can never be physically represented as is expressed in Farradane's definition.

The definition of Farradane also distinguishes between the terms information and data. Data, defined as meaningless attributes, can be viewed as a representation of knowledge, but meaningless facts do not qualify for the "...used for communication" component of the definition. Communication implies putting facts in context and providing perspective.

Farradane's definition expresses information in terms of an, as yet, undefined term, namely, knowledge. The definition should ideally express information in terms of its components rather than in terms of what it itself is a component of. This view will be revisited once knowledge is defined.

From the above it is clear that information depends on two aspects: Context and perspective. Through the sensory organs, a person is presented with data ("meaningless attributes"). Information is created if this data are transformed so that it becomes meaningful. Boland (1987: 363) describes information as "inward-forming" and writes: "[Information] is the change in a person from an encounter with data". This transformation can only be accomplished through the addition of context and perspective. In any communication, perspective is always present; not only does the parties consider their own point of view, but they also take into consideration the other party's point of view (Boland *et al.*, 1992: 2).

It is proposed that information is defined as **data put into context and in perspective**. The words "context" and "perspective" very elegantly describe what is meant: The latin *"contexere"* means *"to join together"*. Perspective means *"the relationship of aspects of a subject to each other and to a whole"*. Taken literally, the definition says that information is data joined together in relationship to each other and to the whole.

This definition includes most of the current definitions: Context and perspective unequivocally imply meaning, but the definition is general enough to include meaning on the sides of both the originator and the recipient. It also implies some processing taking place with data, be it in the mind or somewhere else. It implies appropriation and interpretation of data. It includes all three "phases" of Hoffmann (1980: 292): Assimilated, documented and transmitted.

A last thought is whether information has to be true in order to be information. We already indicated that data are not necessarily only truths and if information is defined as data put into context and perspective, it follows that information does not have to be truths only.

2.2.3 Knowledge

Foskett (in Broadbent, 1984: 212) defines knowledge as "something in the mind" and views information as some form of "communicated knowledge". Gould (1986: 61) describes knowledge as "the result of a complex process in which ideas and information can be checked, tested, and challenged continuously and without restraint by all interested parties". Farradane (1980: 77) defines knowledge as "a memorable record of a process in the brain, something only available in the mind". Glaser, Abelson and Garrison (1983: 2) define knowledge to include: "...(1) facts, truths, or principles, often associated with (but not limited to) an applied subject or branch of learning or professional practice, (2) information or understanding based on validated, broadly convergent experience, (3) reliable identified exemplary practice, including unusual know-how; (4) an item of information that a person certifies as valid by applying one or more criteria, or tests, and (5) the findings of validated research".

A definition of knowledge is given by Horton (1979: 55) as ".. an organized body of information, or the comprehension and understanding consequent to the acquisition thereof". Bell (1976: 175), the person responsible for the post-industrial (or information) society concept, defines knowledge as "a set of organised statements of facts or ideas, presenting a reasoned judgement or an experimental result, which is transmitted to others through some communication medium in some systematic form". He raises the point of many definitions of knowledge and stresses that these definitions are neither right nor wrong: It depends on their usage.

Berry and Cook (in Horton, 1979: 60) see knowledge as a higher level of information. Their work appeared in 1976 and 1977 and they write "...we suggest that the real resource which a department should be seeking to understand and extend is not just its data, but its knowledge" (Horton, 1979: 60 - 61).

Horton (1979: 61) does not agree with Berry and Cook's implication that knowledge is more important than information. He argues that data, information and knowledge is each important in its own right. Each one has its own unique contribution to make to decision-making. He agrees that it would probably be best for an organisation to develop "knowledge systems" as opposed to "information systems", provided they can afford the time it takes to develop these and having to get along without it while they have to wait for its development. Ehlers (1971: 184) also seems to disagree with the view of Berry and Cook and writes that information "is a much more comprehensive concept" than knowledge and one "which includes knowledge".

Ehlers (1971: 178) summarises the above definitions by offering two views when trying to define knowledge. These two views are:

- Knowledge as an attribute possessed by a person. In this regard, knowledge can be seen as "to be familiar with... to have experience of... to be able to recognize or distinguish... or to know that something or the other is the case" (Ehlers, 1971: 178). This view implies that the person must have been presented with something, presumably data or information, before he could have become knowledgeable. It points to information being a component of knowledge.

- Knowledge as a special kind of information. The characteristics making information knowledge are that the information must be generally accepted as being true, that there must be certainty that it is true and that there should be adequate reasons for being certain of the truthfulness of the information (Ehlers, 1971: 178). This view introduces another concept, namely, that of truth. True information, presumably through validation and verification, becomes knowledge.

Taggart and Silbey (1988: 179) describe knowledge as "...data retained for reference with a potential use in future decision situations". Again they take the example "It is raining" (data), "It is raining and my car windows are open" (information) and "In many parts of the country spring is characterized by showers. Therefore, you should shut the windows when leaving the car in the parking lot" (knowledge).

Philosophers, going back to the days of Plato, have long been arguing about the concept of knowledge. General consensus is that knowledge is "justified true belief". It means that knowledge is "believing what is true and having sufficient reasons for it" (McInerney, 1992: 37). Three concepts are introduced in this definition, namely, belief, truth and justification and each one of these concepts has various deep and often conflicting underlying philosophical bases. Belief is something personal: It is how an individual portrays the world around him. In believing, one accepts that there are some facts in the world. That summer is hotter than winter would be an example of a belief. Beliefs are not absolute as one's certainty about them can vary. One can therefore believe more strongly in one thing than another. This kind of reasoning leads to all sorts of philosophical arguments such as the claim by the philosopher, Descartes, who said that if you can in any way doubt what you believe, you do not know it (McInerney, 1992: 42).

Beliefs can be true or false. The second component of the definition, truth, tests whether beliefs depict things as they really are. A belief would be false if it should depict things inaccurately. Truth therefore tests the accuracy of an account of the world. All theories concerned with truth admit that there are false and true beliefs, but differ widely in what makes true beliefs true and false beliefs false (McInerney, 1992: 39).

The third component is justification. Beliefs that are true do not add up to knowledge; justification is needed. Justification reveals *why* a person believes that a belief is true. "Knowledge requires that you have sufficient reasons or a justification for what you believe" (McInerney, 1992: 41). If one has good reasons why one believes that something is true, other reasonable people should be able to accept that, or be able to convince you that your belief is false. It comes back to the question of absolute certainty. Deductive reasoning should start from absolute facts, so-called "self-evident first principles" and then deduce everything from these principles. The search for these absolute truths led to Descartes' claim that the only thing to be certain about is that he exists, the famous *"cognito, ergo sum"* ("I think therefore I am").

Philosophers differ on whether knowledge requires absolute certainty. The "rationalist" philosophers, Descartes, Spinoza and Leibnitz support the theory that knowledge must be absolutely certain while others (empiricists), such as Locke, hold that it does not have to be absolutely certain and that very strong evidence is enough (McInerney, 42 - 43).

The above view of knowledge is strongly personal: It is what every person believes and consequently context and perspective play important roles. Philosophers acknowledge another kind of knowledge, called *a priori* knowledge. *A priori* knowledge is (true) knowledge that is not based on sense perception. Mathematical truths are good examples of *a priori* knowledge (McInerney, 1992: 56). *A priori* knowledge points to a non-personal kind of knowledge; 2 plus 2 always equals 4 regardless of personal beliefs, context or perspective. Relativism, though, claims that all knowledge is relative to "worldviews" implying that even *a priori* knowledge must be personal.

Introna (1992: 2.37) argues that knowledge is generated from data (facts) by reasoning (as opposed to appropriating which leads to the generation of information perhaps using the same facts). Reasoning, according to his view, is logical and clinical; it is a-perspectual, a-historical and a-contextual. It does not even have to involve a human (although it normally will); a machine with the ability of creating knowledge, could hypothetically be produced. The process of generating knowledge is, according to Introna, objective and the investigator "explicitly 'removes' himself (his pre-convictions, fore-under-standing and prejudices) from the investigation or reasoning process" (Introna, 1992: 2,38). This view seems to be strongly influenced by rationalistic thought which says that knowledge is attained by reasoning from self-evident first principles. The opposing view comes from empiricism which says that knowledge originates from sense and "inner" (ie. from within the mind) perception (McInerney, 1992: 43,44).

Where does knowledge originate from? We perceive (data) with our senses, put it in context, test it against what we already know and what is generally accepted as truths and we end up with information. This piece of information is added to our inventory of other information to be stored away until we find it necessary to retrieve it again. This accumulation of information does not happen without structure. Each new piece of information is put in its appropriate place, like the pieces of a puzzle. The collection of information which is believed to be true and can be justified, is called knowledge. To add to knowledge, we use existing knowledge and information.

Knowledge exists only in the mind and is therefore intangible. It is also something personal although a subset of it will be the same for almost all people: That which we all believe in, a body of collective knowledge. How we utilise our personal knowledge sets us apart from each other. This ability of how we acquire and apply our knowledge we call intelligence. Intelligence, as we know, can vary widely from one person to the next. This is the reason why one person may be seen as more knowledgeable than the next person, although they may have access to the same information. What counts is the ability of a person to make meaningful connections and combinations between seemingly unrelated information.

Can knowledge be represented? The answer is yes, it has to be possible. Knowledge exists in the mind only and if it was impossible to represent it in some or other form, we would not be able to be informed. In order to be informed, we must be confronted with something. This something can only be experienced through the senses. In order for one person to inform another, the sender must represent the knowledge in his mind so that the receiver can receive something. Farradane (1980: 77 and 1979: 13) calls physically represented knowledge information. From the sender's side this seems right as it is data put into context and perspective by the sender, but can it also be described as information by the receiver? The answer is a conditional yes. It would be information to the receiver if he puts it into context and by adding perspective. Exceptions would be, for instance, where the receiver does not understand the language used by the sender. The receiver can only define that as data (meaningless attributes with the potential of having meaning).

Buckland (1991: 43) uses the terms information-as-process, information-as-knowledge and information-as-thing. A representation of information-as-knowledge is information-as-thing (and takes place during the process of information-as-process).

Returning to a definition for knowledge, the definition of the philosophers is accepted. The difference of opinions regarding absolute truths (rationalism vs. empiricism) is acknowledged without trying to resolve it here. *Knowledge is justified, true beliefs* and therefore, something intangible. It exists only in the (human) mind and can be represented in the form of information or even data. It is mostly personal (implying context and perspective) but certain knowledge can be non-personal and therefore a-contextual and a-perspectual, called *a* *priori* knowledge.

2.2.4 Wisdom

Ehlers (1971: 179) describes wisdom as an attribute that some humans have. Such humans can pass judgements on, or draw conclusions from information. Wisdom depends on a person's imagination, understanding, honesty, humility and intelligence. He points out that more information does not necessarily lead to greater wisdom (or any wisdom at all). There is a strong relation between wisdom and experience: Wisdom is usually gained by experience and this is why "illiterate people may be called wise" (Ehlers, 1971: 180). The experience Ehlers refers to, relates to Introna's *Erlebnis* (lived experience) (Introna, 1992).

Introna (1992: 2.38) argues that wisdom uses information (derived from data through appropriation) and not knowledge, as its foundation. By using the hermeneutic circle, wisdom is gained by interpreting information, eventually leading to understanding and insight. A person with wisdom is able to make sound judgements. Judgement, he points out, is more than simply making decisions. Judgement uses insight and understanding and relates strongly to a particular situation. The ability to make sound judgements cannot be taught. Wisdom, according to Introna, seeks to understand the meaning of a situation. The interpretation process is strongly historical, contextual and perspectual. (Introna, 1992: 2.36).

From the above it can be concluded that wisdom is situation dependent. A person could be seen as being wise in one situation and illiterate or ignorant in another. However, for the situation where the person is seen to be wise, we can safely assume that such a person would be knowledgeable about the given situation. A person can never show wisdom in a situation if he has no information ("data put into context and perspective") or no knowledge ("justified, true beliefs"). It is, again, how such a person make meaningful connections between the information and knowledge he has available: A person with a "normal" ability to make such connections would be called "a knowledgeable person" and one with a superior ability to do that, would be called a" wise person".

This explains why it is not possible to teach someone to be wise. Just as it is impossible to teach someone how to be more intelligent, that is, how to use available information constantly better, it is impossible to teach someone how to improve the ability to make meaningful connections and combinations of knowledge and information. You can either do it, or you cannot.

Wisdom is the ability a person has to combine the information and knowledge he has available to provide insight into a given situation. For someone to be wise, reasonable intelligence may be a prerequisite, but it requires no level of literacy nor any formal education.

2.2.5 The relationship between data, information knowledge and wisdom

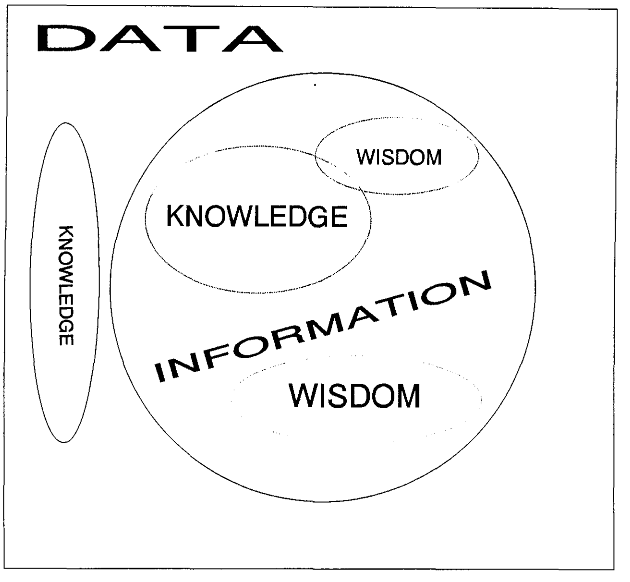
Data are attributes with no apparent meaning. This forms the universe set. Information, defined in terms of its component, data, is data put in context and perspective and therefore a subset of the data universe. Information, defined in terms of knowledge, is knowledge represented physically. Knowledge is justified, true beliefs. It can be based purely on data derived by reasoning and therefore non-personal, or it can be a subset of information derived through interpretation and therefore personal. It can thus be a subset of data or a subset of information. This relationship is depicted in figure 2.1.

Wisdom is the ability to combine information and/or knowledge to gain or provide insight into a given situation. It can therefore be a subset of knowledge or of information.

The problem with the terms data, information, knowledge and wisdom is that these terms are all used by laymen (and scientists) in common, everyday language. This, of course, leaves the term open to be used for a wide variety of phenomena; vulnerable to misuse. (This is where natural science has the

Figure 2.1

The relationship between data, information, knowledge and wisdom



advantage of working with concepts and phenomena not known to or understood by laymen thereby enabling scientists to define phenomena accurately.) Once data, information, knowledge and wisdom are defined, they loose the ability to assume different roles. This is like putting them into straight-jackets (Baily, 1984: 246) or giving rise to its "chameleon" character (Cronin, 1984b: 27).

In the study of information it would be more advantageous to use the terms suggested by Buckland (1991), namely information-as-process, information-as-knowledge and information-as-thing. He proposes the following:

Table 2.1

Four aspects of information

	INTANGIBLE	TANGIBLE
ENTITY	Information-as-knowledge (Knowledge)	Information-as-thing (Data, document, book, object, recorded knowledge)
PROCESS	Information-as-process (Becoming informed) Situational	Information processing. Data processing, document processing, knowledge engin-eering

Adapted from Buckland (1991: 6)

Information, according to Buckland, can be transformed from the one dimension to the other, as follows:

Table 2.2

Transformation of Information

	To: Intangible	To: Tangible
From: Intangible	Through thinking, reasoning (new information-as-knowl-edge; only by humans)	Through expressing (represented knowledge (information-as-thing); only by humans)
From: Tangible	Through perceiving (new information-as-knowl-edge); only by humans	Through information processing (new information-as-thing; possible to accomplish by using computers)

Adapted from Buckland (1991: 116)

The terminology suggested by Buckland is indeed useful. It provides the opportunity to escape from the connotation attached to the familiar terms data and information.

2.3 The Origin and Relevance of Information

The concept of information is as old as mankind itself. Immediately after man was created, God gave him information on what he could eat and what not: "You are free to eat from any tree in the garden; but you must not eat from the tree of the knowledge of good and evil..." (Disciple's Study Bible 1988: 7).

Looking at the interactions between man and his environment, information again plays a major, integrated role. A human being observes everything around him (data) and adds to his composite knowledge. This knowledge is then utilised to create a man-made universe consisting of machines, organisations, etc. and to manage and control his own activities as well as the environment. There is a constant interaction taking place between man, the environment and other human beings by means of organising and controlling, in the process contributing to the composite knowledge of mankind. "The activity control is reflected by the social, political, and economic forces which keep society in motion. In all of these interactions information is involved" (Otten, 1974: 93). Information is therefore an integral part of man's existence.

Checkland and Scholes (1990: 2) take this argument further and state: "Mankind finds an absence of meaning unendurable". In order for man to find meaning, he needs to find answers to many fundamental "unanswerable" questions. Based on what we see and experience, we interpret and form "intentions" as they call it; another unique characteristic of man, according to Checkland and Scholes.

It is therefore not surprising to find that, from the earliest times, man has been collecting information about himself and his environment. The Sumerians were already recording information in the year 5000 B.C. and the event of the first book-press in the 15th century is seen to be one of the major events in world history. According to Toffler (1979: 37), at that time, new titles were published at a rate of 1000 per year in Europe. In 1950, that is, four and a half centuries later, this figure stood at 120,000 per year and in the 1960's, worldwide, 1000 titles were being published per day. "On a worldwide basis, scientific and technical literature mounts at a rate of some 60,000,000 pages per year" (Toffler, 1979: 38). Benjamin (1987: 30) and Naisbitt (1984: 24) claim that the available data double every twenty months and Cronin (1985: 5) claims that "the US Federal Government collects more than 130 billion items of data per year".

The invention of the electronic computer around 1950 brought with it new possibilities as far as the processing of data, including text, was concerned. Suddenly it was possible (though not very practical but at least possible in principle) to manipulate enormous amounts of data. The dissemination of the available information became a reality. This led to masses of data being collected in databases. Cronin (1985: 5) claims that in 1985, 2000 databases were commercially available, containing more than 80 million records and growing at a rate of 8 million per year.

The advent of the computer brought with it the birth of the "Information Revolution" and the gradual end to the "Industrial Revolution". Where the shift from the agriculture society to the industrial society took 100 years, the shift from an industrial society to an information society only took two decades (Benjamin 1987: 30). In a lecture delivered during 1986, Cronin (1985b: 129) made the point that the world has not yet become an information society, but that the signs indicated that it was evolving towards an information-conscious society.

Organizations have also been affected by changes that were taking place throughout the Western world since the 1970's. The need for information increased together with these changes. Organisations grew in size as a result of internal growth as well as from takeovers and mergers. This trend was particularly visible in the motor, aviation, computer and chemical industries where fewer, but much larger firms became evident. Tricker (1982: 22) quotes British Leyland's merger with Honda, the Concord and the Airbus as examples of this trend.

This increasing scale, together with the internationalization of the business, calls for new and innovative organizational structures and places a much bigger emphasis on information. "A diagram of communication and data channels in a modern organization ...is more likely to resemble a plate of spaghetti than a neat organizational pyramid" (Tricker, 1982: 23). The executive of such a firm is faced with the problem of having to take far-reaching decisions. These decisions cannot be taken without the necessary information at the disposal of the executive. As a result, the executive needs the support from a variety of information systems simply because he cannot monitor this complex situation on his own.

It is not only organisations that undergo change. Everything around us seem to be changing. The rate of change also seems to accelerate. The speed and range of mass communication, the speed of travel, the rate at which energy is consumed and even the population growth seems to be taking place at a faster rate (Toffler, 1979: 31 - 37). We are living in an information-rich era. Information, in a generic sense, seems to be all around us. Toffler (1979: 157) indicates that the average American spends, on average, about 52 minutes every day reading his newspapers. That same person listens to the radio for an hour and a quarter and sees about 560 television advertisements. Of these he only notes 76. The rest is "blocked out".

The greatest creation of man, according to Tricker (1982: 40) is the spoken and written word. This ability differentiates him from animals which communicate visually and by the simplest vocabulary of sounds. Being human means being able to convey information by means of language. Language enables man to record his past and imagine his future. Being able to handle information of greater complexity, of higher levels and with greater interconnectedness, enables man to evolve to bigger achievements. The ability to capture, store, transmit and retrieve data offers the potential for higher orders of human relationship between individuals, organisations and societies (Tricker, 1982: 40).

The modern organisation has no option but to rely on its information systems to be able to absorb the changing environment in which it functions. The information system emerges as one of the core information sources of the organisation. Therefore, "the potential for crises, even catastrophe, is significant; so is the opportunity for increased efficiency and effectiveness" (Tricker, 1982: 41).

White (1987: 3) stresses this point when he writes about knowledge as "...the most valuable commodity... Information is the ore from which... we can extract knowledge... Knowledge is the only antidote to ignorance and its attendant evils, poverty and disease". Likewise, Jacob and Rings (1986: 119) write this about information: "Information is integral to all living organisms. How we use that information determines how we live and function and how our societies evolve". Van der Merwe (1986: viii), in a book on computers and the law, writes: "...I argue that information be recognized as one of the most valuable assets in this century and that it should be correspondingly protected by the law". Tom Peters in his book "Liberation Management" (1992: 110) describes organisations as "information processing machines". He even claims that "All economics is information processing" and bases his statement on the fact that it is of vital importance for any business to be in instant touch with its customers: What they want, where they want it, etc.

Information is the fuel of the intellect. Every individual needs it and no business can survive without it. It is only when we stop to think about it when we realise the role information plays in our everyday lives. From our earliest days we collect information about ourselves and our environment and have grown so used to it that we do not give it a second thought. Most of the time we take it for granted. We treat it in the same way we treat oxygen.

Businesses thrive on information. Without it it grinds to a halt. Information is the lubricant of society and of business.

2.4 The Life-Cycle of Information

Horton (1979: 53) contends that any fact has a certain "life-cycle" (bearing in mind that a "fact" roughly equates to data). The four stages of its life (based upon the work of Claude E. Shannon) are as follows:

- Stage one is the "birth" of the fact. At this stage this fact has almost no significance standing alone, out of context. It is a "raw fact" and thus unevaluated. An example of this is for instance a number. A number has almost no meaning on its own and will remain so unless there is a context within which or against which to ask a question.

- Stage two is when the fact grew because someone chose to evaluate the fact by placing some interpretation or meaning to it. This is why information is often referred to as evaluated data.

- Stage three is when the fact reaches "maturity". This occurs when various bits and pieces of information are put together in an even broader context. By adding one's own knowledge to this information, it is possible to move from mere opinion or half-truth to "truth". "It helps us point to principles, and it helps to add to a body of doctrine" (Horton, 1979: 53).

- Stage four is the possible death of the fact which happens when its identity and relevance are completely subsumed and submerged in the knowledge base.

Shannon (in Horton, 1979: 53) and Simon (in Horton, 1979: 54) both developed theories on the nature of information, based on the life-cycle of a fact.

There is a distinct similarity between the life-cycles of Horton and the differences between data, information, knowledge and wisdom. Stage one may be equated to data, stages two and three to information or even wisdom whilst stage four may also be looked at as knowledge ("true beliefs"). It may therefore be useful to look at data, information, knowledge and wisdom as a growth or evolution of a concept, fact or attribute.

Cronin (1985c) points out that information has, in fact, multiple life-cycles; information which is of little value today may be of critical importance a number of years from now and vice versa. This points to the timeliness attribute of information. Cronin's view of the life-cycle therefore points to variations in its value. This is different from Horton's view which is based on the evolutionary stages a fact goes through although implicit in Horton's view there is also an element of value.

Burk and Horton (1988: 11, 19, 30) also refer to the life-cycle of information as one of the models of managing information. They list the following as the life-cycle:

- information requirements definition
- creation, acquisition or collection
- transmission
- processing
- storage
- retrieval
- dissemination
- use and re-use
- disposal.

This view refers more to activities rather than a life-cycle in an evolutionary sense. It does not offer much as in between the creation and the disposal, anything can happen to the "information", or nothing at all. It does not have to go through any of the "stages".

We can conclude that information (in a very generic sense) passes through various stages starting with its creation and ending with its disposal or purging. Important to note is that during these stages, value may be added to the information. It does not have to go through all the stages and there is no limit to the time that it spends in one stage. Information that has been purged at one point in time may be "resurrected" again at a later stage and may, in fact, go through some of the stages again. The life-cycle is therefore not linear; it is more cyclical in nature.

What is important to note is the timeliness concept. This is of specific importance when looking at the management of the information which is covered later on.

2.5 The Dimensions of Information

2.5.1 The Resource Dimension

The general perception of information as a collection of data, facts, ideas, or knowledge, implies that information is a resource, although not always something physical. The Commission on Federal Paperwork (in Horton, 1979: 11) recommended to the US Congress in 1977 that information was to be treated as a economic commodity. Scharf (1984: 40) and Braunstein (1981: 9) also accepts that information is a commodity. Vickers (1985c: 152) writes the following: "The notion that information is a resource is becoming quite widely accepted in certain circles, as evidenced by the spate of pronouncements on the subject by various gurus in the management, data processing and information science journals; in government publications .... and in the national press".

Otten (1974: 97) is convinced that information can be seen as a commodity: "...it can be transported (communicated from/to) or altered (processed by) ...be produced (generated by) and lost (in the process of communicating or processing)." When information is viewed as a resource, time does not play any significant role. He does, however, point out that there is no way of "directly or indirectly" measuring this commodity, thus paving the way to clearly differentiate between the properties of information as a resource and the properties of other resources.

The resource dimension refers to information-as-thing and information-as-knowledge. It includes therefore both the tangible and intangible forms of information.

2.5.2 The Process Dimension

Not everyone agrees with the view that information is a resource. Carlson (of IBM) (1980: 6) states categorically that information is not a resource. Vickers (1985c: 152) finds that people believe that if you cannot hold something in your hand, then it is not real and, therefore, not a resource. The question emerging from this line of thought is: If information is not a resource, what is it then? Is it just a concept? Carlson (1980) does not give an answer, but others feel that information can be treated as a process.

The process referred to is the process taking place when a change occurs in a person's knowledge of something. Wilson (1985: 62) points out that this change, however, can only take place when the person has been presented with some information (the "stuff") and notes: "...no benefit can occur unless some useful change in the state of knowledge of the [receiving] person occurs" (Wilson, 1985: 62). Buckland (1991) uses the term information-as-process to refer to this dimension of information.

When information is viewed as a process, time is important: "Information received at one time can be no information at another time" (Otten, 1974: 97).

Horton (1979: 59) suggests that we think of information both as a process and as "stuff", i.e. "Information, then, is both a process which incorporates the objectives, values, logic and perceptions of the individual and a series of objects in the form of data elements, records, reports, files and messages which are an integral part of the process by which the individual collects, stores, transmits and communicates symbolic data that has meaning or value to the person".

This view implies that the individual describes, understands and interprets the real world through the use of symbols. Individual information processing, therefore, implies the use of symbols and this use of symbols presents one of the root causes of information problems. The way these symbols are organised, conceptualised, presented and are given meaning to, must have an important bearing on the effectiveness of decision-makers and problem-solvers (Horton, 1979: 59).

This view strongly correlates with the views taken by the field of semiotics. Semiotics is the study of a culture as a formal system of signs and therefore views information as the process of communication. The analysis of the process of communication takes place on four levels. The pragmatic and semantic level focus on the contents and purpose of communication whereas the syntactical empirical levels focus on the way and form of communication (Liebenau and Backhouse, 1990; Stamper, 1973).

Wilson (1985: 62) also feels that information must be viewed as both resource and process: ".... it is necessary to think of information as both stuff and process". Otten (1974: 96) calls these two dimensions the static (resource) and the dynamic (process) concepts of information. Buckland (1991) refers to information-as-process and information-as-thing to distinguish between the two dimensions.

Langefors (1993: 150), in his Infological Equation, clearly identifies a process, but also part of his equation is data, which could be viewed as a resource.

2.5.3 Other dimensions

Debons et al. (1988: 2) identify two other dimensions, namely, information as energy and information as communication. The energy dimension is argued by pointing out that the sound waves of an approaching train provides one with information. The communication dimension points to messages flowing from one person to another during conversation (semiotics). These two dimensions,

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however, are both pointing to messages being transmitted and received by means of sound waves with the result that they must be one and same dimension. It is felt that they are already included in the above two dimensions (resource and process).

It is clear from the above that information has one dimension pointing to something physical or conceptual (the resource or commodity dimension) and another dimension pointing to something taking place inside the mind (the process of informing). When referring to the resource dimension, it is important to realise that knowledge, even though intangible, is also included and that it is not restricted to something physical. When evaluating how information should be managed, a particular challenge presents itself, namely, how to manage the intangible part.

2.6 Characteristics of Information

Cleveland (1982: 34) lists the following characteristics of information:

- Information is expandable

  As information is used more and more, more information is added to it, resulting in a growth. There is no limit to this growth and this introduces the problem of information overload: Too much information. The only limiting factors are time and capacity: Time available to humans to analyse and use information and capacity of people to analyse and think integratively.

- Information is compressible

  Paradoxically, information can also be compressed, that is, summarised and concentrated for easier handling.

- Information is substitutable

Cleveland mentions robotics and automation in factories replacing workers and therefore causing a transformation of the workforce. Toffler (1990: 88) and Bell (1976: xiii) claim that information is replacing capital.

- Information is transportable

  "Bits" of information can be transported at the speed of light. Verbal communication takes place at the speed of sound.

- Information is diffusive

  Information tends to "break out of the unnatural bonds of secrecy in which singleminded people try to imprison it" (Cleveland, 1982: 37). Information seems to influence the environment around it, spreading when leaked.

- Information is shareable

  Things are exchanged, information is shared. If an idea is shared by two people, they both have the idea. (It is "...like a good kiss: In sharing the thrill, you enhance it" (Cleveland, 1982, 37)).

Economists identified certain characteristics of a market commodity which may lead to problems and even market failures. The attributes that describe information and often give rise to market failures are, amongst others, the following:

- Simultaneity of ownership, i.e., more than one person may own the same "bit" of information.

- Indivisibility, i.e., half an idea is worth nothing.

- Nondepletability, i.e., when an idea is sold, the seller still has the idea for himself.

- Uncertainty and risk in transaction, i.e., the seller has to tell the buyer what the idea is before the buyer can decide if he wants to buy and then the buyer may not want to buy any more because he already knows what he wanted to know (Braunstein, 1981: 10-11).

It is clear that information has certain unique characteristics. Compared to the other resources, namely human, financial, natural and material resources, the information resource is the most difficult to grasp. From an information management point of view, these characteristics are of paramount importance. They need to be taken cognisance of if information is to be managed properly.

2.7 The Purpose of Information

Introna (1992: 2.11) writes that the purpose of information is to effect change in the recipient of the information. Why would it be necessary to effect change in someone else? The reason for this is to be found in the nature of the human being. A fundamental characteristic of being human is, firstly, to survive and, having achieved that, to search for meaning. In order to survive, we need to be informed: What to eat, what animals are dangerous, how to find food. Searching for meaning means observing the world around us, but also to share ideas with others of the same kind. This cannot be done without information flowing between individuals.

Habits, tradition, customs and knowledge are passed on from generation to generation. As human beings we want to express ourselves. This is impossible to achieve without information.

The purpose of information is therefore to share with others and, as an integral part of the process, to gain more information and knowledge. Information and knowledge kept to oneself, is to be selfish. (Although this argument sounds very logical, people often behave differently. This issue will be explored further in chapter 3, section 3.5.7.) Furthermore, information must trigger some action, either in the owner of the information or in the recipient. Information needs to be productive and not only informative.

2.8 The Uses of Information

As was pointed out in earlier sections 2.3 and 2.7, information plays an integral role in our everyday lives as well as in business. We use it to be informed about many things - from the mundane to the most complex. The same person who spends his working day doing the most complex mathematical computations, may spend his evening watching a fiction movie.

In the business world, decisions are taken based on information. The "better" the information, the "better" the decision ought to be. Having the necessary information regarding its competitors, one business can put the other out of business. Information is the lifeblood of a business: Without it, it is doomed to failure. Careful attention should, however, be given to the kind of information needed in a business. A common mistake (often made by information systems professionals) is that all information must necessarily be structured (quantified) information in order to be useful.

McKinnon and Bruns (1992: 15) undertook an interesting study in the USA to determine, *inter alia,* what information managers need and where they (really) get such information, and proved that the formal accounting systems were "more frequently than not" not the primary source of managers' information. They found that "...successful managers develop the ability to collect and use diverse, ambiguous, and sometimes contradictory information effectively and efficiently". They conclude that the MBLN - Management By Little Notebook - had not died as many would have wanted to believe.

Governments are both creators of data and information and users at the same time. Selective releasing of information to its citizens may put it in a powerful position, leading to the argument that "information is power". Having the necessary information wins wars and gives comparative advantage in negotiating fora.

The uses of information will be explored more fully in chapter 3 when information is analysed in different contexts.

2.9 Disciplines related to Information

2.9.1 Information Theory

The term information theory (or theory of communication) is sometimes used to refer to the work of Norbert Wiener (1948) and Shannon and Weaver (1972) on the mathematical theory of communication. (They originally published their findings in 1949.) It concentrates on three "levels" in the communication process, namely, (i) how accurately symbols of communication can be transmitted (the technical level), (ii) how meaning is conveyed (the semantic level) and (iii) how effectively received meaning affect conduct in the desired way (the effectiveness level). They do this by using a model of a source with a transmitter, a destination with a receiver, the channel between these two and noise coming from other sources and interfering with the signal on the channel.

The technical level (transmission) can be expressed in great detail using mathematics. In this regard Warren Weaver did excellent work to show mathematically how noise, for instance, can affect the channel. The semantic side, that is, the meaning of the message and how it compares with the intended meaning on the source's side, is more complicated. Shannon acknowledges this and says: "This is a very deep and involved situation..." (Shannon and Weaver, 1972: 4). Weaver acknowledges the semantic side, but then chooses to ignore it: "[The] semantic aspects of communication are irrelevant to the engineering problem" (Shannon and Weaver, 1972: 31).

2.9.2 Information Science

Information science concerns itself with the study of communication of information in society (Vickery and Vickery, 1987: 1). It studies all the processes involved in generating, use and transferring information from sources to recipients (users) and addresses the following:

- The behaviour of people as generators, sources, recipients, and users of information, and as channel agents;
- The quantative study of the population of messages - its size, growth rate, distribution, patterns of production, and use;
- The semantic organisation of messages and of channels that facilitates their identification by sources and recipients;
- Problems particularly associated with the functions of information storage, analysis and retrieval;
- The overall organization of information systems and their performance in transfer;
- The social context of information transfer, in particular its economics and politics (Vickery and Vickery, 1987: 12).

From the above it is clear that some other disciplines are drawn into the information science term, namely, library science and computer science. Debons (1985: 66) argues that library and information science belong to the same corpus. The higher level, or meta level, is the knowledge environment.

In a later article, Debons *et al.* (1988: 12) write: "It is clear ...that the major areas of interest of information scientists lie in the logistical (acquisition, storage, and retrieval) properties and requirements of knowledge". It is founded upon the disciplines of philosophy, mathematics, linguistics and behavioural science.

It is clear from the above that information science addresses the same issues as information theory with the difference that information science does not approach it from an engineering (mathematical) angle. It views it as a social issue. A part of the information science discipline is library science and, to a lesser extent, computer science. Both library science and especially computer science, have their own specialist fields, but in total, they all belong to the same corpus: The knowledge environment.

Information science is very relevant to the concept of information management and makes an important contribution in understanding what information management is. It tends to focus more strongly on the *content* side than on the *conduit* side.

2.9.3 Computer Science

Computer science concerns itself primarily with computers and operating systems. It recognises however, that the purpose of these is to manipulate data into, what is ordinarily called, information. It therefore has to touch on the terms data and information, but it not necessarily in a great amount of detail.

Rice and Rice (1969), in a book on computer science, deal very briefly with the concept of information by acknowledging that they do not try to define it precisely. They write: "We simply feel that [information] is something abstract that does not have any physical existence". This reference to information by Rice and Rice is remarkable in the sense that, by saying that it does not exist physically, they clearly recognise that information can never be created by computers. It has the implication that is only exists in the mind, presumably as knowledge.

Although this is rather unsatisfactory from a definition of information point of view, it must be understood that computer science is more interested in the "how" rather than the "what". In contrast to information science, it focuses on the conduit rather than the content.

2.9.4 Information Systems

An information system is generally understood to be a system to provide management and others with information they need to do the tasks they have been assigned. Although such a system does not have to be computerised, most information systems used in business are. Even computerised information systems will always have elements of manual procedures as part of the overall system. Davis and Olson (1984: 7) sum it up: "...some tasks are best performed by humans, while others are best done by machine."

An information system is essentially a mechanised representation of the real world. To successfully develop and implement such a representation is not easy. Various ways have been invented to "translate" the real world - usually users' requirements - into a mechanised system. Information mapping or information modelling is one such way. Information modelling can be approached from at least two views: The Reality Mapping view and the Formal Language Development view (Lyytinen, 1987: 9). The former "concentrates on the completeness, predictability, and consistency of the [information systems] design", whereas the latter "concentrates on the nature of human communication and sensemaking" (Lyytinen, 1987: 17).

Generally speaking, an information system processes data in order that humans can transform such data into information, leading to a state of awareness of the environment. It usually involves a combination of "persons, machines, and procedures that augment human biological potential to acquire, process, and act upon data. It thus improves our chances for survival" (Debons *et al.,* 1991: 9). It is important to realise that an information system cannot produce, generate or create information. Information, according to the definition, is data put into context and in perspective. Only a human can do that. Introna (1992) uses the term "appropriation". Again machines cannot do that on behalf of a human.

What is possible for a machine to do is to produce an information *product* (such as a report), thereby producing an information *resource*. But even this process is impossible without a human having "programmed" such a machine beforehand.

Semiotics, the study of analysing signs and how they function, is very relevant to information systems. Semiotics concerns itself with the process of informing; in transmitting a signal from a sender to a recipient and having the objective of getting a message across as clearly as possible in order for both parties to understand. Semiotic analysis provides useful diagnostic tools to analyse problems associated with information systems. It does the analysis with respect to the meaning, form, content and purpose of the message. The problem can therefore be defined at the correct level and fixed on that level without interfering with the others unnecessarily. "The semiotic approach to analysing information systems is robust and independent of any particular technology. Instead, because it is based upon the way people use signs, it can come close to capturing the full range of properties" (Liebenau and Backhouse, 1990, 17).

A term often used is management information system (MIS). There is little difference between a management information system and an information system although, generally, the management information system is aimed more at providing information to management rather than lower levels of the organisation. Davis and Olson (1984: 6) define an MIS as "...an integrated, user-machine system for providing information to support operations, management and decision-making functions in an organization. The system utilises computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database".

What is important is that an information system can never be and should never be viewed as something technological only. There is a strong sociological side to an information system which must not be underestimated. Lyytinen (1987: 17) writes: "Information systems development is both a social and cultural change that is carried out in relation to introducing information technology". Not only is that true for the design and development phase of an information system, but it is especially true for its implementation phase.

Going back to the definition of information, namely, that it is data put into context and perspective, it is clear to see that a machine, or the procedures of a manual system, can never put data into context and perspective: Only a human can do that for himself. Transforming data into information can therefore only be done when a human is involved; when information-as-thing becomes information-as-knowledge. Information systems designers often overlook this "human" side of information systems and concentrate on the technical side, only to be totally surprised when the systems is not successfully implemented.

The study of information systems is important to information management as the two are interrelated. Information management will always involve information systems in some way or another. Successful implementation of information management requires an in-depth understanding of information systems, especially the social side thereof. The importance of a good understanding of information and its relation to data and knowledge to the field of information systems is evident in the work of many authors on information systems. In this regard the work of Langefors (1993) and Lyytinen (1987) can be mentioned.

2.9.5 Information Technology

Information technology refers mainly to computer technology: Hardware and software. Because of the close relationship between information systems and information technology, it is important to take note of technology when addressing information management. Peters (1992: 11) writes: "The computer is the locomotive of the Information Age." By this he means that information technology has been the enabler of the information economy and society; without the developments in information technology and the convergence of related technologies, such as telecommunications, the growth of the information economy would be impeded.

Otten (1984: 17, 23) uses the term information tools to refer to information technology. This is what supports the information work. The support function is, of course, important as, without it, the information work would become impossible to a large degree. Yet, it must not be seen as an end in itself; it is only the means. Otten distinguishes between data manipulating and information processing technologies (note the plural). The data manipulation technologies are concerned with data and its form of representation (print, image and speech) and therefore not with content. Information processing technologies concentrate on content and not the form; they are used to transform "input data into output data" and therefore add value to information (Otten, 1984: 18). They become artificial extensions of human capabilities. Otten argues that the individual who is in full control over these technologies has a competitive advantage in the labour field while those who fall behind may even become obsolete (e.g. a typist who cannot use a word-processor). Likewise, businesses which are in full control of technologies gain competitive advantage. For business this implies for information to be regarded as a resource. The same could apply on a national level (Otten, 1984: 19).

Many writers equate information technology and information systems with information management. A good example of this is the book by Duffy and Asad (1980), *Information Management*, in which just about the entire book is devoted to the development of information systems and the management of information technology. Another example is the book by Paul L. Tom: *Managing information as a corporate resource*. The very last sentence in the book says it all: "It is important that all the computer hardware fit together to contribute to the overall goals and mission of the corporation. *That needs corporate management of the company's information resource*" (Italics added) (Tom, 1987: 308). This clearly indicates that the author holds the view that the information resource consists of the computer hardware only.

Of course, information technology plays a very important role in information management, as will be later explored more fully, but is but one of the components of information management. It provides the necessary information infrastructure for the information management, but is not information management itself.

2.9.6 Conclusion

It is clear from the above that information falls within the domain of many and varied disciplines. Each one of these disciplines has a justified claim to information as one of its focal points, but this often leads to a definition of information suited to that specific discipline. This is the reason why information is perceived and defined differently by computer scientists, librarians and communication scholars. What is clearly called for is an holistic approach. An approach which does not aim at a specific discipline, but one which takes the different approaches into consideration.

2.10 The Cost of Information

It is argued by Horton (1979: 57) that information can be viewed (in an economic sense) as a commodity. That immediately introduces the concept of selling and buying of information. For a market to exists, the commodity must have a value to the buyer and a cost to the seller. Marchand *et al.* (1986: 212), however, point out that information is not an ordinary commodity - it can be sold without a loss of ownership and, what is more, it does not get depleted. Information products, though, are sold on a daily basis; newspapers and books, for instance.

It was pointed out that information is a product obtained when data are converted through a process of adding context and perspective. In order to obtain the product called information, it will be necessary to collect or generate data and then to put it through a process of data manipulation using technology, or doing it manually, or both. Such a process implies that a cost is involved. Each additional element of data carries a marginal cost although this cost usually does not increase in a straight line as manpower or computing facilities are added to acquire and manipulate that data element.

The moment that the data become information implies that someone found the data useful and it therefore acquires a value. This does not mean, however, that data do not have, at least, a potential value or that information does not have a cost. Data, like water in a reservoir waiting to be sold, have potential value. Data may even have a real value: Someone may buy raw data in order to extract information from it. The cost of information is found in the cost of the resource used to obtain the information: The data.

The value of the information to the user follows an inverse exponential curve. If the user knows nothing of the subject, each element of information reduces his uncertainty considerably and it will consequently have a high marginal value over the cost. As the user learns more, each element of information adds less to his knowledge base until new data add nothing more and might even confuse him (Tricker, 1982: 34 - 35).

Costing or pricing information and the valuing thereof are not simple matters. Information, as was shown, lies on a continuum ranging from something tangible (information-as-thing) to highly intangible (information-as-process and information-as-knowledge). If we define information as the process of increasing knowledge then we must agree with Wiener (in Tricker, 1982: 35) who writes: " ...information is what changes us. It is not a commodity to be bought and sold".

2.11 The Value of Information

By looking at information and the role it plays in decision-making, one can conclude that the value of information must be closely tied to the decision made with that information as basis (Carlson, 1989: 7). This view implies that information cannot possibly have an absolute universal value. "Its value is related to who uses it, when it is used, and in what situation it is used" (Ahituv and Neumann, 1982: 50). Farradane (1986: 14) does not look at the receiver of the information to determine its meaning. He looks at the originator and writes: "The only valid meaning must be sought in the originator's thought". Likewise, Hoffmann (1980: 291) shows that the information content of a document can be qualitatively determined by just looking at what is written in the document, that is, without taking into consideration what effects the information may have on the receiver.

To determine the value of information in a given situation, Ahituv and Neumann propose three techniques:

2.11.1 The normative value of information

According to the *normative value* of information, the nett income which may be realised is calculated by subtracting the expected income without the information from the expected income with the information, that is:

a = b - c,
where
a = Nett expected income,
b = Expected income *with* the information and
c = Expected income *without* the information.

The normative value of information is derived from decision theory and is also sometimes called information economics. It has a high degree of probability as its base. Also underlying the theory is that there is some preliminary knowledge available about the occurrence of the events. This knowledge is then utilized to assign to each event an a priori probability, either objective (such as tossing a coin) or subjective (such as predicting a winner of a sports match). Additional information is fed into the model and the nett income then calculated (Ahituv and Neumann, 1982: 51).

It is clear to see that this technique is very individual-oriented. An extension of this technique, called the team theory, is sometimes used and takes into consideration the views of groups of people to determine its value.

2.11.2 The realistic value of information

It has already been pointed out that information forms the base for taking decisions. Decisions trigger actions and actions affect the achievements of the information user (which, in this case, could be a person or an organisation). If we can therefore measure the differences in achievements, the impact of information can be determined. The common term for achievement is performance, and the measured difference in performance, due to informational factors is called the realistic or revealed value of information (Ahituv and Neumann, 1982: 56).

This technique offers significant advantages over the normative technique. Firstly, it is not necessary to know the probabilities and strategies and to formulate a mathematical model. The information-processing/decision is therefore treated as a "black box" into which the inputs are fed and out of which the outputs are measured. Because the outputs are measured, rather than calculated, the model has a second advantage.

Performance can be measured in terms of profitability, response time or accuracy of reaction and although it might still be difficult to relate changes in output directly to changes in information (the input), these can be overcome (Ahituv and Neumann, 1982: 56).

The third advantage is the fact that this technique takes into account human factors related to perception and preferences as well as the technical characteristics of the information system. The normative technique is furthermore sometimes criticised because of its basic assumption that human beings act fully rational and wish to optimise. Simon (in Ahituv and Neumann, 1982: 57) claims that the normative technique uses satisficing rather that optimising. The realistic model incorporates this idea because it measures what is achieved instead of what should be achieved.

A disadvantage of the realistic value model is that it could be expensive to set up an experiment and sometimes difficult to have an experiment similar in all respects to the real situation. If these can be overcome, however, this model provides a good way of determining the value of information.

2.11.3 The subjective value of information

This technique takes into account a person's impression of the value of information. Individuals are confronted with alternative outputs (such as reports) and their opinions asked, usually to rank the alternatives, or to designate their satisfaction on a scale, or to estimate how much they are willing to pay for the report (Ahituv and Neumann, 1982: 57).

Ahituv and Neumann (1982: 57) point out that this technique is used quite frequently in our everyday lives. When the price of a newspaper is increased, we reconsider whether we are still willing to pay the new price. At some stage the price asked for the newspaper will be higher than the value of the information if the price is continually increased. This price is then our subjective value of the information.

Ahituv and Neumann (1982: 58) quote several problems with this model. Firstly, it is based on the subjective values of individuals. Totally different values could, therefore, be obtained should key personnel change. Secondly, to put a monetary figure to a scale rating of, say 1 to 7, is difficult to do (and again subjective) and having done that, it is hard to decide between systems when system A is graded 4 (with a value of, say, R20,000) and system B is graded 4.5 (with a value of R25,000). The third problem is that the subjective value is *ex post,* that is, the value can only be determined *after* the information is available. To get the information to be available might sometimes be a costly process in itself.

If we accept that information can be treated as a commodity - even though it might not be " ...a commodity like any other" (Scharf, 1984: 39) - then a market for information must exist. This is indeed the case as proved by Cronin

(1985: 5), claiming that in 1985 there were already 2000 databases available on a worldwide basis. The selling of books and specifically textbooks, is also nothing but the selling and buying of information.

The nature of information is again such that its trading is often problematic. Once information is sold to a customer, that same customer may sell the same information to a third party. Depending on the price paid by the first buyer, his price to the third party may be less that what the original seller asked. "This has become a real problem in the information field where there are examples of producers of information competing against their customers for additional buyers" (Braunstein 1981: 11).

Another problem with the trading of information is that it is not easy (if at all possible) to determine what the value of the information is before it is known to the buyer what the information is. That is, the buyer cannot make an accurate judgement on the basis of part of the information. "And if I did have perfect information about what was offered for sale, I would no longer need to purchase it" (Braunstein, 1981: 11).

The view that information does not have absolute value is not uncommon to other commodities. The value of a glass of water differs between someone who has lost his way in the Sahara desert and the value it may have to someone who lost his way in an arctic desert. The same applies to the value of knowing the results of a horse race. It depends on the person (whether he is a gambler), the time (before or after the race) and the situation (whether the bookmaker is accessible) (Ahituv and Neumann, 1982: 50).

Valuing information is not a simple matter. Marchand and Horton (1986: 212) write: "No topic is more complex that the one of finding useful ways to measure the value of information products... and of determining their costs".

2.12 The Information Quantity

When considering economic commodities and services, it is customary to define the entity and then some unit of measure of the entity. This is necessary to determine the value of the entity per unit. When the entity under consideration is data, its representation is letters and digits. It is possible to quantify this, for example, by counting the number of characters, number of words or the number of sentences. This, however, does not give any indication of the meaning of the letters or figures. With data and information it is therefore not possible to do any kind of evaluation before the user and the situation in which the data are used is also identified and taken into consideration (Ahituv and Neumann, 1982: 59).

Characters, digits, words and sentences are therefore all valid measurements for the quantity of data, but clearly not indicating the meaning, neither to the recipient, nor to the originator. There is another measurement, called the entropy function, which attempts to go one step further by taking the meaning into consideration.

Langefors (1993: 114 - 129) introduces a concept he calls an information element. He writes: "An information element is the knowledge of something elementary, or simple, about an (identified) object" (Langefors, 1993: 115). He then identifies elementary messages (e-messages), elementary sentences (e-sentences), data records and information about information (meta-information) in order to design a model to be useful in information systems design and development. The e-message provides a way of structuring information (Goldkuhl, 1995: 63).

The entropy function has its origin in the study of thermodynamics and serves as a measure for the degree of disorder in certain states of nature. Shannon and Weaver (in Ahituv and Neumann, 1982: 59), suggested a method to adopt this function in communication and information theory. In the case of information, the entropy function is used to determine the quantity of information that is necessary to reduce uncertainty.

The general equation for entropy for numerous events, n, whose probabilities of occurrence are $p_1,....p_n$, is:

$$H = - \Sigma p_i \log p_i$$

H can assume values between 0 and 1. H = 1 indicates complete uncertainty (e.g. the toss of a coin) and H = 0 indicates complete certainty. If the entropy is calculated in this way, and the result is zero, no information has to be transferred, or as Ahituv and Neumann (1982: 61) put it: "...you do not have to transfer information if everyone knows what is happening".

The entropy therefore supplies us with a handy technique to quantify information in such a way that the meaning of the information is also included in the unit of measurement. It assumes though that the information can be used to reduce uncertainty for the recipient of the information. Farradane (1986: 14) does not agree with this assumption. He writes that one cannot look for the real meaning on the side of the recipient. "The only valid meaning must be sought in the originator's thought" (Farradane, 1986: 14).

As was shown earlier in section 2.2.2.1, Hoffmann (1980: 291 and 1982: 134) worked on the determination of the information content of documents. His definition of information is that information is a function of facts/figures and of their meaningful connections or, $I = f(n,e)$, where I = Information, n = nodes (facts/figures) and e = edges (for meaningful connections). The smallest unit of information (IU), according to Hoffmann, is a unit consisting of two nodes (facts/figures) and one connection between the nodes. The more facts (nodes) and edges, the higher the information value and the more edges to one node, the more important the fact or figure. By analysing the number of edges to a node, a "specific weight" or "intrinsic value" of the IU can be attributed. Hoffmann calls this the connectivity (C) of the IU (Hoffmann, 1982: 134).

Burke and Horton (1988: 21) propose the Information Resource Entity (IRE) to solve the problem. An IRE can be anything having the capacity to create, acquire, provide, process or disseminate information. An IRE takes into account both content and medium, for instance, a management report would be purely content, whereas a blank piece of paper would be pure medium. By identifying the IRE's of a business, an inventory of its information resources can be established. This concept will be revisited when information management in practice is explored.

Measurement of resources in general does not present a problem. Human resources, financial resources and natural resources are easily measured in terms of the number of staff, the balance of the bank account or the tonnage of steel. Information, because of its peculiar nature, is not easily measured. This presents a problem and a challenge to the information manager as one would normally first of all determine the quantity of the resource you are trying to manage.

2.13 Information Quality

Information is of vital importance to humans, businesses and nations alike. The underlying assumption, of course, is that such information must be of good quality to be of value. This is a basic assumption for any resource to be valuable. However, the nature of information makes it far more difficult to define what is meant by quality than in the case of, for instance, a natural resource.

Marchand (1990: 9) argues that there are five approaches to measuring information quality: Transcendent-based, user-based, product-based, production-based and value-based.

Transcendent-based means that information quality is universally recognisable, absolute, timeless, enduring and therefore such that it rises above changing tastes and styles. This is clearly an idealistic viewpoint, subjective and not practical. User-based is based upon individual wants, needs and cognitive styles and therefore just as impractical as a universal measurement. The product-based approach tries to be more precise as it attempts to define the information quality in terms of the characteristics of the information product. The problem, as Marchand points out, is that it seldom happens that there is a one-to-one relationship between quality and the attributes of the information product.

The production-based approach addresses the quality issue from the side of the meeting of requirements. Quality is therefore related directly to meeting of requirements and with "...doing the job right the first time within budget, and on time", resulting, generally speaking, in lower costs (Marchand, 1990: 9). The problem with this approach, as Marchand points out, is that user requirements change over time and this approach therefore does not provide a satisfactory answer over the longer term.

The value-based approach looks at the value obtained from the use of information measured against the ease-of-use, time saved, cost saved, the reduction or elimination of unwanted information ("noise") and, lastly, the quality of the information. It balances the elements of excellence and worth and results in "affordable excellence" - a concept which does not have well defined limits and is often subjective.

Marchand proposes eight dimensions of information quality:

- The actual value an information product or service has for the user. This is, of course, a very subjective judgement which may vary widely between users.

- The features associated with the product or service. Included would be the accuracy or comprehensiveness of the information.

- The reliability of the product or service. Inaccurate information from a reliable source may be worth more than accurate information from an unreliable source.

- Meaning over time. Even though the meaning of information varies over time (and also between different users), the meaning is still an important dimension of quality.

- Relevance. This is to be differentiated from meaning over time. Relevance refers to the degree to which the information conforms to the users' specifications or standards.

- Validity. This dimension refers to the method or techniques employed to arrive at the information.

- Aesthetics. This is a subjective dimension associated with the way in which the information is presented.

- Perceived value. This is another subjective dimension and refers to the reputation of a product or service as an indirect way to measure different information services or products. (Marchand, 1990: 10 - 12.)

Schwuchow (1990: 56), with reference to information services, lists a number of "indicators" of the quality: Reliability, up-to-dateness, novelty, speed/frequency, completeness, selectivity, relevance, integrity, security, user-friendliness, flexibility and accessibility. Olaisen (1990: 96) suggests two interdependent groups of quality "factors", namely the cognitive authority group (*how* the information is perceived: Credibility, influence, reliability, relevance, meaning over time, validity and perceived value) and the technical user-friendliness factors (*what* the user is offered: Form, novelty, accessibility, timeliness, desired speed, flexibility, completeness, intrinsic plausibility, selectivity browsing and features).

It is clear from the above that these dimensions, factors and indicators are all very subjective. This should not come as a surprise as information itself is subjective: Data put into context and perspective. Schwuchow (1990: 56) draws the conclusion that "...it is impossible to find a simple overall measurement for the quality of information services". Although he says that about services, the same may be said for information itself. Rice and Blair (in Schwuckow, 1990: 54) say: "...quality [of information] may be largely subjective and determined separately by the producer and the user".

Hegedüs (1990: 73) has another suggestion. He links the quality of information to its usage and concludes that the "....level of usage must be an important factor in evaluating the quality of information". If information is being used, it would indicate a certain minimum quality level or the usage would not occur. This is, of course, a dangerous assumption as a person may be forced to use the information he does have at his disposal with disastrous results. The fact that the information was used, does not necessarily mean that the quality was good.

Marchand (1990: 14) suggests that the relationship between quality and cost, price, market share, productivity and profitability should be investigated. The relationship between quality and cost seems to be inversely related: The higher quality leads to higher costs (although one could think of higher costs without, necessarily, higher quality). However, higher quality information could lead to a reduction in overall cost, leading to higher profitability, possibly through increased market share.

These relationships may appear to be apparent on the surface, but would be extremely difficult to prove scientifically. Too many factors influence price, market share, profitability and productivity to empirically prove direct relationships.

Intuitively, one feels that the higher the quality of information, the higher the payoff as a result of applying the information. Ideally, high quality information should lead to higher quality decisions (resulting in lower overall costs, higher profitability and market share) in an organisational setting and to increased knowledge on a personal level. However, this is assuming that decision makers always take rational decisions and that people recognise quality information when they come across it. This is, however, not always the case. As Olaisen (1990: 97) puts it: "...information seeking behaviour is neither logical nor rational. The importance of satisfying information need is dependent on the situational context and different situational contexts will involve different quality factors."

The only fact one can state with any degree of certainty is that information of poor quality will undoubtedly lead to poor results, in whatever form the results are measured. Nevertheless, quality information must be seen as important, however difficult it may be to define or measure it. Casanova (1990: 51) writes: "Total quality in information is the search for 'Eldorado'".

The challenge is to seek or to provide quality information for the particular situation, taking into consideration the cost to obtain or provide the information.

2.14 Summary and Conclusions

The concepts data, information, knowledge and wisdom are closely related. They are also common terminology to both laymen and experts. It is therefore not surprising to find that these terms are very difficult to define in such a way that all the different meanings attributed to them are catered for.

There are few disagreements as far as the term "data" goes. Most definitions agree that data are facts not having any meaning on their own. Because a fact needs to be a truth, a move away from the word "fact" is suggested. Data are therefore defined as attributes with no apparent meaning.

Definitions of information differ widely, but all agree on the fact that meaning plays an important role when it gets to information. The moment data are put into context or perspective is added, it becomes information. Information is therefore defined as data put into context and perspective. This brings a very important aspect to the fore, namely, that information always has context and perspective attached to it. This explains why the "same" information does not have to carry the same message to everyone. The contexts and perspectives added by the recipients may be different and hence the difference. One can never talk of information without also talking about context and perspective. De Bono (1992: 29) says: "...information comes wrapped in concepts and perceptions".

Having added context and perception to data and in the process having created information, the recipient adds it to his existing body of beliefs. It then becomes "knowledge" to him. Knowledge exists in the minds of people and is therefore intangible. It is personal - what the person believes in - but a common set of beliefs, justified over years through experience and reason, becomes knowledge to a group of people (a business, for instance), perhaps the entire world population. Such knowledge still depends on context and perception but because all these contexts and perceptions have evolved to be the same, they do not matter that much any longer.

Wisdom is gained from the use of information and knowledge and is strongly situation dependent, hence someone can be called "wise" in a given situation and completely ignorant in another. Wisdom depends on the "connections" a person makes in respect to the information and knowledge available to him. Such "connections" lead the person to show remarkable insight into a situation and to make sound judgements.

Common use of the above terminology does not distinguish between the different terms. In order to overcome this problem, one could generically call the collection of data, information and knowledge information and then differentiate between information-as-thing, information-as-knowledge and information-as-process. Data and information would then qualify for information-as-thing (tangible, a "resource") and knowledge would be information-as-knowledge (intangible). Transformation from tangible to intangible is possible through contextualising or perceiving, whereas from intangible to tangible would be through expression. Tangible to (other) tangible and intangible to (other) intangible transformations are also possible. Information-as-process refers to the process of transformation, or being informed. This leads to the notion of two dimensions of information: As resource (information-as-thing) and as process (information-as-process).

The moment man was created, information began playing a role in his life. In fact, the moment after creation, he was given information by God. The process of being informed has not ceased and will never cease. People want to be informed and want to inform others. It did not take man long before he devised a way to record information more permanently than just passing on the word from one generation to the next; substantiated by the egyptian hieroglyphics already perfected in the days of the first dynasty (3110 - 2884 BC). The recording of information has today reached unparalleled levels both in terms of volumes and in sophistication. The downside of it is that it rapidly reached such proportions that it is impossible to keep abreast of everything being recorded. This provided fertile ground for the proliferation of information technology to help humans cope with the data glut.

Information-as-thing has some peculiar characteristics which distinguishes it from other resources such as financial, human, equipment and material resources. It can be expanded by adding more information to it, but can also be compressed through summarising. Information can be shared by many without anyone losing "his" information. It could even be sold, without getting depleted and it could have more than one owner at the same time. It can be transported (transmitted) at the speed of light. The same information could have different effects on different people. Some may be thrilled by it while others may be left cold by the same information. One moment a person may be willing to pay an enormous amount for information, a minute later the same information may be completely and utterly worthless. Determining the cost and the value of information is not easy, especially under the above circumstances.

Unlike other resources, there is no handy unit of measure for information. It has been suggested that bits, characters, words and so on must be used and, through lack of something better, it is being used all the time. The problem remains: How is the meaning being measured, bearing in mind that it is usually the meaning which is the important part. Various methods have been proposed without much success.

Determining the quality of information is just as difficult. Because of the subjectivity (contexts and perceptions) which is part and parcel of information, quality has different meanings to different people. This presents a specific challenge to the manager responsible for information as, generally speaking, the higher the quality of the information, the better the decision taken. Normally though, the higher the quality, the higher the cost.

These characteristics call for a specific approach when information is being managed and when being treated as an economic good. It cannot be treated just like any resource. It is a special resource and it would be a mistake to treat it just like the other resources. It is a powerful resource; major changes can be brought about through its use thereby affecting the lives of millions. Through its use other resources can be conserved. It must be used with care and the necessary responsibility.

Now that the nature of information has been explored and information and its related concepts have been defined, a broader framework for information is needed. Does it have a broader purpose in real, everyday life? Where does it manifest itself? These, and other aspects, will be investigated in chapter 3.

CHAPTER 3

3. INFORMATION IN CONTEXT

3.1 Introduction

Information has been defined in chapter 2 as data put into context and perspective. As long as information is not put into context and perspective, we can only call it data, that is, meaningless attributes. But information, like everything else, must fit into a broader framework. In order to be useful, it must play a role in life; fulfil a purpose. To understand information, we need to understand its roles and to do that, we must look at it in context and explore its sphere of influence. This will be explored in chapter 3.

As individuals we need information in order to survive; as members of a social and economical order, we need it to succeed. Every day all of us consume masses of information, mostly without giving it a second thought. Our lives are impregnated with information in its many forms and we have become so used to it that we collect, process and disseminate it relentlessly and subconsciously. The danger exists that, like water, we may take it for granted until one day when we are stranded without it. In order for water to be valuable, it needs to be collected, perhaps processed and channelled through pipes and tubes so as to satisfy the thirsty person opening the faucet.

The same is true for information. The question is: Do we fully understand this role of information in our everyday lives and do we understand the relationships between information and the walks of life? What has been the effect of the "information explosion" on our lives, on society and on the economy? Does it have national implications and what are they?

In order to get an answer to this question, it will be explored how information fits into the lives of individuals, into society, the economy, business, on a national level and, finally, on a global level. This will be used as the framework to explore information in context.

3.2 Information and being human

3.2.1 Fundamental human needs

Human needs have been studied for many years since the earliest of times, but researchers still come forward with new ideas on the subject. Maslow (in Meyer *et al.*, 1989: 359), perhaps the most popularised psychologist on the subject, classified human needs in two categories, namely deficiency and the growth motives. The deficient motives relate to the more basic needs such as hunger and thirst, in other word, those needs centering around survival and the physiology. The growth motives relate to actualization needs. Maslow identified the first group of needs as the most basic and claimed that they will dominate all other needs should they not be satisfied.

Once a person's physiological needs (hunger, thirst, sleep) have been satisfied, his need for safety will become prominent. The safety needs include security, stability, freedom from fear, the needs for law and order and the likes. Should these be satisfied, the need for belonging is next. This would include love, caring, affection and acceptance by others and to others. The next order is that of self-esteem; it becomes important for the person to be recognised and that appreciation be shown for his achievements, but also an own sense of achievement, confidence and independence.

The highest order, according to Maslow is that of self-actualization. This includes a need for truth, justice, meaningfulness and aesthetic (beauty, perfection) needs. (Meyer *et al.*, 1989: 359 - 362.)

Maslow therefore proposed a hierarchy of needs always starting at the bottom and moving up the ladder but only once the lower needs have been satisfied to a certain level. Should some of the lower order needs again become unsatisfied, the needs will go back to that level until such time that they have again been satisfied.

Murray (in Meyer *et al.*, 1989: 273), another psychologist, also classified needs into two categories, namely the viscerogenic (primary) needs and the psychogenic needs. He identified a human's needs for information as part of the latter group of needs. With "information needs" he means the need to explore, ask questions and seek knowledge, but also to give information; to explain, to lecture and interpret. It is remarkable that Murray's first works appeared in 1938 and that even then information was clearly identified as a need.

Max-Neef (1989: 26) (a developmentalist) and his colleagues differentiated between needs and satisfiers. The needs, as they identified and classified them, are universal to all human beings; they are culturally and historically constant. These (axiological) needs are the needs for subsistence, protection, affection, understanding, participation, idleness, creation, identity and freedom. The hierarchy is limited to two levels only with the need for subsistence (the need to remain alive) as the lower level and the rest all sharing the same level above.

The satisfiers of these needs, on the other hand, vary according to culture and circumstance, to the point where the choice of the satisfiers, in fact, define culture. A need is therefore satisfied at different levels and with different intensities within three contexts: the *Eigenwelt* (oneself), the *Mitwelt* (social group) and the *Umwelt* (environment). Max-Neef and his colleagues make an important observation: Any need which is not adequately satisfied, reveals a human poverty. Hence, an individual, or a community, could have several poverties at the same time. This gives new meaning to the term "poverty" which is usually taken to mean the lack of material goods.

The need for "understanding", as identified by Max-Neef and his colleagues, is of particular importance as it relates strongly and directly to information. The satisfiers associated with this need are curiosity, literature, study, education and others. Information is an integral part of all of these satisfiers. Information is also implicit in most of the other satisfiers especially if one looks at what Max-Neef calls the violators or destructors. With these violators or destructors present, the satisfiers become impossible, thereby rendering the need unsatisfied. Censorship (deprivation of information) is seen as one of such violators as it would leave the need for understanding, participation, leisure and others unsatisfied. (Max-Neef *et al.*, 1989: 34.)

Pseudo-satisfiers on the other hand, stimulate a false sense of satisfying a need. As such indoctrination would be seen as a pseudo-satisfier for the understanding need. Inhibiting satisfiers are those that would (over-)satisfy one need and inhibit others. An example would be commercial television which would satisfy the need for leisure, but would inhibit the understanding, creation and identity needs. Singular satisfiers are seen as those satisfiers that would satisfy only one need while being neutral to the others. Synergistic satisfiers are those that satisfy more than one need simultaneously. Such satisfiers would, for instance, be popular education which will primarily satisfy the need for understanding, but secondary, the needs for protection, participation, creation, identity and freedom (Max-Neef *et al.*, 1989: 35).

Information runs like a golden thread as an essential ingredient in the satisfying of human needs, regardless of the model used for the classification of needs. Even for the most basic of human needs, namely, the need for survival (Maslow) or subsistence (Max-Neef), hunger, thirst, etc, requires information (knowledge) to be present. (What is safe to eat? Which animals are dangerous?) In the other, "higher" order needs, information and knowledge again appear. Information and human needs cannot be separated; satisfaction of these needs can only be done through the use of information and knowledge.

3.2.2 Information and being

To determine the relationship between humans and information, one needs to ask a very fundamental question: What and who are we? What does it mean "*to be*"? What distinguishes humans from animals? In order to be a person, one needs to have specific capabilities and abilities. It is normal for humans to consider their futures and try and control it as far as possible. They have ideals for their behaviour; a sense of their own past and of history; the ability to reason; they communicate through language; they have complex conceptions of who they are as well as complex emotions. Animals do not have these characteristics (McInerney, 1992: 101 - 102).

If these are some of the characteristics of a human being, it is clear that, in order to effectively develop and apply them, information about a large number of matters is vital. Meltzer (1981: 152) points out that even the most primitive tribes need information to survive: They need to know what food is safe to eat, where and how to find and retrieve it, etc. This leads him to conclude that information is a basic human need, as was shown in the previous section.

Curiosity is natural to any human being. Long before a child is exposed to formal education, he is curious about everything around him. Not only is he curious: It is a specific characteristic of a human being to attribute meaning to what it observes and experiences. "Indeed, human beings are not simply ready to attribute meanings, they cannot abide meaninglessness" and "Mankind finds an absence of meaning unendurable", write Checkland and Scholes (1990: 1 - 2). Meaning and information go hand in hand: In order to attribute meaning, a basic human characteristic, information must be available.

Frankl (in Meyer *et al.*, 1989: 424 - 431) contends that man is primarily concerned with a will-to-meaning. This view led to his well-known theory called logotherapy ("therapy through meaning"). This theory states that the search for meaning in one's life is a basic human need. "He wants to live a life that makes sense and has meaning" (Meyer *et al.*, 1989: 426). This will is stronger than any other motivation and is found, not created. Taylor (1989: 18) suggests that sense is made of life through articulating it. Introna (1994: 282) says that humans create meaning by expressing themselves through action and words.

The quality of information a person has at his disposal could have a direct influence on his life. Direct observations tells us that there is (worldwide) an inequality of opportunity to be informed and to learn through the transfer of knowledge and information. The use of "high-tech" (advanced technology) further accentuates this phenomenon (Wilson, 1987a: 1). "In terms of print-based information, the third world is already suffering disadvantages but the sophisticated infrastructure required to participate is so lacking as to place them mostly outside the pale of participation" (Wilson, 1987a: 2).

Toffler (1990: 363 - 367) uses the term "Law of Ubiquity". It says that strong commercial and political incentives will arise for making the new electronic infrastructure inclusive, rather than exclusive. He claims that this led to a "maldistribution of information - an 'information divide' as deep as the Grand Canyon". Work requires people to have informational skills and information-illiterate people will find it increasingly difficult to find jobs. It is not only the informational job-skills that are needed, workers must have knowledge about time, dress, courtesy, money and language.

Humans and information cannot be separated. In order to be, the being searches for meaning: To find meaning, it needs information. Humans and information are eternally interlinked and without the one, the other becomes meaningless.

3.2.3 Information and communication

It was shown in section 3.2.2 that humans search for meaning in their lives. Part of the process of attributing meaning, is expressing oneself. Expression without someone to express oneself to, is meaningless. Expression must be towards something and with a particular intention (Introna, 1994: 279). It can either take place through action or through speech. This leads to the phenomenon of communication through language; another unique attribute of humans.

The communication model involves five steps, namely, meaning, encoding, transmission, decoding and meaning. Encoding takes the form of language (words), facial expressions of gestures or even physical actions. Transmission takes place through some channel, for instance, a page of paper. Decoding is done through sense perception, for instance, hearing or seeing. Once the message is received, meaning must again be attached to the message (Griffin, 1987: 488, 489).

Communication takes place through the use of signs. These signs can have various properties. Tools, varying from a social to a technical analysis, have been developed to analyse the communication process. Pragmatics focus on the content and purpose of communication whereas syntactics and empirics focus on form and means.

Pragmatics takes into account the general culture and context of communication. Semantics concentrates on meaning and knowledge and considers the signs used and the actions or behaviour as a result of the signs. Syntactics focuses on logic and grammar. "Syntactics provides us with the rules for the construction of formal rules and the means by which they interrelate" (Liebenau and Backhouse, 1990, 13).

Empirics concerns itself with the codes, signals and physical characteristics of the media of communication. It includes the mechanics for encoding and decoding of the signals as well as the speed and quantity of the signals. The process of analysing signs and how they function is called semiotics and is based upon the work of the French linguist, Ferdinand de Daussure, Charles Morris, Claude Levi-Strauss, C.S. Peirce and John Locke. It provides useful tools for analysing signs used in communication on all these four levels (Liebenau and Backhouse, 1990, 13 - 15; Stamper, 1973, 18).

Vickery and Vickery (1987: 16) show that all social processes depend on communication. It forms the basis for all social processes. "Though rarely *homo sapiens*, we are inherently *homo loquens*" (Vickery and Vickery, 1987:

16). They argue that the main functions of communication are informing, instructing, commanding and influencing. Regardless of the purpose or function, information is passed from the sender to the receiver. The ideal communication takes place through the "hermeneutic circle" whereby information is passed in both directions between the sender and the receiver until true understanding (via appropriation) takes place.

The fact is that through communication - verbal or otherwise - data flows between two or more parties. Hence, communication is impossible without data. Without data to communicate, why would it be necessary to communicate in the first place? Through communication, that is, the transfer of data, context is added and information and knowledge are created. Communication, a fundamental social process, is therefore integrally linked with information.

3.2.4 Information and learning

For any human being to cope in adult life, two factors are essential: His ability to physically grow and his ability to learn. Growth is determined genetically while learning is directly influenced by events in the individual's living environment. Learning is defined as "a change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth" (Gagné, 1970: 2 - 3). Learning therefore implies a change in behaviour or an increased capability for some type of performance. It furthermore calls for a change in attitude, interest or value, must be more than just momentary and distinguishable from changes that can be attributed to growth.

Examination of the learning event shows that there must be a learner (that is, one with a desire to learn) and a stimulus affecting the learner in such a way that his performance changes from what it was before the event to what it is after the event. If this change has not taken place, learning did not occur.

Gagné (1970: 70 *et seq.*) contends that the stimulus must first be apprehended, meaning that it must attract the learner's attention, thereby acknowledging and registering it. At this stage learning has not yet taken place; one can apprehend without necessarily learning something. It is only when the stimulus is acquired by the learner, that performance is changed and that learning took place. Once acquired, it must be stored, preferably in long-term memory for possible later retrieval.

The question is: What represents a stimulus? It would seem that the stimulus educationalists talk about, can only be information (or better still, data). A stimulus can only be observed by the senses and the senses pass that on to the brain as data. Once interpreted and put into context, it becomes information.

Learning therefore rests firmly on information, or more fundamentally, data as its base. For learning to take place, data in some form or another must be passed to the brain by the senses. This data must be appropriated to become information (Introna's proposition). The proposal put forward in this thesis is that data must be put into context and perspective to become information. The teacher is the instrument to help with the process of appropriation, contextualising or perspecting (information-as-process leading to information-as-knowledge). This information, combined within perspective, context and history, through an interpretation process, may lead to knowledge and wisdom.

How do we know that learning actually happened? This question leads to the field of educational didactics. Various researchers proposed classifications schemes or taxonomies that can be applied to determine if, and to what extent, learning took place. Bloom (in 1956), Guilford (in 1967), de Corte (in 1973) and Gresse (in 1975) each developed a classification scheme that is useful. These combined views are depicted in table 3.1.

Bloom's taxonomy is hierarchical, meaning that within the cognitive domain there are six levels of knowing; the lowest and simplest form is the ability to remember facts (called knowledge by Bloom) and the highest, more complex

Table 3.1

Bloom's Classification Scheme

Bloom's educational goals	Guilford's intellectual abilities	De Corte's categories of cognitive action	Gresse's verbal interaction instrument
***Knowledge* based on:**	**Memory**	**Reproduction**	**Reproduction**
***Understanding* based on:**	**Cognition**	**Apperception and recognition**	**Reception**
***Application* based on:**	**Divergent and convergent production**	**Interpretative production**	**Interpretative**
***Analysis* based on:**	**Divergent and convergent production**	**Convergent and divergent production**	**Convergent and divergent**
***Synthesis* based on:**	**Divergent and convergent production**	**Convergent and divergent production**	**Convergent and divergence**
***Evaluation* based on:**	**Evaluation**	**Evaluation**	**Evaluation**

(Müller, 1986:80)

level is the ability to make quantitative or qualitative judgements (called evaluation) (Hamachek, 1990: 352). Between these extremes lie levels of understanding, application analysis and synthesis. The goals on the higher levels cannot be achieved unless the goals on the lower levels have been satisfied (Müller, 1986: 80). According to table 3.1, for instance, knowledge (the ability to remember facts), as an educational goal is accomplished through the *intellectual* ability to memorise (Guilford), the ability to *cognitively act* by reproducing those facts (De Corte) and the ability to *interact verbally* also through reproduction (Gresse).

Although perhaps not directly, there seems to be a relationship between Bloom's scheme and the concepts of data, information, knowledge and wisdom. Bloom's argument goes as follows: Knowledge (defined as the ability to remember facts) leads to understanding through cognition and perception, that leads to application, then to analysis, to synthesis and eventually to evaluation. The line of argumentation in this thesis goes: Data leads to information through context and perception which leads to knowledge and then to wisdom. This can be depicted as in table 3.2.

In conclusion: Fundamental to the learning process is information (in a generic sense). Without it no learning can happen. Varying ability to assimilate and appropriate data differentiates individuals. Some, the followers, will remain on the first level while others, the leaders, will reach the higher levels. The challenge for the information manager is to assist and facilitate workers and managers to reach the higher levels.

3.3 Information and society

3.3.1 The information society

The concept of an information society appeared around 1970 and gained momentum in 1974 based upon the work of Daniel Bell in his book *"The coming of postindustrial society: A venture in social forecasting".* The argument was that agrarian (pre-industrial) economy has been replaced by an industrial sector when the economic emphasis shifted from agriculture (including mining, fishing, timber and other resources such as natural gas and oil) to manufacturing. A characteristic of the pre-industrial economy is its *extractive* nature, whereas the industrial economy is characterised by a focus on *fabricating* of goods.

Within the industrial economy, a post-industrial sector evolved when a shift took place from manufacturing to the provision of services. The services sector is characterised by *processing* where telecommunications and computers play crucial roles for the exchange of information and knowledge (Bell, 1976: xii).

Table 3.2

Comparison of Bloom's classification and the relationship between data, information, knowledge and wisdom

Bloom's classification	This thesis' classification
Knowledge ↓ Understanding ↓ Application ↓ Analysis ↓ Synthesis ↓ Evaluation	Data ↓ Information ↓ Knowledge ↓ Wisdom

It follows logically that if the economy is in a post-industrial phase, society should also move from an industrial society to a post-industrial society. It is important to note that Bell's famous publication was firstly an analysis of the state of society and the economy, but many of his statements were meant as forecasts, as the name of the book indicates.

Bell not only argued the concept of postindustrial society as many before and after him have done (notably Alain Torraine in 1969 and Tom Stonier in 1983), but took it a step further in speculating that, not only was a post-industrial society evolving, it was, in fact, evolving as an information society (Bell, 1976: 467). In this information society knowledge and information was replacing labour and capital as the central variables of the economy (Bell, 1976: xiii). Bell points out though that the post-industrial society does not *displace* the industrial society; it is merely adding another layer.

The dimensions of the post-industrial society are listed by Bell as follows (Bell, 1976: xvi *et seq.*):

- Knowledge becomes central.

- Mathematical en economic techniques will be used to find more "rational" solutions to "economic and engineering, if not social, problems" (Bell, 1976: xvi).

- A spread of a knowledge class. (Technical and professional people will be the fastest growing group in society)

- A change from goods to services, more specifically human, technical and professional services.

- A change in the character of work. Nature and artifacts are excluded from work and work-life becomes a "game between persons" where they have to learn to live with one another, an "unparalleled state of affairs" (Bell, 1976: xvii).

- Employment opportunities for women will expand thereby providing women a secure base for economic independence for the first time.

- Science will become integrated with technology, the military and society in general, thereby losing its charismatic nature where the quest for knowledge and not its application, is the ultimate goal.

- The formation of society into "situses", a vertical order as opposed to a previously horizontal order in society. The interest conflict will occur between these situs groups and may lead to political grouping. He identified four *functional* situses, namely, scientific, technological, administrative and cultural and five *institutional* situses, namely, economic enterprises, government bureaus, universities, social complexes and the military.

- Achievement rewards would be based more on merit (education and skills) than on inheritance or property (meritocracy).

- Scarcity focusing on information and on time and less on goods.

- Whereas the spreading of goods took place through competition between producers, the spreading of information in the post-industrial society will have to take place through a cooperative strategy in order to spread and use knowledge in society. This is because information is a collective rather than a private good. Bell calls this the "economics of information" and identifies it as "the most fascinating challenge to economists and decision makers in respect to both theory and policy in the post-industrial society" (Bell, 1976: xviii - xix).

The difference between pre-industrial, industrial and post-industrial society is illustrated by Bell (1976: 117) as in table 3.3.

The information society idea seemed to gain momentum with the convergence of different technologies such as telecommunications, television, computers and the likes. This is not unexpected when it is considered that these technologies enabled data to be stored and processed in ways never possible before.

Bell's concepts are evident in Toffler's work (1980) with his "third wave" concept; the first wave being agriculture, the second industrial and the third information. A major part of this third wave would be decentralised work, or the "electronic cottage", as Toffler called it. Workers would be allowed to work from home by means of remote terminal or workstation access to centralised computers, thereby enabling particularly women and disabled people to be economically productive while, in the case of women, caring for children at the same time. It would also be contributing significantly to a reduction of air pollution and saving on energy by limiting commuting. Although the idea may have held many promises, Lyon (1991: 83) reports that progress was rather slow. It would seem that face-to-face communication was needed more

Table 3.3

General Schema of Social Change

	Pre-industrial	**Industrial**	**Post-industrial**
Regions:	Asia Africa Latin America	Western Europe Soviet Union Japan	United States
Economic sector:	Primary extractive: Agriculture Mining Fishing Timber	Secondary Goods producing: Manufacturing Processing	**Tertiary** Transportation Utilities **Quaternary** Trade Finance Insurance Real Estate **Quinary** Health Education Research Government Recreation
Occupational slope:	Farmer Miner Fisherman Unskilled worker	Semi-skilled worker Engineer	Professional and technical Scientists
Technology:	Raw materials	Energy	Information
Design:	Game against nature	Game against fabrication	Game between persons
Methodology:	Common sense experience	Empiricism Experimentation	Abstract theory: models, simulation, decision theory, system analysis
Time perspective:	Orientation to the past Ad hoc responses	Ad hoc adaptiveness Projections	Future orientation Forecasting
Axial principle:	Traditionalism: Land/resource limitation	Economic growth; State or private control of investment decisions	Centrality of and codification of theoretical knowledge

(Bell, 1976: 117)

than was originally thought. Unions in general were also not much in favour of the electronic cottage concept.

Naisbitt and Aburdene (1991: 282) coined the term "electronic heartland" rather than electronic cottage. They noticed a distinct trend to move away from the big cities to smaller rural settlements. With the help of fax machines, computers linked into networks, telephones and fast courier services, remote people could be as close to business as their city-dwelling counterparts. The scattered electronic cottages of Toffler may develop into electronic heartlands. "The very nature of the information economy makes it easier to be part of this trend" (Naisbitt and Aburdene, 1991: 284).

In 1971 Japan gave a major impetus to the idea of an information society by producing a proposal in the shape of *"The plan for information society: A national goal toward the year 2000"* and followed in 1981 with a book by Yoneji Masuda (in Lyon, 1991: 6). In these works a futuristic view is painted where information technologies create an almost utopia-like world. Masuda (in Lyon, 1991: 6) wrote "...the goal ...is a society that brings about a general flourishing state of human intellectual creativity, instead of affluent material consumption". This corresponds with Bell's meritocracy concept. Masuda also introduces the concept of information society infrastructures and "new towns" with built-in co-axial cabling as the data carrier. This concept was put in practice with the building of Japan's Tama New Town. Stonier (1983: 202) echoed Masuda's view and writes: "Living in a postindustrial world means that not only are we more affluent, more resourceful and less likely to go to war, but also more likely to democratise". These views correspond with the one of Naisbitt and Aburdene who predict that the truly global cities of the year 2000, would not be those that are the largest, but those who are the "smartest", consisting of "smart" buildings (presumably having "smart" streets, "smart" homes inhabited by "smart" people).

Bell (1976: xv) also realised the need for an appropriate infrastructure for the post-industrial society. The pre-industrial society needed the first infrastructure, namely roads, canals, rail and air for proper movement of people and goods. The second infrastructure was for the energy utilities such as networks for pipelines, gas and electricity. The third infrastructure would be telecommunications (radio, TV, etc.) but Bell forecasted that an infrastructure would be needed to link together the increasing number of computers so as to effectively transmit data and information. This forecast proved to be accurate when looking at the growth in data networks and the building of "smart cities" linked together by "data highways".

Based on the above viewpoints, one could argue that we are living in an information society. "Our society is truly an information society, our time an information age", writes Mason (1986: 46). Strassmann (1985: 188), however, seems to doubt the information society concept and writes: "Information is primarily a means of production rather than an item of consumption. Calling the postindustrial economy an information society is a misnomer." The point Strassmann makes is that even though society consumes "enormous amounts of information", it is only as a part of purchases from the production sector. It is difficult to agree with Strassmann's argument on information not being an item of consumption. Information is indeed consumed on a daily basis by millions all over the world. People, businesses and nations are buying it and trading in it. It is, perhaps, the unique characteristics of information - such as its non-depleteability - that prompts Strassman's views.

The role of information has been emphasised over the years and it is growing in importance. The growth in the service industry possibly contributed to the importance attached to information. Porter (1986: 9) says: "There can be no doubt that the Information Age has arrived for the working world. We meet it driving to work as we use our cellular phones, at work in our electronic offices, and back home as we plug in our personal computers to do our 'homework'. Analysis of the article - even the above quote - by Porter shows that his interpretation of the concept "information" is very closely equated with information technology with the implication that the "information age" he is referring to could just as well mean the "information technology age".

It is granted that information technology has a direct bearing on information itself in the sense that technology plays a very significant role as the enabler.

Without technology, the processing, generation and distribution of information, amongst others, would be impeded. It is therefore not totally wrong to relate what is happening in the information technology world to what is happening in the information world. It certainly does provide the conduits necessary for the data, information and knowledge to flow. Otten (1984: 17) uses the term "Information Tools". These tools are being used in the information society by the information workers and include computers.

Cleveland (1982: 38) points out that it is not necessarily "better" or "worse" to be living in an information society rather than living in an agricultural or industrial society. These aspects are dependent on "...who uses the information, in how a refined form, and for what purposes".

What, then, is meant with the notion of being an "information society"? Reduced to its basics, its means that workers have changed from using their hands to using their brains. It means putting minds to work rather than putting muscles to work. In the agricultural and the industrial eras, the majority workers were doing manual work (the workers) and the minority were doing the "thinking" (the managers). In the information era more people are working in and around the thinking part through, *inter alia,* generating, collecting, organising and manipulating information.

Businesses are out-"smarting" each other by more effective uses of information rather than out-"performing" each other by producing more items or items of higher quality. And it appeals to the consumer because he is also "smarter" in his purchases. That is what gave rise to the concept of an information society. It is about a society which is conscious about everything around it by constantly informing itself. Shoshana Zuboff (1988: 10) coined the concept of "informating technology" to describe the use of technology to achieve more than just automation. It is the way in which corporations and individuals use information distinguishes the one from the other. An information rich society competes globally; an information poor society goes begging.

But the information society goes further than just that. It does mean that fundamental changes to the economic and occupational systems are taking place, but, more importantly, these changes have serious effects on the social structures. These, in turn, may have an effect on the polity and culture. This is important to the individual, who is confronted with a changing occupational system where knowledge becomes paramount, it is important to business to position itself for survival in an economy having a different locomotive and it is important to governments, having to deal with a changing society as its constituency.

3.3.2 An information culture

It is well known fact that the everyday use of information technology has had a dramatic effect on every citizen's life (Zuboff, 1988, Toffler, 1990). Relatively few households do not have a television set and few individuals do not make use of automated teller machines for their banking. More and more households are getting computers with children spending long hours playing games and adults doing more productive work such as managing their financial affairs. Work has become "portable" using cellular phones and notebook computers. Electronic communication via computer has become an accepted way of communicating and, to a limited extent, for shopping via vast electronic mail networks, bulletin boards and "electronic malls". There is no indication that this trend will not continue; on the contrary, it is likely to grow at an even faster rate.

The question is: Will this extensive use of technology and obsessiveness with information breed a new culture? It is conceivable that a world characterised by (and sometimes obsessed with) telecommunications, mass communications and information technology, could have a cultural "synchronisation" effect, as similar messages encircle the globe through the use of these technologies. Lyon (1991: 16) argues that exactly this is already happening. (The ethical question is raised: Who controls these messages and could it lead to cultural dominance of one group (the information rich) over the other (the information poor)?)

The potential of television to influence culture is acknowledged by many and in this regard Britain already ruled that its TV stations may only broadcast 14 percent of non-EEC material while in France state radio was allowed only up to 50 percent American popular music to be broadcast (Lyon, 1991: 128). In the USA, the Coalition for Better Broadcasting tried to limit the sex-and-violence content of television programmes by resorting to media-strikes (Lyon, 1991: 129). These point to a perceived threat of data in the form of electronic images having negative influences on, at least, moral standards, but ultimately even on culture.

If it is accepted that there was a shift away from industrialisation to a services based economy, or that we have become an "information society", is there any evidence of cultural trends changing? Naisbitt and Aburdene (1991: 121) contend that english became the language of the information age. They claim that "more than 80 per cent of all information stored in the more than 100 million computers around the world is in english. Eighty-five per cent of international telephone conversations are conducted in english, as are three-quarters of the world's mail, telexes, and cables. ...more than 80 per cent of all scientific papers are published first in english." (Naisbitt and Aburdene, 1991: 121). They also claim that the language of international business, diplomatic and ecumenical communications and communications of the international youth culture are all done in english. But then they add a very important rider to their argument: There seems to be a backlash against it as nations are insisting on keeping their traditional languages and cultures alive (Naisbitt and Aburdene, 1991: 123 - 124). This "backlash" perhaps provide proof of the negative effects of changing language could have on culture.

Bell (1976: xxi) contends that changes to the social structure is the major theme of post-industrialism and that this will only indirectly influence culture. Max-Neef (1989: 21) contends that basic human needs are universal to all cultures, but that the choice of quantity and quality of satisfiers to human needs is culturally determined. Should, however, changes take place in terms of traditional satisfiers for the purpose or dropping old ones or adopting new ones, cultural changes could take place. If this argument is applied to the post-industrial economy and society, it is clear that, should the changes have an effect on the choice of satisfiers, cultural changes could be expected.

Lyon (1991: 16) quotes David Bolter who introduced the concept of the computer becoming the key symbol of the information age; the "defining technology", leading to humans thinking of themselves as information processors and nature as information to be processed. Computer games have progressed to virtual reality where a person can escape into a virtual, make-believe world (called cyberspace) in which he can actively participate. It would even seem that the male gender of computers (algorithmic and logical) has begun to change to more female-type behaviour (fuzzy-logic). Computers, through the application of "artificial intelligence", are already able to "think" and learn from their own mistakes and inferior knowledge. Lyon (1991: 131) quotes Steve Woolgar, a sociologist, who asks: "Why not a sociology of machines" and "In what sense can we continue to presume that human intelligence is not artificial?"

Extending this argument further to religious and ideological aspects, could it happen that humans begin to think of themselves as being in the image of their technology, thereby shaping a completely new religion and, perhaps, a new culture (Lyon, 1991: 17)?

When talking about cultural change, Glastonbury and LaMendola (1992: 68) remind us that while technological change has a span of 40 years, cultural change has a span of nearer to 200 years. Span in this context is taken as the time between a change being initiated until it is an observable fact. It may, therefore, still be difficult to clearly identify cultural changes resulting from society's use of information and information technology. However, the world we are living in, regardless whether it is called the information age or not, has already had an impact on our lives, our language, our eating habits, our apparel and our behaviour. Most nations and ethnical groupings do not live in isolation any more as the boundaries dividing and differentiating between them are becoming more vague. This is bound to have significant effects on traditional culture if it has not created a new one already.

3.3.3 Information and development

To improve one's own living conditions, social standing, education and wealth comes naturally to all human beings. It also comes naturally to want to do the same to other people and communities. In fact, as Boon (1992: 22) points out, it has its origins at the time of creation when God gave man the instruction to manage His creation. Billions of all currencies are being spent annually on the development of communities around the world. All governments allocate funds to develop their own communities and some countries are willing to allocate funding to those in other (poorer) countries. Development is big business and development institutions proliferate the globe. Despite all of these efforts, the world is still divided in two major groupings: The richer (developed) countries living in the first world on the one hand and the poorer (developing) countries living mostly in the third world on the other. Positioned somewhere between these extremes, are the NIE's, the newly industrialised economies.

Despite the fact that development has been around for so long, longer term, sustainable results are not so easy to find. One reason for this phenomenon is that it is not as straightforward to measure the success of development as it at first appear to be. And if it is difficult to measure, it is difficult to decide where to invest with the best longer-term yield. Earlier the emphasis was placed on the economic side: An increase in the Gross National Product (GNP) or in the per capita income meant that development was succeeding, the reasoning being that this kind of growth would "trickle down" to the masses. In the later years, it was realised that concentrating on the economy only was not good enough. Despite growth in GNP and per capita income, living conditions of the masses still remain unchanged.

This called for a revision of the measurement and, indeed the definition of development. Development is more than just an improvement in the economy (Du Plooy *et al.*, 1993: 3). "Development includes socio-cultural, educational and economic change, to name just a few" (Boon, 1992: 229). "Now we need an indicator about the qualitative growth of people" (Max-Neef *et al.*, 1989: 19).

Todaro (1989) suggests three core values of development: life sustenance (the basic needs), self-esteem (being a person) and freedom from servitude (the ability to choose). He showed that economic success was a necessary but not a sufficient condition for development in a socio-economic sense.

Max-Neef, one of the newer developmentalists, coined the term "human scale development"; "*Development is about people and not about objects.* This is the basic postulate of Human Scale Development" (Max-Neef *et al.*, 1989: 19). He revisited what human needs really are and paid particular attention to the satisfiers of the needs (see section 3.2.1). This he took as the point of departure to address the development issue.

If people are central to development, it follows that information has an important role to play in the development process. It was shown earlier that humans and information cannot be separated meaningfully; information must therefore also be central when it comes to development. Material resources naturally play a very important role in developing people. People must have houses, water and electricity, money and so on, but if people have to be fully developed so that all their needs are being addressed, information and knowledge must also be transferred (Boon, 1992: 229).

The needs of people in under-developed countries usually focus around the basic needs, that is, the physiological (hunger, thirst) and protective (shelter) needs. If Maslow's needs hierarchy is used, it could be argued that people with those basic needs would not have any need (yet) for information because information would lie on a higher level. Both Todaro and Max-Neef place less emphasis on a hierarchy of needs. Once the basic need of subsistence has been achieved, all, or a combination of other needs will appear. This combination depends on the culture as the choice of the satisfiers is determined by cultures (Max-Neef *et al.*, 1989: 21). Information would obviously be one of the important need-satisfiers.

Information would manifest itself, *inter alia*, in the form of education (knowledge transfer), freedom of speech and of the press and access to information sources such as libraries. To the decision makers in the development field, information is indispensable. Demographic, socio-economic and other information in the form of statistical (census) data is essential to determine where investments are to be made to obtain the best yield. As Boon (1992: 71) points out, this kind of information is not always available and if they are available, they are sometimes regarded as suspect because of distrust in the government collecting and disseminating the information for its own agenda. All of this calls for an information infrastructure to be available or established. Hanna (1991: 10) points out that such an infrastructure is, more than often, not present in developing countries.

The stakeholders, or role-players in the development process can therefore be classified into three groups, namely, the people who are to benefit, the people who are involved on an operational level (the developers) and then the people who are involved in a project management capacity (Boon, 1992: 234). Boon also suggests that the required information must satisfy certain conditions to be useful to the development process:

- The information must be easy to use through user-friendly interfaces;
- Access to and retrieval of the required information must be possible;
- Quality must be high, that is, the information must be accurate, comprehensible, current, reliable and valid;

- The delivery of the information must be adaptable to the particular need.

Boon (1992: 234) argues that information has not always played the role in development that it could. He lists a number of reasons for this failure and suggests possible solutions to rectify them as in table 3.4.

In conclusion Boon places specific emphasis on the need for a national information policy to provide a framework for information and development. National information policies are explored more fully in section 3.6.2.

Hanna (1991: 5) talks about "information poverty" in developing countries. By this he understands the following:

- The "gap" between developing and industrialised countries in the use of information technology;

- No information or incorrect information available to planners with regards to external debt, the performance of public enterprises, natural resources, socio-economic and demographic information;

- The isolation of researchers, scientists, engineers and "other knowledge workers" from international development in their fields of expertise;

- The underutilisation and poor "packaging" of locally produced information; and

- Poor communications infrastructure. "Tokyo alone has more telephones than the whole of Africa" (Hanna, 1991: 10).

The reasons for this state of affairs, according to Hanna, can be attributed to the following:

Table 3.4

Reasons for Information Not Playing an Optimal Role in Development: Some Possible Solutions

Reasons for failure	Possible solutions
Information not seen as a basic and valuable resource	Information awareness and education programs
Ineffective infrastructures and services responsible for vicious circle	Upgrading of existing infrastructure and service; establishment of new infrastructures and services
Inadequate and inappropriate information technology	Adequate resources for appropriate technology
Lack and shortage of appropriately qualified information workers	Recruitment, appropriate education in information for development
Information services do not meet the needs of people - Western models	Take user need and communication habits into consideration when designing and developing information services for development
Information irrelevant, inappropriate, unadaptable (content and medium)	Value-added information services package information in right form
Information not used optimally	Education for information use
Problems of accessibility to indigenous information	Development of effective access systems
High cost of international information systems	Subsidize
Lack of coordination	Information policy and plan for information for development
Lack of government support for information policy, legal aspects, allocation of resources	Government should recognize its "information responsibility" - informatisation of top managements in government
Lack of macro- (strategic information) and microdata bases (site-specific data bases)	Integrated information development plan by all parties concerned
Lack of appropriate community resource centers (e.g. community information centers)	Creation of rural information infrastructures complementary to established informal information networks
Illiteracy	Information literacy programs, appropriate technology (pictorial information) and programs like easy read for adults

Adapted from Boon (1992: 238)

- Institutional and infrastructural weaknesses. Information is not regarded by policy makers as important;

- Centralised information infrastructures. Information is not user-orientated and flows in one direction only;

- The unwillingness to share information and to protect power bases; and

- Information illiteracy (as a result of poor educational infrastructure).

It is clear that information plays an important part in development. This comes hardly as a surprise: If it is accepted that information is a satisfier of many a basic human need, then it follows that satisfying the need for information must be a priority. It is, however, this quest for information which gives rise to inequalities between nations: the have's versus the have-not's. Many developing countries simply do not have the information infrastructure required for information to play the role that it could. One thinks of library facilities, the media and general availability of information technology as an enabling technology. This phenomenon was explored more fully when the information society was discussed section 3.3.1.

For the decision makers in the development field, information is essential. Without the necessary information to base decisions on, development investments become shots in the dark and could well be the reason for many development project failures. This does not necessarily mean more information; it means the right information for the particular need. It calls for information literacy on the part of government and development agencies.

3.3.4 Ethical issues regarding information

To resolve moral and ethical conflicts in general, four theories are generally accepted, namely, egoism, natural law, utilitarianism and respect for persons. According to egoism, what is best for a given individual is right. Natural law states that humans have an obligation (i) to promote their own health and life, (ii) to propagate, (iii) to pursue knowledge of the world and of God and (iv) to pursue close relationships with other human beings and to submit to the legitimate authority of the state. Utilitarianism states that those actions doing the most good for the most number of people, are right. Respect for people states that actions are right if everyone adopts a moral rule presupposed by the action, that is, that people should be treated as and end and not as a means to an end (Dejoie *et al.*, 1991: 1).

It is perhaps the very illusive nature of information which gives rise to many ethical and moral questions regarding its use. Information's potential to provide a base for power, stands first and foremost. In order to obtain such power, people would be willing to behave unethical. Ethical questions regarding information can be dealt with by looking at four aspects: ownership (property), privacy, accuracy and access.

3.3.4.1 Ownership

The definition of information as information-as-thing implies that it is "something". It then follows that this "something" must belong to someone. Ownership of information becomes very problematic unless it is governed by some or other law. Anyone can freely collect information about anything or anyone, but the question remains: Who owns the information? The person collecting it, or the person of whom the information is collected? To make things worse, on the one hand we have the public's right to know but on the other, the individual's personal right of privacy.

Braunstein (1981: 10) points out that more than one person may own the same "bit" of information and this is the heart of the ownership dilemma. The simultaneity of ownership was identified as an inherent characteristic of information. Where there is a high degree of certainty as to the origin of the information, there may be a chance to prove ownership, but if not, ownership fades away. Mason (1991: 47) points out that whilst it is sometimes extremely costly to produce a piece of information, it is usually very cheap to reproduce that same piece of information and usually without destroying the original.

Based on the work of Snyder, Horton (1979: 10) feels that "any and all data pertaining to our describing an individual is the property of that individual". He also points out that the Swedish Data Act of 1974 demonstrates this view by treating the misuse of personal information as "data trespass". This may be true for some countries, but, at least in South Africa, personal information is still being traded as normal practice.

An individual can protect intellectual information even though it may be made public, for example, an author publishing a book or a dress designer putting his creation up for sale. Confidentially is in such cases not an issue any more, but the individual can still protect his interest by means of the copyright act or by registering the design and thereby protecting ownership.

In the process of doing business, the organisation has to divulge information to some of its employees - some employees may even be instrumental in the establishment of such information. The production engineer must know the details of the production process, for example. The law is quite clear on the "ownership" of such information: When the organisation discloses information to its employees so that they can make use of them in doing the job they were hired to do, the company owns such information and may revert to the law to prevent employees from using or disclosing such information.

Although the law provides a certain degree of protection to both the individual and the organisation when it comes to company confidential information and inventions or even suggestions or ideas originating in part or in full from an employee in the course of his duties, such cases could be very complex and proving ownership may be very difficult. Christou (1985: 29) suggests: "All businesses should have a well-defined policy and procedures for the protection of their confidential information, inventions, trade secrets, designs and copyright work. These are highly valuable resources for many kinds of employer...".

However, should the employee acquire expertise or skills while being employed, such expertise and skills would be considered the property of the employee as it is inseparable from the person and is necessary in performing his trade or profession. Inventions made in the course of a person's duties would be considered the property of the employer, but any inventions made outside the line of duty, would be the person's. In certain cases the employee may have a right to fair compensation from his employee should an invention of "outstanding importance" be made (Christou, 1985: 26).

Organisations can call upon the law when it comes to the protection of trade secrets. There is not a common definition of what a trade secret is, but, at least in the USA, it is done purposely, namely to accommodate new technologies and intellectual endeavours (Relyea, 1986: 46). The purpose of laws for the protection of these trade secrets is so that fair play in business can be enforced. A trade secret is usually information which is not known by people outside the organisation. By contrast, information which is an "open secret", can also be protected by the law, namely by registering the information as a patent. A patent gives the inventor a seventeen year right of exclusive use, after which period it is disclosed (in the USA) (Relyea, 1986: 48).

The allocation of publicly-owned information assets is, in the end, a political decision, particularly if the information is considered close to the personal, national or corporate interests (Horton, 1979: 29). Lewis (1985: 13) agrees with this view: "Questions relating to data protection, computer piracy, transborder data flow, copyright and public/private sector interaction are no longer just professional issues, but matters of national and international governmental concern". When it comes to the disclosure, or not, of scientific and technical information, there is often a conflict between the view of scientists and that of government. Scientists are mostly willing to share their findings with the rest of the scientific world (transborder information flow) but this may lead to problems of national security, especially when it comes to military information. "The government and the research community have struggled with defining the trade-offs between national security and openness in science and technology for much of the post-World War II era. The process of determining an optimal balance between openness and secrecy promises to continue" (Gould, 1986: 79).

3.3.4.2 Privacy and secrecy

It has become an acceptable way of life to fill in forms for all sorts of purposes: tax returns, credit applications, student registrations, passport and visum applications, etc. In addition, personal behaviour is being recorded daily in the form of transactions as we use our credit cards, rent a car or board an aeroplane. More alarming is the development of automatic identification of motor car number plates or, potentially, of individuals themselves as they pass through monitoring points thereby keeping accurate details of people's movements.

All of these data bits are entered into computers and when put together, an almost complete file can be compiled on virtually every individual. Normally, all such data would be fragmented as they are being collected by different institutions thereby giving each institution only a part of the total profile of the individual. Combining such data, however, poses a serious threat to one's privacy and "...provides powerful political knowledge for those few who have access to it and control over it" (Mason, 1986: 49).

The right to privacy of personal information of the individual (in the USA) can be traced back to Constitution of the United States and more specifically, in the Bill of Rights, although it is not very specific (Shank, 1986: 7). The recognition of the individuals right to privacy and the violation of which could be made the subject of a lawsuit, was pioneered around 1890 by two Boston lawyers, S.D. Warren and L. D. Brandeis (Shank, 1986: 12). This, together with actions form others, eventually led to the promulgation of acts such as the Privacy Act of 1974 and the Freedom of Information Act of 1966 (in the USA). The Privacy Act prevents Government agencies from disclosing specific categories of information relating to individuals. This put a stop to the general use of the Social Security Number with resulting confusion amongst tax collectors, law enforcement officials, welfare workers and many others who had come to rely on that number. The Freedom of Information Act provides the public with legal authority and a procedure to obtain records held in agency files.

Similar acts emerged in other countries. Norway (Sweden, according to Cawkell, 1982) created a Data Inspectorate which issues licences before personal data can be used. West Germany has strict standards about protecting personal privacy; individuals may force disclosure of any data held about them and have it corrected, if necessary. Britain has a system of compulsory registration of files containing personal data. People damaged by misuse of data have access to the courts (Tricker, 1982: 188). Similar laws exist in countries such as France, Denmark, Austria and Luxembourg and in 1974 the Council of Europe adopted a resolution similar to the ones adopted in Sweden (Cawkell, 1982: 5). Relyea (1986: 45) sums up the privacy matter: "There can be little doubt that privacy - the autonomous determination of when, how, and to what extent information about oneself is communicated to others - has become an increasingly important and cherished value in American society".

In South Africa a code of conduct for credit bureaus was recently promulgated in the Government Gazette (1994: 38). In this code of conduct credit bureaus are compelled to keep a record of those organisations it supplied information to and to make such information accessible to the individual(s) concerned. Even though the South African law recognises an individual's right to privacy, legislation regarding the right to data privacy is "almost non-existent" (Schultze, 1994: 85). With regards the freedom of information in South Africa, a task force under the Chairmanship of Mojanku Gumbi was announced very recently by the Government to draw up a Freedom of Information Act (Business Day, 19 October 1994). This act supposedly will deal with privacy issues as well as issues relating to the disclosure of certain information. Judging from what appeared in the press it would seem that the emphasis is placed upon disclosure of information relating to companies and government (and presumably TV/broadcasting companies) and less on personal information. The legislation is to be presented during 1995.

Most businesses exist to make profits. In order to achieve that, they collect information relating to its marketplace, its products and its resources. Information can give an organisation a competitive edge over his opponent. "Secrecy....is the soul of business" writes Relyea (1986: 43). It is therefore understandable that businesses devote huge amounts of its resources to secrecy matters. The information must be safeguarded against theft because large amounts of money is spent to collect information by means of market surveys and others. Secrecy is to the organisation what privacy is to the individual although the usage may not be the same.

Not all information which a business may have, can be kept secret. Some information must be made known to its shareholders while other information must be publicised as required by the law. "From this situation there arises a condition of continuous tension as to the kinds and quantities of business information that are provided to government as well as the arrangements under which it is obtained, maintained, and utilized by agencies of the state" (Relyea, 1986: 43). Although the law views an organisation as a "person", the laws for privacy do not apply to the organisation. These laws are reserved for individuals (Relyea, 1986: 45).

Protecting an individual's privacy in respect of data held in electronic form is a complex matter. It is all very well to have laws governing such data, but it is extremely difficult to effectively prevent such data to be transmitted around the world via computer networks in a matter of seconds, in the process making it available to virtually everyone on the network with little or no evidence where it originated from.

Privacy is a basic right a person has (or should have) to have certain aspects of his or her life to be kept confidential. Article 8 of the European Convention on Human Rights declares: "Everyone has the right of respect for his private and family life, his home and his correspondence" (Cawkell, 1982: 4). In a world of miniaturised video and other cameras, microphones and centralised phone tapping, computers and worldwide networks, protecting privacy is almost impossible to achieve.

3.3.4.3 Accuracy

Collecting personal data is one issue; keeping that data updated in order so that the data is correct at all times, is another, just as serious issue. Arthur R. Miller of the Harvard Law School quotes the FBI's National Crime Information Center (NCIC) which keeps record of all arrests. These records are accessed widely by insurance companies, banks and others. Miller points out that 80% of these records just say "arrested" with neither indication of the crime, nor of the conviction or exoneration. Decisions are often made based on this inadequate and outdated information.

Lyon (1991: 96) quotes the National Security Agency (NSA) in the United States "...one of the most dangerous computer-driven organisations in the World". It operates outside the control of the Senate or the Congress. Although no-one knows what this organisation does, it is suspected that they do all kinds of surveillance and direct spy satellites. Although these examples are from the United States, most countries have similar bodies acting under no control and under a cloud of secrecy and consequently suspicion. All of these examples raise grave concerns over what data is being collected, about whom, but more importantly, how accurate and recent such data is.

The potential danger of out-of-date information about an individual is acknowledged by the law. The California Fair Information Practice Act of 1974 gives a person the right to contest information kept on him in terms of accuracy, completeness, pertinence and timeliness. The Minnesota Privacy Act allows the same (Goldstein and Nolan, 1975: 64). The code of conduct promulgated in the South African Government Gazette (1994: 39) compels credit bureaus to give consumers access to information kept on them and to correct incorrect information. It also governs the periods such information may be kept.

Miller (1991: 127 - 128) pleads for five steps to be taken in order to alleviate the situation. Firstly, he pleads for what he calls "fiduciary obligation - which you can translate into a humanistic notion of good faith, fair dealing - to the data subject". Secondly, that certain information not be collected at all (e.g. religious and political affiliation). Thirdly, the safeguarding of personal data. Fourthly the right of the data subject to have access to his or her own record. Fifthly, he calls for "death to information", meaning that as data gets older and less relevant, it should be purged or archived or even deleted so that it does not "sit there like an informational time bomb" (Miller, 1991: 128).

3.3.4.4 Access

While it could be disputed whether we are truly living in an information age or whether we are an information society, it can be stated as a fact that one has to have a certain level of computer literacy to survive. Such literacy, according to Mason (1986: 53) lies on three levels:

- One must have the basic skills of reading, writing, reasoning and calculating, that is, the basic intellectual skills to deal with information.
- One must have access to information sources such as libraries, radios, television, telephones and, increasingly, to personal computers in order to access computerised information.
- One must be given access to the information itself.

The first level dealt with is an educational task and is, to a certain extent, available to everyone. The second and third levels are, however, not always affordable to everyone. Even public libraries, hard pressed for funds, are beginning to charge for their services. Access to specialised databases requires firstly, knowledge of their existence and, secondly, the use of specialised equipment (computers and modems). Access to such networks and to the databases could carry a high cost. "Many people cannot or choose not to pay [these fees] and hence are excluded from participating fully in our society. In effect, they become information 'drop outs' and in the long run will become the source of many social problems" (Mason, 1986: 54).

Access also has another meaning: access by an individual to information kept about such individual. Such an individual is often referred to as the "data subject". The Minnesota Privacy Act, Chapter 479, Section 4 states: "Upon request... an individual shall be informed whether he is the subject of stored data and if so, ...shall be informed of the content and meaning of the data recorded about him or shown the data without any change to him". Likewise, the California Fair Information Practice Act of 1974 states: "Every governmental body maintaining an automated personal data system shall... inform in writing an individual, ...whether he is the subject of data in the system and if so, make such data fully available to the individual in a form comprehensible to him" (Goldstein and Nolan, 1975: 64).

Although there is no formal legislation with regards to data privacy in South Africa, a code of conduct for credit bureaus governs credit information. It forces credit bureaus to disclose information kept on individuals as well as the period such information must be retained (Government Gazette, 1994: 38).

3.3.4.5 Conclusion

"An abundance of information and data may decidedly be useful in improving life, but it can be equally useful in lessening and threatening our existence", writes Herman J. Saatkamp (Dejoie, 1991: xi). This to a large degree sums up the ethical considerations regarding information. On the one hand, having the technological and intellectual means to collect and disseminate information to each and everyone, is laudable. Being informed as a human being means being in a better position to enjoy and cope with life.

On the other hand though, the same technology and intellect can be put to use in order to exploit information collected for own personal gain. Such usage would be considered unethical by moral standards. The challenge facing information professionals and lawyers alike, is to create a framework where unethical behaviour is prevented, detected and punished.

3.4 Information and the economy

During the industrial era the economy was dominated by the industrial sector. Not only was the industrial sector sizeable, it had a dominant influence on the other sectors (de Lange *et al.*, 1993: 3). When one sector in the economy of a country becomes so big that it dominates the others, the total economy is then often referred to by this sector.

Thus it is often said that a certain country has an information economy, e.g. the USA (Naisbitt, 1990: 40, 79; Lyon, 1991: 45). This has the implication that the information sector has grown to such an extent that it dominates the other sectors, either in terms of size or in terms of importance. Miles and Robins observe that statements referring to the information economy, information society and information age are usually originating from "interested parties rather than dispassionate social scientists" (Miles and Robins, 1992: 1). It nevertheless warrants a careful investigation of these concepts as there may be some significant trends forthcoming.

3.4.1 The information economy

The work of economist Fritz Machlup and Marc Uri Porat, starting in the 1960's, indicated that a shift took place from an agricultural through an industrial to what looked to be an information or services based economy. Evidence of this was found in a decline in the number of workers in industrial production and a steady increase in the number of workers handling information in some form or other. This suggested the emergence of a "post-industrial society" and a "post-industrial economy" as Daniel Bell called it in 1976. At that stage it was suggested that a full emergence of a post-industrial society "would be associated with substantial changes in social relations: for instance, the ownership of capital would no longer be the main source of social power. ...knowledge itself would become the organising principle" (Miles and Robins, 1992: 4 - 5).

In the work done by Machlup in 1962 it was estimated that as much as 29 percent of the Gross National Product of the United States was tied up with the production, processing and distribution of information. The figure, from the work done by Porat in 1977 (1967 according to Lyon, 1991: 10), was estimated to be 46 percent. In addition, it was found that nearly half of the labour force had something to do with information-related work (Meltzer, 1981: 3 - 4). Debons *et al.* (1981: 2) point out that Porat's figures included workers working in organisations which were classified as knowledge or information industries "...regardless of whether the workers were directly involved engaged in handling of data and information...". This criticism is echoed by Lyon (1991: 10) when he points out that because Porat did not use a clear definition of information, the categories are blurred and that, as a result, judges and rent-collectors found themselves in the information category. Miles and Matthews (1992: 93) call this problem the problem of aggregation and point out that whereas the services sector lumps together "a great range of diverse activities", the information sector tried to overcome this, but "...this still involves aggregating very heterogeneous activities together".

Debons (1981: 2) and others published the results of a survey undertaken in 1980 in which they tried, amongst others, to define the information worker more precisely. They found that there were 1.64 million information professionals employed in the United States. Of this figure more than 40% were involved in the computer workfield while 10% came from the library workfield. 1.16 Million of the total number worked in the industrial sector, 370,000 in state and local governments, 78,900 in federal government and 30,100 in colleges and universities (Debons *et al.*, 1981: 10 - 13).

Toffler (1990: 71) made the point in 1990 that the service and "symbolic" (knowledge) activities account for 75% of the work force in the USA. Naisbitt and Aburdene (1991) seem to pick up a continuing trend in 1991: "The information economy is producing an extraordinary number of well-paying, challenging jobs".

Strassmann (1985: 5 - 6) estimated that "more than 63% of all equivalent working days in the US economy in 1982 was devoted to information work; ...the average weekly workhours expended by information workers is 10% to 20% greater than those put in for other occupational categories", and: "...information workhours becomes greater than 70% of total" workhours recorded, and that at the United States economy spends at least 67% of its labour costs on information work".

The Organisation for Economic Cooperation and Development (OECD) reported in 1981 that Austria, France, Germany, Finland, Japan, Sweden, the USA and the UK were experiencing a "profound change in their occupational structure" (OECD, 1981: 13). They too analysed the information sector in the economy, but try to address the "aggregation problem" (of Miles and Robins) by splitting the information sector into primary and secondary information sectors. The occupations, however, still ranged from bookbinders through sales supervisors, stage directors to metallurgists (Miles and Matthews, 1992: 93).

It is important to note that a shift occurred in the gender of the workforce. Where, in the industrial age, the male (typically uneducated and unskilled) dominated the workforce, this has disappeared in the information economy. Since 1973, the end of the industrial age, real male incomes (in the U.S.) declined until 1985 when it was again at the 1973 level. Women did not suffer the same dip as their male counterparts. This happened because not many women were part of the union-based high-wage phase of the industrial economy. Naisbitt and Aburdene (1991: 38) claim: "...women have taken two-thirds of all the new jobs of the information economy". Bell (1976: xvii) noted that women were provided with a secure base for economic independence for the first time.

The type of work also seem to have changed from the agricultural to the industrial and now to the information economy. Knowledge has become more important than skills or raw, muscular power. As already pointed out, this allowed women and disabled people to join the workforce more than they were able to do in the industrial age. Knowledge workers require a different approach from management and supervision of such workers. Naisbitt and Aburdene argue that it is "...almost impossible to 'supervise' information work" (1991: 198). They point out that "work" changed to what "...goes on in people's heads" (1991: 198). People are being paid for what they know and how they can apply such knowledge.

This emphasis on knowledge led to the concept of "human capital", a term first introduced by Theodore W. Schultz, a Nobel prize winner, in 1961 (Hudson, 1993: 13, Crawford, 1991: 5). He used it in relation to economic growth as a result of improved health, schooling, training and acquisition of information. Later studies undertaken by Paul Romer proposed that human capital must be added to the other main production factors, land, labour and capital (Hudson, 1993: 14). The concept of human capital will be explored more fully when dealing with information and business (section 3.5).

Not everyone agrees that the economy changed that much. Cronin (1985b: 130) warned that the "...picture may ...change". He quotes Naisbitt *(The Year Ahead)* where he claimed that only about 10% of the jobs created in the last 10 years have been high-tech jobs. An analysis by Lyon (1991: 47 - 50) of the information sector and, indeed, the information economy, shows several flaws. Firstly, labour figures do not show up a significant decline in the industrial labour force as such. What did decline was the labour force in the agricultural sector while what grew was the services sector. Services sector does not necessarily means information sector. Lyon shows that where the identification of the services sector is not a simple matter, identification of the information sector is even more difficult. This point is shared by de Lange (1993: 4 - 5) who points out that even a hamburger vendor can be said to manipulate symbols in providing a till slip, by Miles and Robins (1992) and Miles and Matthews (1992).

In the second place Lyon points out that the growth in the services sector depended to a large extent upon the manufacturing sector. It could, therefore, not be argued that it was replacing the manufacturing sector. Thirdly, the labour force in the advanced societies is undergoing changes itself. He quotes, like Naisbitt and Aburdene, examples of the growth in women's labour and the informal sector. Lyon (1988: 53) feels that an empirical analysis leads to the "evaporation" of the information sector and concludes that the information economy and information sector are slogans useful to those who want to believe in "the transformative power of technology". He does, however, admit that there is evidence of a marked increase in information activities and in its diversity and that this may have sociological impact.

Bell (1976) who is attributed with the information society concept, pointed out in the foreword to his book that the post-industrial society does not displace the industrial society, "just as an industrial society has not done away with the agrarian sectors of the economy" (1976: xvi). He compares it with the adding of additional layers to existing layers in society, strengthening some features and weakening others. This argument could perhaps be applied to the post-industrial economy also.

Regarding the information sector in South Africa, only a few studies have been undertaken, namely individually by Burger, Zaaiman and Fouché (de Lange *et al.*, 1993: 8 - 9). Burger's study, done in 1981, indicated that there was not yet a significant information sector present in South Africa. Fouché's study of the 1987 census showed a figure of 28% of information workers in the economically active population in comparison to 56% in the USA for the same period. The available statistics on the information sector in South Africa is therefore inadequate to be conclusive. Speculatively, one could argue that there will be a well developed services sector and even an information sector present in the South African economy. However, there is still a very strong agrarian sector (subsistence economy, mining sector) present in South Africa, but also a strongly developed industrial sector. South Africa therefore is a micro-cosmos of the world economy with elements of developing as well as developed economies present within one country.

The impact of information technology as contributing to the information sector must not be underestimated. It leads back to the concept of Fordism as the era of mass production and consumption when economies of scale in the manufacture of standardised goods became the norm. In the mid-1970's Fordism became destabilised and made way for post-fordism where privatisation and a breakup of the welfare state became the norm. Technology (in general) is seen as the catalyst to help the post-fordism concept along. Developments in information technology made it possible for the microprocessor chip to become a heartland technology; a technology which spans across many products in many sectors thereby reshaping the economy, like the electrical motor has done. (Miles and Robins, 1992: 8 - 13).

Whilst one could argue about the exact numbers in any country, it is evident that a change took place in the composition of economies of most countries, more significantly so in the developed countries. In most countries the services sector certainly grew at the expense of the agrarian and industrial sectors. It is also clear that far more women and disabled people have entered the workforce with much success. This, in itself, is a clear indication that there are plenty of opportunities in the economy where muscular work is not of importance.

The question of an information economy must be left unanswered because of the many shortcomings; the lack of a precise definition and measurement of the information sector being the most problematic one. There can be no doubt, however, that globally speaking, a shift occurred from a manufacturing (industrial) economy to a services dominated (post-industrial) economy. As far as an information sector is concerned, it can be safely said that information sectors are present in many countries, but because of the difficulty in precisely defining and measuring the information sector, its influence on the economy as a whole and on the other sectors, is still to be proven conclusively. This however, does not reduce the importance of the information activities taking place in countries. Governments and other policy makers must take cognisance of the information sector and its influence on the national and global economies. Individuals must take note of the shift in the economy as far as occupation trends are concerned; the change from physical labour to knowledge workers.

3.4.2 The economics of information

There is no doubt that a change took place in the economy and more specifically the driving forces in the economy. Bell (1976) contends that we have evolved from a pre-industrial (agrarian) economy to an industrial economy and are now in a post-industrial economy. The industrial economy was based on machine technology, the aim to fabricate goods (*homo faber*). Industrial goods were produced in discrete, identifiable units and traded, in the process being depleted and used up (e.g. a loaf of bread).

The post-industrial economy is based on services, shaped by intellectual technology. The "good" is knowledge and information; its characteristics vastly different from the good of the industrial economy. It is not used up; once created, it remains available to the producer after being sold. Knowledge is a social product, a collective good, unlike the good of the industrial economy which is a private good.

The economics of information is different from the economics of goods. Scarcity gets a new meaning in the post-industrial economy. Because information plays such a crucial role in the post-industrial economy, it will expand in response to the demand for it. This brings to the fore one of the most fundamental issues in economics: complete information. In classical utility theory it is assumed that complete information is available about goods. With more and more information becoming available, one could argue that this assumption is (at last) becoming true. Yet, more information does not mean complete information - in fact, more information could well have the precise opposite effect, e.g., by hiding the wanted information in voluminous reports. Information will, paradoxically, remain scarce in the post-industrial economy, data will be abundant. Complete information remains a goal- even in the "Information Age".

Not only will information be scarce, it will become more technical and in order to understand it properly, one will have to have expertise in a number of disciplines. News, for instance, will not only be reported, it will have to be interpreted by specialists.

In order to deal with data from which to extract and distil the required information, another resource become important, namely, time. In the industrial economy, time was a restraint when not enough goods could be produced in a given time frame, or when a machine broke down. Adding capacity in the form of another machine in the production line could easily solve that problem. In the post-industrial age, the problem is more complicated. The (economic) "good" becomes knowledge and information, whilst the "machine" becomes a knowledge worker with a certain knowledge make-up. Adding another human with the same knowledge base may not be possible and time is only available in a limited quantity. Like with any good which is in limited supply, it has a cost.

In order to utilise their own time more optimally, knowledge workers will "outcontract" to others more and more services they could do themselves if they had the time. This has an effect on the people supplying these services in the form of an opportunity. Secondly, in order to have more time available for consumption (to read, to visit friends, to go to the theatre) people will spend less time, for example, on food preparation, with a resulting increase in ready-cooked food, another opportunity in the post-industrial economy.

People will truly become *homo economicus* as far as the utilisation of time goes (Bell, 1976).

This "economics of information" is important to understand. The changes are not limited to the economy only, they have a far more profound effect on society. Society, as Bell points out, consists of the social structure, the polity and culture. The economics of information has implications for all three parts.

3.5 Information and business

It was shown that information stands in close relationship with individuals, with society and with the economy. The question is: What is the relationship, if any, between information and the business world? This will be explored by first researching where information entered the business equation. When did it become important? Its relationship will then be explored, including the effect the information has on power bases, its effect on decision-making and, finally, its relationship with company politics.

3.5.1 Historic Perspective

The first people known to record information must have been the Sumerians. The Sumerian priests developed a "...system of writing or recorded data to account for all the transactions entered into" (George 1968: 4). This historic event took place in the year 5000 B.C. The purpose of written documents was for managerial control which seemed, even in those days, impossible without information.

The Egyptians were the next to record information. The building of the pyramids (from 5000 to 525 B.C.) was a great managerial achievement if it is taken into account that one project took twenty years and involved the labour of 100,000 men (George 1968: 4). Every aspect of management as we know it today must have been involved in that project: planning (even long-term planning), organising, control, transportation and the logistics in feeding and housing the multitude of workers. The Egyptians must have realised the importance of information as can be determined from the writings of Ptahhotep (around 2000 B.C.): "...be calm as thou listenest to what the petitioner has to say" (George 1968: 6). Various other documents of that era point to the necessity of recording information.

It was only in the 1800's when literature on management really started to appear seriously. The literature concentrated on the functions of the manager and of the organisation and information *per sé* received little attention.

One of the earlier managers to acknowledge the importance of information was Daniel C. McCallum (1815-1878) (Wren 1972: 85). He was made General Superintendent of the Erie railway line in 1854. Frequent and accurate reporting was to him, amongst others, essential for good management. He stated five principles of management of which one was: "...information to be obtained through a system of daily reports and checks that will not embarrass principal officers, nor lessen their influence with their subordinates" (Wren 1972: 86). This principle led him to obtain hourly reports on the position of trains, daily reports on passengers and cargo and monthly reports for planning and control. Wren (1972: 87) writes that McCallum "...developed information management to probably the highest state of the art for the times".

Henry Varnum Poor (1812-1905) further enhanced the work of McCallum and stated three principles for good management, namely, organisation, communication and information (Wren 1972: 88). (He must also have been one of the first sellers of information with his *"Manual of Railroads in the United States"*, containing financial and operating information about the railroads.) He called information "recorded communication" and advocated the principle of frequent and sound management reporting. Poor pleaded for a systems approach long before Frederic Taylor, for a human approach long before Elton Mayo and for a removal of the formal organisation long before Chris Argyris (Wren 1972: 92). Wren (1972: 92) calls Poor "...one of our most outstanding early contributors to management thought".

Although Charles Babbage (1792-1871) is usually remembered as the father of the first computer, he was also a manager. In 1832 he recommended in his book "...that data obtained as a result of rigid investigation should be utilized in managing an enterprise" (George 1968: 73).

It can be said that Henry Metcalfe practised early information management, perhaps unbeknown to him. Metcalfe was a Captain in the United States Army and the work done by him was recognised by Frederic W. Taylor in acknowledging his debt to him for some of his own ideas (George 1968: 81). Metcalfe promoted and practised the idea of a single source of authority with detailed information flowing back to that source. He disposed of all except the most important and needed reports at the Frankford Arsenal and managed to eliminate "...thirteen different kinds of books and reports that had been in regular use" (George 1968: 82). It would seem from this fact that even in the time of Metcalfe, it was necessary to separate the data from the information and that information overload was already present.

The end of the 1800's and the beginning of the 1900's saw the emergence of the scientific movement with people such as F.W. Taylor, the Gilbreths and Henry L. Gantt. Harrington Emerson (1853-1931) pointed to what could be termed aspects of the management of information in his book *"Efficiency as a Basis for Operation and Wages"*, published in 1911. Emerson contended that it was really *ideas* which created wealth and not land, labour or capital (George 1968: 103). (Ideas, as shown in chapter 2, are sources of information.) Emerson listed 12 principles of efficiency and one of these principles mentions information as it is needed for decision making: "Reliable, immediate, accurate, and permanent records - a call for facts upon which to base decisions" (George 1968: 104).

Carl C. Parsons wrote a book in 1918 in which he contended that the heart of the efficiency of the organisation was the office. He realised the importance of information as a basis for good decisions and reckoned that the office is where all the information was kept in the form of records, reports and statistics (George 1968: 120).

Although it is Ludwig von Bertalanffy who is credited with coining the phrase "general systems theory", Wren (1972: 482) contends that the South-African General, Jan Christian Smuts, first spoke of a holistic view towards form, matter, life and personality. He writes: "Smuts' work represented a Gestalt view of the universe and must be considered as an attempt at what was to become the province of general systems theory".

Norbert Wiener worked on feedback systems and called it "cybernetics" (Wren 1972: 483). His study showed that is was possible for any system to control itself by "feeding back" information through a communications "loop" and thereby adjusting itself. At the same time when Wiener was working on cybernetics, Shannon and Weaver were developing their information theory; the mathematical study of communication. With Bertalanffy's ideas as basis, the economist Kenneth Boulding tried to integrate the theory of cybernetics with the information theory of Shannon and Weaver (Wren 1972: 483). It was only in the 1960's that general systems theory was to make an impact on the theory of management (Wren 1972: 485).

The systems approach seeks to bring the physical, human, and informational aspects of management into "one grand framework of a 'way of thinking' by the manager about how to integrate all facets of the organization into an integrated whole" (Wren 1972: 487).

Wiggens (1986: 41) writes that Bertalanffy considered "biological organisms as open systems interacting with their environment by way of exchange of materials, information and energy". The systems theory led to narrower aspects such as systems analysis in computing. Libraries and information centres are not considered closed systems. "They interact with a range of other systems and sub-systems that are both within and outside their immediate organisation" (Wiggens 1986: 41 - 42).

The systems view of management essentially focuses on the decision making process (Tricker 1982: 22). This is perhaps the first view to point directly to information as a vital aspect of management. Where the classical and the behavioural schools look at the work managers perform and recognise the importance of achieving results through people, the systems approach provides an alternative view, namely by looking at management as the process of using information and of making decisions (Tricker 1976: 68).

Although not the only important task of a manager, a large part of management can be seen as making decisions. For good decisions to be made, information must be present. "Modern executive, medieval farmer and ancient Pharoah alike need to be informed. Whether launching a new product, ploughing the fields or building a pyramid they want information about the state of their resources and knowledge about the uncertain events they may have to face. Decision making is an information process" (Tricker 1982: 20). "Information has always been crucial to management decision making, and the Egyptian scribe who recorded his master's inventory with a stylus on a clay tablet was a forerunner of the modern information specialist" (Wren 1972: 490). "For as long as men have been striving together to accomplish tasks, making decisions about scare resources in uncertain situations, management has been practised; and information has been needed" (Tricker 1976: 1).

The trend today in bigger organisations is towards distributed decision making. This means that decisions are made by a number of people, each acting autonomously within his area of responsibility, but working together towards a common goal. Each one of these people has his own perspective of matters and in order to take the decision, these perspectives need to be shared - *perspective taking*, according to Boland (Boland *et al.*, 1992: 1 - 2). For this process to work, perspectives - based on information and knowledge - must be exchanged and therefore put even more emphasis on the importance of information as a basis for decisions.

We can therefore conclude that, although information has not been specifically mentioned by the earlier writers on management thought, its presence was perhaps taken for granted. "Like sunlight to the Victorian botanist, clearly it was crucial to the process, but it was either available, or it was not" (Tricker 1982: 21). Organisations and their executives were perhaps not as pressed for information because of the relative small size and the lack of internationalization. Organisations studied by the management writers in the early days were mostly manufacturing concerns (the Industrial Society) and therefore management thought focused primarily on the production process and its effectiveness. This does not mean that information was not important to early managers. There were just other aspects which were more important at that stage.

Information got more attention as the complexity of organisations grew. Management writers focusing on decision making realised the importance of information and with the emergence of the systems approach, information got its rightful place.

3.5.2 Information replacing capital

As was pointed out in the discussion of the information economy (section 3.4.1), the post-industrial economy is characterised by knowledge replacing capital as the main power base. Toffler (1990: 88) argues that this is already happening. He quotes examples of where information substitutes for high cost of inventory. By using an information system, Merloni Elettrodomestici (a multinational company in Italy) were able to reduce their cost of inventory by 60%. The owner is quoted of saying that less capital is needed to do the same thing as previously. Information can be said to be replacing capital.

A related area where information can be said to replace capital is Just-in-Time (JIT) inventory control systems. JIT means less inventory, shorter delivery times, smaller orders and faster turnaround. To achieve this, information -

precise information - is essential (Toffler, 1990: 123). Again, capital (locked up in inventory) is replaced by information.

Whereas fordism was concerned with mass production and mass consumption, post-fordism was characterised with a high variety of products and customisation of products to suit individual needs and tastes (Miles and Robins, 1992: 12 - 13). Such an environment in the fordism sense would require high infrastructural capital and running cost outlays, usually making such a venture completely unfeasible. Through the use of information, knowing the needs and tastes of customers, where geographically the products are needed, what the inventory levels are at different warehouses and through the use of computer controlled production floors, such an environment in post-fordism sense does become feasible. The cost of diversity is therefore driven towards zero (Toffler, 1990: 87).

Our knowledge of materials and their physical attributes allow us to build machines that defy the hostile environment of outer space, or design tennis rackets and racing bicycles or fibre optical cables to transmit thousands of data bits simultaneously. In some cases earlier materials would preclude us from achieving it at all and where it would be possible with such materials, the cost would be prohibitive (while being far inferior in quality) for example, using copper wire to achieve the same throughput as with fibre optic cable. Knowledge made it possible; knowledge acquired over many years by documenting current knowledge and expanding it further generation after generation.

Toffler (1990: 88) also reminds us that knowledge saves mightily on time, one of the most important resources in the post-industrial age and in terms of storage space in warehouses and elsewhere.

Cronin (1985b: 129) remarked that information must be seen as a social and economic "lubricant"; one which conserves other resources. This is perhaps what this is all about. Whilst it could be argued against the notion that information and knowledge *replace* other resources (at least not directly), it must be clear that information is most definitely contributing towards the more effective utilisation of other resources, thereby *conserving* them. Efficiency and effectiveness in the utilisation of other resources is what information is all about. The efficiency in collecting such information contributes directly to the "bottom line".

This makes information and knowledge and, very importantly, the efficiency of obtaining such information, very important to business. Anything that contributes towards more effective and efficient utilisation of other resources and increase productivity, must be taken seriously by business. Information is such a resource.

3.5.3 Information and human capital

"Human capital" is a term which evolved out of the work of Theodore W. Schultz in 1961 (Crawford, 1991: 5). Schultz was studying mainly economies of the low-income countries and got to the conclusion that the welfare of poor people did not happen as a result of improvements in the production of space, energy or cropland but through the improvement in the population quality and advances in knowledge (Hudson, 1993: 13). What was needed was child care, home and work experience and the acquisition of knowledge through training and schooling. This concept he called human capital; the accumulation of knowledge. Stewart (1991: 42) says: "It is the sum of everything everybody in your company knows that gives you a competitive edge in the marketplace".

Although the term "capital" is usually associated with money, it does not have to be. Webster's Dictionary (in Crawford, 1991: 10) defines capital as "any form of wealth employed for the production of more wealth". A medical doctor or professor's knowledge produce wealth for them in the form of a substantial income and could therefore be considered as capital. Japan is a classical example of how an economy can be built on human capital. Their investment in high levels of education and through hard work enabled one of the highest growth rates (Crawford, 1991: 24 - 25).

Paul Romer proposed that human capital be added to the other three factors of production, namely, land, labour and capital. In his opinion, human capital could be measured by the number of years of education and ideas through the number of patents (Hudson, 1993: 14). Hudson proposes the term intellectual capital rather than human capital, the difference being that human capital is aimed at entire populations while intellectual capital is aimed at the individual.

Human capital and intellectual capital are therefore terms used to denote the "capital" locked up in and gained through education, training and experience. The more intellectual capital an individual has, the bigger his potential to contribute and the more human capital a country possesses, the higher the standard of living should be. This was proven by a study done in the USA in 1980 when it was found that men with post graduate educations were earning 130% more than those who never finished high school (Stewart, 1994: 28).

Hudson (1993: 15) warns that the concept of intellectual capital must not be "intellect as pure intellect" but that it should have a degree of "intellect in action". The aim is therefore not only to obtain intellectual capital, but to make it productive through action. This is an important principle for information management, as will be shown later. It also relates strongly back to the purpose of information as described in chapter 2.

As human capital and intellectual capital increase, so does the ability to generate information (or data to be more exact). It is the countries where educational levels are far higher than others where the most publications are produced. It is also those countries where business executives and others are complaining about information overload.

Clearly, human capital and intellectual capital are directly related to a company's human resources. Because it is locked up inside the human brain, it can only be intangible. Most companies will agree that its human capital is one of the biggest assets of the company - that without it, the company will come to a grinding halt. However, with possibly the exception of patents licensing or capitalised research, it is not found where all the others assets are reported on, namely, in the balance sheet.

The link between human capital and information is clear. Learning and experience takes place through having the raw material - information - available. But it is not a case of the more information, the more human capital. One has to be selective when providing the information needed to create knowledge.

The concept of human capital has huge implications for business. With the increased emphasis on knowledge as a major "production factor", businesses have to rethink their investment patterns and decisions. The workforce will undergo change as women and minorities gain acceptance because of the fact that physical strength is not required in many cases. The organisation evolves from a pyramid to a living organism (Crawford, 1991: 113).

3.5.4 Information and power

According to Follet (in Tricker, 1982: 39), power is the ability to make things happen. This definition implies two concepts:

- Power "over" people. This is the case where people do something they do not really want to do but do it nevertheless out of fear of punishment, penalty or non-reward. Griffin (1987: 422) calls this coercive power.

- Power "with" people. In this case, power is not based on fear, but instead, things are made to happen by setting goals, making plans and achieving objectives with others. People are made to do things by controlling the way they interpret messages and by acknowledging their world, needs and situation.

In primitive societies the tribal leaders, witch doctors and priests had power over the people because they had access to information not available to the others (at least that is what the other people believed). This information was passed on from generation to generation with due ceremony and great care. This is how they managed to retain their power base.

Tricker (1982: 38) notes how interesting it is to observe how insurgents today seize the local television station and airport before they occupy the government buildings or the royal palace. "Consequently, power resides in the capacity to deprive people of information that would give rise to challenge or criticism" (Tricker, 1982: 39). Depriving people of information or selectively letting them have the information suiting your needs is one sure way of staying in power. The battle, almost to the point of taking up weapons, between the previous South African government and an opposing political party's radio sender, Radio Pretoria, is another case in point.

The trend towards participative management found in organisations today, attacks the root of managerial authority. The union movements demand more information from managers about resources, results, prices, profits, etc. Likewise, consumer groups, customers and supply organisations demand more information. It is evident that union movements are scoring more and more successes at least in terms of wage disputes as their power base expands. Andrews (1987: 18) says the following about the assumption that only the people "at the top" knew what is going on: "...that has changed now because the organisation down here also has access to that information. People don't follow instructions any more. You can't tell them what to do any more, they need to understand what you are doing before they will listen".

Fundamental to this is information. We are told that we live in an "information" world (Toffler, 1979: 137; Sunter, 1987: 38; Cawkell, 1986: 92) and in such a world, information "...is not merely incidental to the exercise of power but is itself a basic source of power" (Tricker, 1982: 39). Naisbitt (in Dejoie *et al.*, 1991: 59) writes: "the new source of power is not money in the hands of a few but information in the hands of many". Cawkell (1986: 94) points out that the majority of people seem to be unconcerned about the fact that information gives the possessors power over them and writes: "The information haves will accumulate more power, a trend which is unlikely to be arrested".

The American Civil liberties Union Foundation (in Horton, 1979: 253) has this to say on information as a basis of power: "The principal commodity of power in our society is information. Power may come out of the barrel of a gun, but far more power comes out of a computer or a data bank, particularly if the information in it relates to people who do not know that it has been collected or cannot challenge its accuracy or use".

Touraine (in Tricker, 1982: 40) summarizes it: "The principle opposition between ...classes does not result from the fact that one possesses wealth and property and the other does not. It comes about because the dominant classes dispose of knowledge and control information" (Tricker, 1982: 40).

The other side of the coin is that with mass media within range of virtually every citizen, control of information becomes more difficult to those wanting to hijack it. Naisbitt and Aburdene (1991: 281) acknowledge the power that information gives people but write: "There are fewer dictators on the planet today because they can no longer control information". They base this argument on the availability of information to everyone because of global television and video cassettes Davenport *et al.*, (1992: 53) point out that more than just putting in technology or information management practises are needed to get information to become freely available through the organisation. They use the term "information politics" and contend that these politics must be properly managed for information flow to occur. They write: "Information may flow like water, but in the real world even water doesn't flow without political assistance" (Davenport *et al.*, 1992: 56). One reason for the reluctance on the part of people to give up "their" information is the power they have by having the information exclusively. It is to be naive to expect people to part with such information. See also section 3.5.7 for a discussion on information politics.

Boland (1987: 372) calls the notion that information is power, a "fallacy". He argues that power is not an entity to be "molded, shaped, redistributed and possessed as if it were a three-dimensional object". Power, according to him is a relationship between people and each party to this relationship has access to power over the relationship. It comes about through dialogue and interactions. Information in itself, therefore, does not have power - it is what a person do with such information and how he does it, that may or may not give him power.

There can be little doubt that having the "right" information available exclusively, puts a person at a distinct advantage, provided, of course, as Boland suggests, such a person makes use of such information in his interaction with others. It is on this premise that the notion that information is power is built. This is and will remain a fact and because this, people will continue to keep important information to themselves. However, it becomes more and more difficult to collect and keep information exclusive to oneself. Even businesses and especially businesses, are guarding their information closely in order to gain a competitive edge over their opposition. The same is true of people in their business, but also their social, life.

3.5.5 Information and decision-making

The model for the decision making process, described by Simon (in Radford 1981: 10), consists of three stages as follows:

- Intelligence. The problem is defined by searching the internal and external environments of the decision maker and information is gathered.

- Design. The various possible solutions to the problem are identified and analyzed.

- Choice. One of the possibilities is selected on the basis of an evaluation of its effectiveness relative to achieving the objectives.

To make the decision, an iterative process may have to be used.

All three stages require information to be available. Without information the decision can be made, but the effectiveness of the decision will be doubtful. "One of the most important components of the decision-making process is the gathering of information from which an appreciation of the decision situation can be made" (Radford 1981: 1).

Decisions in an organisation are made at three levels, namely, at the strategic, managerial or operational decision-making levels (Tricker, 1982: 36). On the strategic level, decisions are aimed at the longer term direction of the enterprise and its interaction with the outside world. Decisions on the managerial level concern themselves with technical and control decisions and where the allocation of resources is decided within overall strategies. The operational level of decision-making concerns itself with decisions necessary to execute managerial requirements.

The type of decision varies from the one level to the next. Many decisions on the operational level are programmable whereas the decisions on the strategic level are of a creative nature. Likewise, the time horizons change from level to level. The decision maker on the strategic level deals with great uncertainty. "The challenge is to identify the uncertain future" (Tricker, 1982: 37).

It is clear that the information needed to make the decisions varies from the one to the next level. The information needs of the executive making strategic decisions and which frequently involves a creative process, is a very unique one. The decision-maker has to merge two, or more, self-consistent "frames of reference" to create new insights and therefore new information. Tricker quotes the example where the executive has to combine information he once read in the Financial Times with something that he remembered a colleague once said to obtain new insight into a problem or for a new opportunity to be explored. It captures what might be called the "a-ha" effect (Tricker, 1982: 37).

The decision-making model of intelligence-design-choice has the appearance of a simplification of the decision-making process. The classical decision theory rests on the assumption that all the necessary information is available to the decision maker; hence, the availability of *perfect* information, or complete information. Boland (1987: 375) calls the notion of perfect information (another) fantasy and writes: "Perfect information is a description of the 'true' form of nature - an unattainable, transcendental ideal". Moreover, the classical decision theory assumes complete information regarding all possible alternatives, that decision makers have a rational systems for ordering preferences in a hierarchy of importance and that the goal is always to obtain maximum payoff (Griffin, 1987: 207). In most cases in the business world, this is not the case leading to situations where decisions have to be taken with imperfect information. This calls for another process: thinking, or even better, creative thinking; making informed decisions with the available information, well knowing that it is not perfect information. This concept was called satisficing by Simon and plays an important role in decision making (Griffin, 1987: 209).

The behavioural decision theory assumes that decision makers do not have complete information regarding the situation, that they do not have complete information regarding the alternatives and that they are unwilling or unable, or both, to fully anticipate the consequences of each alternative. The third theory is called irrational decision theory and, different from the other two (classical and behavioural) which assume rationality, it assumes that most decision makers are irrational in their decision making. This was postulated by Soelberg (in Griffin, 1987: 209).

Paradoxically, more information thrown into the decision making model does not lead to less thinking. "On the contrary, the need for thinking becomes greater and greater because we have to make sense of the information" (De Bono, 1992: 24). Also, more information does not necessarily contribute to the creation of new ideas. Less information could, in fact, be more conducive to creativity than a lot of it, because it forces the person to think very creatively with the information he does have available. De Bono calls this the value of "innocence" (1992: 29 and 43).

This leads to a serious dilemma. It is generally assumed that more (let alone perfect) information will lead to more informed decisions, that is, better decisions. But there are examples abound where less information leads to very creative decisions or ideas. De Bono (1992: 29) suggests that the reason for this lies in the fact that "information rarely comes as information. Usually the information comes wrapped in concepts and perceptions". This points not only to receiving un-pure data, that is, data already clouded by perceptions, or attaching own perceptions to pure data. The solution lies in getting the "right" information as input into the decision making process; not necessarily "more" information. The process of collecting information in order to take a decision is therefore very important.

Hence, it is not only important for the manager to have information at his disposal, the manager must decide beforehand what information he needs. Tricker (1982: 25) reckons this to represent a new, and crucial, management task. The manager must identify, understand and determine his information needs.

The challenge to computer systems developers is to develop information systems that merge information originating from more than one plane. According to Tricker (1982:37) efforts so far have tended to concentrate on single planes. One must be careful, though, not to fall into the trap of believing that an information system produces information. Information is obtained when data is put into perspective and context and no information system can do that. Boland (1987: 366) speaks about information without *in-formation*. By this he means that structured data is not yet information; it needs dialogue in order to obtain meaning and only then can one talk about information. There is, therefore, a human side to information systems which, if ignored, could have a detrimental effect on the effectiveness of the system.

De Bono (1992: 24 and further) shows that there is more than one way of looking at data. Two people may have exactly the same data and yet, they may draw two different conclusions. One person may, for instance, use the data to confirm what he already believes ("what is"); someone else may use the very same data and come up with something new ("what could be"). Sometimes the concept comes before the data, other times the data comes before the concept. The outcome could be vastly different depending on the choice.

Decision making cannot happen successfully without information. Information is integral to the process of making a decision or solving a problem. However, it is a fallacy to argue that the more information, the better decision. Simply more information does not necessarily lead to better decisions. Better decisions need relevant and timeous information rather than more information. In order to have relevant information, the decision maker must be selective in the process of collecting or generating information. This poses a challenge to decision makers: To make a conscious effort to resist the temptation to collect more and more information and to concentrate of collecting only relevant information.

3.5.6 Information and innovation

There seems to be a special relationship between the ability of a business to be innovative and its use of information. Research done by Henderson and Cockburn showed that successful pharmaceutical companies were able to "...foster a high level of specialized knowledge within an organization, while preventing that information from becoming embedded in such a way that it permanently fixes the organization in the past, unable to respond to an ever-changing competitive environment" (Henderson,1994: 100).

She points out that a pharmaceutical company is bombarded with information coming from different disciplines internally and externally to the company. Large numbers of scientists are continuously doing research on a wide variety of rapidly advancing disciplines. As an example, she quotes the field of cardiovascular research where, during the last half of 1992, 80,000 articles were published. Apart from hiring the best people in their respective fields and managing them effectively, success came because management was able to manage the companies' knowledge and resources.

Henderson's research showed that the successful companies firstly kept their scientists closely connected to the scientific community at large. This, however, did not guarantee success; the danger is that a company may have the best scientists, but if such knowledge is not applied properly, it is wasted in organisational terms. Secondly, the companies allocated scarce resources effectively so that debate was stimulated and information was transferred. "Our results suggest that the companies that take advantage of knowledge generated from all areas of the organization are significantly more productive than their rivals" (Henderson, 1994: 104). This shows that information has to be shared in order to be effective.

Innovation is essential in today's world. Very successful companies of the past have fallen behind the younger and more innovative ones. One thinks of companies such as IBM, DEC and General Motors (Henderson, 1994: 100) and successes of companies such as MicroSoft. The research of Henderson points clearly to effective information and knowledge management, amongst others, to enable the company to be innovative.

3.5.7 Information and organisational politics

Davenport *et al.,* (1992) use the term information politics to refer to the power play one is likely to find in any organisation as a result of the unique information people have. Attempts to implement information management or to become information-based companies have failed in many organisations studied by Davenport and his colleagues because, in their views, the politics of information was not properly managed.

They found that the bigger the emphasis placed by the organisation on information, the less people are likely to share it. Five models of information politics are defined by Davenport and his colleagues (1992: 55):

- Technocratic Utopianism. This is found where a strong emphasis is placed upon technology. Usually driven by the information systems department, the aim is to provide technology to each and every desktop so that information can be delivered instantaneously. The information itself and its contents are often given little or no attention. In this model it is believed (by the technocrats) that those having information of value will share it willingly with others; from there the expression "Utopia".

- Anarchy. Organisations fitting this model have no prevailing political information model and exist in a state of anarchy. It usually happens where no key executive realises the value of common information and everyone is allowed to keep his own information.

- Feudalism. This model was encountered most by the researchers. In this model each key executive control the information within his area of responsibility. In this model it is extremely difficult for the central authority to make informed decisions for the common good.

- Monarchy. In this model power is centralised in one person; either the CEO or someone empowered by him.

- Federalism. This is the preferred model, according to the research of Davenport and colleagues. It treats information politics as natural and legitimate and let people with different interests work out between themselves something acceptable to all.

It is suggested that an organisation first determine the model applicable to it, then to select the model it ideally wants, taking its culture into account. They recommend only two models found to be viable, namely, monarchy and federalism. Federalism is more difficult to implement as it relies on the cooperation of its employees to willingly share information. For this reason monarchy is easier and can be just as effective (Davenport *et al.*, 1992: 60).

Davenport and his colleagues make a very valuable contribution towards understanding how information is treated by both employees and the organisation. It is naive to expect managers and other users of information to suddenly start sharing information willingly based on a few policy and procedural statements. The reason for this relates back to the information-is-power concept or, as Davenport and his colleagues (1992: 54) state so elegantly: "One reason the stakes are so high in information politics is that more than information is at stake".

The politics surrounding information will be revisited when information management is addressed in chapter 4.

3.6 Information in national context

3.6.1 Information and forms of Government

Control over information by the State puts it in a powerful position. Should the ruling government take the form of an autocracy, it would be important for the state to control information strictly. Only information favouring such a government would be disseminated to citizens. In this regard information technology could play a strategic role. In this regard, Lyon (1991: 95) quotes South Africa as an example. He refers to the pass law system which, without technology, the "...white minority government could not keep track of black employment and housing without the [IBM based] automated system". With the right technology, the state has the infrastructure needed to record all sorts of personal information regarding its citizens so that surveillance becomes a reality. The linking of all the different bits of data contained in many different data bases, both those of the state and private ones, would indeed put a state in a very powerful position, a position which could easily be put to use for political gain. Most governments have the infrastructure needed to accomplish this kind of "electronic surveillance" systems already in place, for example, (West) Germany with their computer readable identity card system, the United Kingdom with electronic surveillance of motor car licence plates and the National Security Agency in the USA (Lyon, 1991: 95 - 96). These are only examples - some with legitimate applications - but with the potential of "Big Brother" watching over citizens.

The last decade saw a demise of socialism with the dramatic fall of the soviet republics as the stronghold. Naisbitt and Aburdene (1990: 77) argue that this demise can be attributed to (i) the global economic forces at work (insustainability of a closed, self-sufficient economy), (ii) technology as an enabler for the global economy and (iii) the failure of a centrally planned economy to make way for decentralisation and market-driven entrepreneurship. In addition, an contrast to earlier times, the individual has become much more important; a focus away from the state to the individual. This was acknowledged by the Soviet Union in its acceptance of *glasnost* which is nothing other than openness and transparency; a free flow of information and communication.

The opening up of communication channels via television, the printed media and, in general, freedom of speech cannot be underestimated. The wide-spread use of technology has empowered individuals: "Computers, cellular phones, and fax machines empower individuals, rather than oppress them, as previously feared" (Naisbitt and Aburdene, 1990: 281). Global television networks such as CNN make people aware of what is happening elsewhere. This access to "foreign" information coming in via transborder television, lead to the demise of East Germany. In Poland the state tried to suppress the use of satellite dishes using feeble arguments relating to the environment ("...the landscape has to be preserved"), but satellite dish companies cannot keep up with the demand

(Naisbitt and Aburdene, 1990: 96). People want information and they will not be stopped in their quests for it.

On the other hand, the State could go a long way in obtaining understanding from its citizens by sharing information with them. It could even allow them to participate or, at least, to influence decision making through interactive cable television, called push-button polling or the "electronic town hall". The Canadian parliament broadcasts press conferences and committee hearings over 104 television channels (Lyon, 1991: 88) while the House of Lords in London and the House of Representatives in the U.S. are covered by TV (Lyon, 1991: 91). It is possible to send hard copy letters through CompuServe or the InterNet, two of many global electronic networks, to members of the US Senate, the U.S. House of Representatives, the Vice President or the President. These are all examples of how the state can use technology to disseminate information to and solicit opinions from its citizens.

Technology enables participation. The prophets of the information society see a society being given a wider choice regarding politics and participation in decision making nationally (Lyon, 1991: 12). With the use of information technology, citizens could participate almost instantaneously in decisions affecting them (Lyon, 1991: 86). This electronic recording of opinions and even votes, however, has a serious ethical implication and raises many moral questions as to privacy, ownership and other issues as discussed earlier.

The change from autocratic forms of government to focus on the individual, its rights and its participation in the governance of the nation, is facilitated by information technology and its ability to let information flow freely. Without modern technology such as real-time television from around the globe, computers and computer networks (data highways), cellular phones and fax machines, empowerment of the individual would have been much more difficult, if not impossible. Once again, information helps to shape the world and how we, as society, are living and being governed in it.

3.6.2 National information policies

It has been shown that information is an important resource to individuals, to business and in a national context. If the effect of information activities on national economies, human development and society as a whole is considered, the need for a national information policy becomes evident. If that is accepted as a point of departure, it is only logical to expect the collection, utilisation and dissemination to be guided by policy frameworks. This would not only be true at a national level, but it should be true for any business, that is, a business information policy.

In practice, however, information policies, whether on national or organisational level, are not often found, at least not in a single policy document. Even in the literature one does not find much with regard to it. Reasons for this phenomenon will be explored later.

Because information covers a broad range of subjects, it should not come as a surprise that an information policy covers a wide range of subjects; from telecommunications to journalism (Rosenberg, 1982: 3). Government itself is probably the biggest collector of information and provider of information services in any country and with the many different government departments and agencies, the possibility of duplication is very real. Overlap with the private sector is also possible. The developments in information technology made data storage easily accomplished with the resulting danger of a proliferation of data simply because it is possible to do so. It also brings another danger, namely, the danger of such information being incorrect, out of date and of falling into the wrong hands. All of this emphasises the importance of information policies. It is not a luxury, but a necessity.

According to Rosenberg (1982: 8 and further) an information policy should address at least the following issues:

- Public sector vs. private sector issues

  The rationale here is that the policy should be governed by the principle that it is more important for the public to have access to information sources than for a private enterprise to profit from it. The access should ideally be free because the taxpayer paid in the first instance for the information to be collected, generated and processed and should therefore not have to pay again for obtaining it (Rosenberg, 1982: 8 - 9).

  The debate of having to pay for membership of public libraries in some towns in South Africa is a case in point. If Rosenberg's principle is used, membership should be free to all ratepayers seeing that public funds have been used to establish the library in the first place.

- Government restraint on scientific publication

  Some scientific publications (research) contain information that may pose a threat to the security of the state. Scientists usually want to publish their research in the name of science, whereas government would be more selective in what gets published. The National Security Agency in the USA requested scientists working on cryptography to submit publications to them first before publication. This censorship does not sit well with values such as transparency and even democracy and, unless resolved in an information policy, will cause constant tension between science and government.

  (It is interesting to note this tension between science and government as a forecast of Daniel Bell (1976) come true. These two are two "situses" identified by Bell to lead to tension and conflict.)

- Privacy

  The issue of privacy was discussed extensively in section 3.3.4.2 where the dangers were pointed out. The information policy should address this issue.

- Ownership

  This issue was also discussed in section 3.3.4.1.

(Rosenberg, 1982: 8 - 11)

Harfoush and Wild (1994: 11), in their proposal for an information policy for South Africa, suggest that an information policy should have the following characteristics:

- It must fit within the overall policy framework defined by the government;

- It must serve government and local communities alike, so "...as to enable the development process to be driven by the needs of communities rather than the needs of the bureaucratic system" (Harfoush *et al.*, 1994: 11); and

- It must respect the rights of individuals.

Transborder data flows need special attention in an information policy. It is not only financial transactions flowing from country to country, it is also scientific data being exchanged via networks (making censorship unfeasible). Television coverage to other countries would also fall in this category and already countries are taking precautions to protect culture. France limited the use of American music on their radio stations and in Britain state-run TV stations may only broadcast 14 per cent non-EEC material (Lyon, 1991: 128). This is something that needs to be spelled out in a national information policy.

Again, this issue has the potential of conflict between government (control motivated) and private enterprise (profit motivated).

Hanna (1991: 42) (with the emphasis on information technology in developing countries) suggests that an information policy should address the following:

- Trade, investment, industrial and regulatory policies with regards to information technology and information. A balance must be maintained between the protection of the local informatics sector and making use of what is available on the international markets.

- Setting priorities. It is obvious that limited resources will make it impossible to address or achieve everything at once and therefore an information policy must be clear on what and where the priorities are. The priorities must be driven by demand and not by technology itself.

- The role and effect of information technology on education, training and employment. The issues of people being replaced by technology, but also the need for skills as a result of the introduction of information technology, must be addressed.

- Socio-political issues such as equitable access to information, the effect of foreign media on local cultures, privacy and ownership and the role of information in development.

- The role and function of government as a major user of information and information technology.

- International issues, for example, transborder data flow and the role of international donors and development agencies.

According to Rosenberg (1982: 16 *et seq.*) France, the UK and the USA have advanced far with the development of information policies. In the French "plan", cognisance was given to the decrease in industry-related employment and the growth in intellectual jobs and the predicted increase in home-based work and they decided on a strategy conducive to access to information to everyone. They consequently decided to concentrate on computer networks. This they called the democratisation of information. Education was seen to play a major role (Glastonbury and LaMendola, 1992: 183 - 184).

The Japanese accepted an Information Society Plan in 1972 having the following major objectives:

- To promote knowledge industries over smokestack industries;
- To develop solutions to the problems of industrial age industry; and
- To focus upon software rather than hardware solutions (Glastonbury and Lamendola, 1992: 182).

Canada concentrated more on information technology in their policy because of its vulnerable position regarding technology and the influence of the US mass media on their culture. Brazil is quoted as having advanced the furthest of all third world countries (Rosenberg, 1982).

South Africa does not yet have a national information policy. The first efforts in this regard are found in the work done by the National Advisory Council for Libraries and Information (NACLI) in 1986 (Pauw *et al.*, 1986). (NACLI was established by the Cabinet in 1982 and reported to the Minister of Education.) They produced a report on the structure of the South African system of Libraries and Information (SASBI) and in the report referred to the necessity for a national policy on information.

In 1993 the International Development Research Centre in Canada undertook a study in South Africa to, *inter alia,* propose a framework for the development of a national information policy. Their studies culminated in the report by Harfoush and Wild (1994).

There can be little doubt about the relevance and importance of a national information policy for any country. Yet, it is not found easily. Harfoush and Wild (1994: 12) list the following problem areas in South Africa:

- Information fragmentation. This may be a South Africa specific problem with the many homelands, independent States and lack of centralised data bases;

- Lack of coordination, and

- Lack of information culture in government.

The influence and effect of information and information technology on individuals, communities, the economy, society and on a nation, is too far-reaching to be left to chance. Every business should have an information policy and every country should have one.

3.6.3 An Information Bill of Rights

The integral part information plays in individual human life, in society, in the economy, particularly in development and in national regard was pointed out in the foregoing sections. The ethical issues attached to information and information technology and in particular, the possibilities of it being used to further inequalities and a proliferation of the gap between the information rich and the information poor, prompted Glastonbury and Lamendola (1992: 187) to propose an [Information] Bill of Rights.

They base their Bill of Rights on the following "priorities":

- Social, historical, cultural and ethical factors must dictate the introduction and development of information technology. The emphasis must clearly be on what information technology can do for people and not the other way round.

- Information technology developments must be assessed for their potential impact on democratic principles and individual freedom. This clearly points to the fact that information and information technology can contribute to both democracy and autocracy.

- An agenda is necessary to identify and guide the characteristics of emerging societies (be they information, post-modern, industrial or whatever societies) using information technology.

- The application of information technologies cannot be left to be determined by market forces, commercialism or material interests, but must be guided by conscious human choices. This emphasises the potential threat to individualism by technological determinism.

- The "direct and side-effects" information technology use must be considered, that is, choices made have benefits and costs and both should be considered. Those who will benefit, but also those who will loose because of choices to the use of technology, must be weighed up before embarking on a road.

- Information technology and systems must be scrutinised for their effect on discrimination; racial, gender and disability.

- Information technology must be de-mystified by the use of everyday language(s) in documents. Guidelines must be written accurately and clearly for everyone to understand.

- National information technology plans and policies must be established.

- Technology transfer (through development aid) must be guided by a "sympathetic framework of open technology transfer" and not through market exploitation.

- It must be recognised that although there are global principles and priorities with regards to information technology and its application, there are also equally important local, personal, family and community principles and priorities to take into consideration.

(Glastonbury and Lamendola, 1992: 188 - 191)

Based on the above, they propose a Bill of Rights of 15 statements.

Du Plooy and Roode (1993: 18) contend that the Bill of Rights of Glastonbury and Lamendola has been developed from a first world perspective and should be expanded to make it applicable to developing countries too. In a later article by the same two authors, they argue why a Bill of Rights for developing countries should be different from one for developed countries (Roode *et al.*, 1994: 11). They propose an additional nine clauses to the Bill. These clauses concentrate on the role developed countries play in developing countries and suggest guiding principles for the relationships between such countries, as follows:

- Assisting developing countries to establish ethical checks and balances regarding their information technology industry;

- The willingness by developed countries to share of information with developing countries;

- The willingness by developed countries to assist developing countries in education and training and appropriate technology transfer by adapting it to local situations and in a responsible manner;

- There must be a "good fit" between technology and culture;

- Fundamental human needs should be the driving force behind the introduction of information technology;

- Developed countries will not withhold training and experience opportunities from developing countries;

- IT will not be promoted as a panacea for all problems of organisations and societies;

- The application of IT in underdeveloped countries shall be guided by the tenet that economic and socio-economic development go hand-in-hand; and

- All developing countries should have an appropriate national information technology policy.

(Du Plooy *et al.*, 1993: 18 - 20 and Roode *et al.,* 1994: 12 - 16).

Postman (1992: 20) coined the term "technopoly": A state of affairs where technology "rules" and is based upon the belief that the highest goal of human labour and thought is efficiency. Technopoly is where all forms of culture and economic development submit to the sovereignty of technique and technology. Hence the human is moved into the background and technical calculations become superior to human judgement. This kind of argument leads to a form of technological Utopianism "...which holds that the best way to attack and solve problems, ...is by applying yet more (and ever more complex) technology" (Roode *et al.*, 1994: 3).

It would seem that there is not many differences between what could be described in a national information policy and what could be described as a Bill of Rights. A Bill of Rights defines the departure point for a national information policy to be written, but it could be implicit in the policy. A Bill of Rights does give citizens some legal grounds to fall back on whereas a policy does not. It is of course possible that some other laws could protect the same. For instance, the USA does not have an information Bill of Rights, but it does have laws such as the Privacy Act and the Freedom of Information Act to protect citizens against privacy and ownership/accuracy issues.

Developing countries would possibly be better off should they have a Bill of Rights. It is therefore dependent on the particular country's circumstances what form of protection would be more appropriate. What is important is not necessarily which one is chosen; what is important is that some form of protection exists.

3.7 Information in global context

On the global level, it is evident that some countries have advanced much further than others with respect to the use of information technology up to the point where one could possibly talk about an information society, or, at least, of the wide use of information technology by society at large. On the other hand, it is far from being a global phenomenon if one considers the third world and the role information technology plays there although much information technology manufacturing flowed over to some previously developing countries (e.g. Taiwan and Korea), now called Newly Industrialised Countries (NIC's). Bessant (1987) calls this phenomenon the North-South Divide, characterised by a concentration of knowledge and information in the Northern hemisphere and by technology and capital goods flowing in one direction.

Competing globally means using modern technology, particularly those technologies used to process information with. The world is indeed "shrinking" in terms of communication. In 1988 the first fibre optic cable bridged the Atlantic ocean enabling 40,000 simultaneous calls via the one cable; in 1989 the Pacific was bridged when the U.S. and Japan were linked by optical cable. These are the cornerstones of what Naisbitt and Aburdene call "an international information highway" (Naisbitt and Aburdene, 1991: 14). Add to this the numerous communications satellites enabling, *inter alia*, live television coverage of any spot on the face of the earth and it becomes clear that what significantly goes on anywhere on the world is known within seconds by the rest.

All of this may result in dependence by third-world countries on the West and to a lesser extent on some eastern countries. This then raises a serious issue, namely, the power an advanced nation could exercise over another just because of its access to and use of information and information technology, thereby creating an information "gap". In this regard, Glastonbury and LaMendola (1992: 3) write: "Information technology offers intelligence without integrity. As such it can take on whatever rules or moral standards its designers and controllers choose". Lyon (1991: 14) sounds the same warnings and points out that although a society as predicted by Stonier and Masuda may have some welfare benefits, the same technology could be (and have in the past been) applied for warfare supremacy. (In fact, information technology originated from the need to more accurately guide ballistic and other missiles.) Another warning is sounded by Du Plooy and Roode (1993: 2) by pointing out that information technology is never neutral and its introduction on a large scale therefore never leaves society unchanged.

In response to the potential negative effects that such an imbalance may have on the developing and under-developed countries, the African countries represented at UNESCO proposed the establishment of a "New World Information and Communication Order" (NWICO) in 1976. It was followed in 1977 by a document called "Many voices, one world". These documents focused on the areas of journalism, advertising and television as well as on the effects the large transnational corporations have on less advanced nations.

These proposals lead to some positive action on the part of the less developed countries, but at the same time lead to a departure from UNESCO by some western countries. In 1981 a United States subcommittee found that the NWICO proposals would violate the American First Amendment principles. The USA withdrew from UNESCO in 1984, followed by the United Kingdom and Singapore in 1985, causing UNESCO's efforts to become almost irrelevant.

It did, however, lead to some countries entering into bilateral agreements, such as the communique signed in 1982 between Mexico and France in which they pledged to protect each other's national identity specifically in so far as communication languages in information systems are concerned. Similarly, in 1982 the United Nations passed a resolution forcing satellite owners to obtain mutual consent before broadcasting messages across borders (Lyon, 1991: 112 - 120).

It is clear that there are many sides to the political and global theme. The world thrives on information and in order to compete globally, information technology is fundamental. Governments should, however, be careful how these technologies are introduced into the economy and into society and such introduction in the developing countries in an uncontrolled and unplanned manner, could have the opposite result that what was expected.

3.8 Summary and Conclusions

Human beings and information are interlinked and cannot be separated without life becoming meaningless. It is the most natural thing for human beings to collect and assess data and to convert it into meaningful information by putting it into context and adding perspective. It starts at birth and continues for as long as the brain remains in good health. Withholding information from someone, translates into a poverty for such individual or community. In general, without information, many human needs remain unsatisfied.

A part of the meaning-attributing process is to communicate information. Communicating means sharing; adding value to ideas and thoughts.

Learning takes place through this process; information-as-thing through information-as-process leading to information-as-knowledge. Although information itself is not a fundamental human need, it helps satisfy our needs, that is, through information our needs are being satisfied. It makes life meaningful and contribute towards self-actualization. To be completely cut off from information is to be reduced to little more than animal status.

Looking at society today, it is clear that we have become information intensive through the mass media and the use of information technologies. As technology evolves and proliferates, more and more information becomes available. In order not to drown in all this information, specialisation and customisation became necessary and the result is television and radio channels, magazines and newspapers and even computer networks catering for particular fields of interests.

Based upon the above, one can justifiably claim that we are an information intensive society; an information society, for short. Bell called this the post-industrial society. This bombardment by information (perhaps more data than information), potentially has a serious impact on individuals and society as a whole. It influences the way we live (take for instance the effect of television on social life) and may in the long run affect our culture. Culture falls in the realm of expressive symbolism and meanings (Bell, 1976: 12). With symbols changing and meaning changing, it is perceivable that culture will also eventually change; already there are clear indications of language becoming a universal (english), dress codes becoming universal (jeans), food habits becoming universal (MacDonalds) and so on. Local and national customs, values and beliefs are threatened to the point of becoming extinct. Contemporary culture may well be changing.

Whether or not advanced societies can be called information societies or just post-industrial societies, the truth is that society has changed once the economy changed from being driven by industry to an economy driven by services. Knowledge became central and took center stage from capital goods. This allowed women and disabled people to enter the workforce and be successful. Developments in information technology and related fields such as telecommunications facilitates the proliferation of the new "good" of post-industrial society, namely, knowledge and information. The one feeds on the other: more technology can handle even more information and knowledge and more information and knowledge requires even more advanced technology.

A special relationship exists between information and human development. Information to the policy and decision makers in the development arena is essential. Without the necessary information on which to base decisions, financial and other resources may be wasted. By making information available to the masses, basic human needs are being satisfied. The dilemma is that, for both these dimensions, an information infrastructure is a pre-requisite and this is normally not available in developing countries. What is more, an information infrastructure is usually not high on the priority list. This potentially has many negative implications: developing countries become dependent on developed countries for the development and maintenance of such infrastructure and may even be exploited in the process. It also widens the gap between the "have not's" and the "have's".

Does more and more information lead to a"better" life? Postman (1992: 60) poses the same question, but phrases it differently: Are the problems in Africa or Northern Ireland because of a lack of information? Are the thousands of people dying of starvation around the world because of a lack of knowing on how to grow food, or perhaps on how to distribute the food? Information in itself does not and will not solve all the problems in the world. "The fact is, there are very few political, social, and especially personal problems that arise because of insufficient information" (Postman, 1992: 60). This emphasises the point that it is not enough just to have information or knowledge, it is what is done with it.

Lured by the potential powerful position when controlling information, or by the potential to make money out of the selling of information, it is not unexpected to find examples abound of unethical information practices. Technology can be made to serve any purpose; good and bad. James March observed: "Information is not innocent" (Davenport *et al.*, 1992: 53). The illusive nature of information leads to many questions regarding ownership of information, privacy issues, an individuals right to access to information kept on him and also his right to other information. The proliferation of databases populated with personal information and the potential to establish links between such data bases, is cause for concern. So serious are these issues that it is proposed that an Information Bill of Rights be considered.

There is general agreement that the emphasis shifted from an agrarian economy to an industrial one and then to a post-industrial economy. In this post-industrial economy the driving force comes primarily from the services sector. The services sector's main product is the intellect; information and knowledge. From this view emanates the notion of an information sector, or even, an information economy. Defining this information sector is not an easy task and measuring it even more difficult, especially when different views exist on what is really meant by services and what is meant by information.

What is important to note is that a shift took place in the type of work performed. By far the most people employed during the industrial era did physical (manual) work while few were doing intellectual work. More people today do intellectual work than physical work. This allowed women and disabled people to join the workforce.

Shortly after computers really started making an impact on the day-to-day living of people, predictions were abundant regarding the world being taken over by computers and robots and the human race becoming slaves of such Big Brother machines (the Orwellian scenarios). Having survived the first shock, it is now being realised that technology is just the tool of the information age and that it is only there to serve mankind. The emphasis is on the human and what it could achieve with his modern age tools to assist him. Naisbitt and Aburdene (1991: 6) write: "The most exiting breakthroughs of the 21st century will occur not because of technology but because of an expanding concept of what it means to be human".

Today's competitive environment both for individuals and businesses, has led to constant power struggles. Governments were quick to realise the comparative advantage of controlling information. Information is an integral ingredient in power struggles especially considering the fact that we are living in a world dominated by the intellect as opposed to goods. He who controls information has the power. It therefore comes as no surprise that people are not always willing to share information with others. Yet, information is a collective good; once it has been created, it is by its character, available to all. Ideally, a cooperative strategy should be followed to facilitate the diffusion of knowledge and information into society. It blends well with man's natural instinct to communicate what he knows. The nature of information calls for sharing so that it can grow. This, however, opposes the notion of power to the one who has the information.

Not only did information change the economy's main driving force, it also created its own economy, an economy with different principles from the industrial economy. The economy of information differs from other economies because of the peculiar characteristics of information itself: Information is a collective (as opposed to private) good, does not get "used up" when selling it, could have more than one owner and that there is no "utility" for it. Scarcity gets a new meaning: Having more information does not always mean being better off. Time and the scarcity of it in the information economy becomes an area of focus and people will change their way of living to adapt for the time scarcity. This in itself has effects on the economy.

Information played an important role in business since the early ages. As business became more complex and more competitive, the role was emphasised. Information is used in business to conserve the other resources; capital, human and natural resources. It is used extensively in decision making, but the paradox of more information-produce-better-decisions is again not valid. The solution lies in having the right information and not necessarily more information. This highlights the need for decision makers to define their information needs accurately. If they do not, information overload will be the result, with the outcry of drowning in data and dying for information.

Government is both the biggest producer and user of data and information in any country. It can use information to oppress or to empower and get participation from its citizens. Censorship becomes extremely difficult in a world of global television and data networks and examples abound where governments were toppled because of citizens being informed from outside the borders of the country. On the other hand it offers governments golden opportunities to allow citizens to participate via opinion polls and in general by allowing transparency.

The importance of information to individuals, society and the economy together with the many ethical issues related to information, lead to the need for a national information policy. Such policy should address citizens' rights as far as privacy, ownership, access and accuracy of personal information. It should spell out the role of private versus public sector interests, the publication of scientific research, the introduction of information and other technologies, taking into consideration the stage of development of the country. It must prioritise these issues.

Lastly, information has changed the world in a global context. Countries, communities and even individuals (celebrities) cannot live in isolation. In order to be a part of this information world, a certain infrastructure is needed. If it is not present, there is no way that such a nation can become a world player. This, again, leads to the burning issue of the third world and its apparent inability to take part in this game. The question becomes: Will it be left to die?

In this chapter information was put into context. Its role and function in business and society has been explored. A framework was created into which information can be fitted. Information now being understood and put in place, one can turn to its management. In the next chapter information management as a concept will be explored and defined.

CHAPTER 4

4. THE MANAGEMENT OF INFORMATION

4.1 Introduction

Information is an integral part of business. Like humans, businesses cannot survive without information; it acts as a lubricant to wheels of business and is a vital resource having the quality of conserving other resources. With this as a departure point, it follows that it is vitally important to manage this resource properly.

This viewpoint led to the use of the term "information management" and, later, "information resource(s) management" (IRM); both terms attempts to manage information.

Where the second chapter defined the term information and the third put information in context, this chapter will explore the concept of information management. What does it mean "to manage information" and, even more fundamentally, "*can* information be managed"?

4.2 Defining management

An organisation exists to supply a product or to render a service, regardless whether such organisation's motive is for profit or not. This process of conducting business cannot take place without the existence of an input, (production factors or resources), an output (a product or service) and a process by which the input is transformed into the output. In the process, value is added. This process is facilitated by what is called management; ensuring that the goals set are to be achieved. It takes place through certain *actions*: Planning, organising, leading and controlling of the production factors, resources and processes. During the entire process decisions are continuously being taken regarding all the actions.

Hence, management is "the process of planning and decision making, organizing, leading, and controlling an organization's human, financial, physical, and information resources to achieve organizational goals in an efficient and effective manner" (Griffin, 1987: 8 - 9). The definition also identifies the purpose of management, namely, the realisation of the goals of the organisation in an effective and efficient way. The challenge to any manager is to mobilise and utilise the resources allocated to him in the correct "mix". To be effective means to be doing the right things; to be efficient, is to be doing things right (with the minimum waste).

A company generally has four kinds of resources at its disposal: Natural (physical), financial (money), human (labour) and information. It is only recently that some writers are including information as one of the resources.

The definition above points to a process as opposed to an event. Management is the continuous process of planning (and making decisions), organising, leading and controlling. These steps in the management process do not always follow in the same sequence; a manager would typically be involved in almost all of the steps throughout the day.

4.3 Defining information management and information resources management

Three distinct terms are found in the literature on information management: "Information management" itself, "information resources management" and the phrase "the management of information (as a resource)". Often these terms are used as synonyms, but many writers have something very specifically in mind when using the term. It needs to be clarified whether these terms are, in fact, synonyms and if they are found not to be, what the differences are between them.

4.3.1 Information resources management (IRM)

Adams (in White, 1986: 29) defines information resource management as "...a top management function to develop a set of policies, programs and procedures to efficiently and effectively plan, manage and control information requirements and supporting information handling resources". Why he specifically refers to top management is not clear; surely other levels in the organisation need to be involved as well. It is, though, essential to obtain top management involvement and commitment to focus attention on the matter.

Bryce (1987: 89) defines IRM as: "...the management of data, people and processes that produce information that serves a business or functional need". Lee (1987: 4), commenting on the article of Bryce in a letter to the editor, disagrees with him in that processes are not resources. He writes: "They [processes] are ways of using resources; and the fundamental resources of today include: Information, people, information technologies, money, and facilities".

The Director of the Office of Management and Budget of the United States describes information resources management as "...the planning, budgeting, organizing, directing, training, and control associated with government information. The term encompasses both information itself and the related resources, such as personnel, equipment, funds and technology" (Miller, 1985: 52735).

Another Miller (1988: 3) defines IRM as an "...umbrella term that includes the management of such information resources as computer hardware, software, communications, internal and external data bases, planning and review, as well as the integration of these resources for the support of managing information for the organization as a whole." This definition hence focuses strongly on the management of information technology with a reference to the existence of other resources.

The above definitions make reference to information resources. That raises the question of what information resources are.

When the term information resources is used, information is usually regarded as "stuff" (Wilson, 1985: 62). According to Wilson the most important information resource is people. It is natural for anyone who wants to know something, to first try asking someone else. He also points out that almost no organisation sets out to record its "knowledge holders" even though it is accepted that any newcomer to the organisation will spend "a great deal of time" to find out "who knows what".

Wilson (1985: 63) puts information resources into two main categories, namely internal resources and external resources, as follows:

Internal information resources:

- People - oral communication;
- Correspondence - mail, memoranda;
- Data, records, files (on activities/operations/personnel/etc.;
- Internal documentation (meeting papers, minutes, internal reports, etc.) and
- Graphic materials (maps, charts, diagrams, etc.).

External information resources

- People outside the organisation;
- Internal information resources of other organisations;
- "Published" information - books, journals, reports, government publications, statistical information;
- Mass media - news and
- Electronic databases and data banks (covering parts of both of the above items).

He points out that this list is not complete and concludes that information is a multi-media phenomenon because it involves sound (voice), numbers, text, pictures, moving pictures, graphics and more (Wilson, 1985: 63).

Horton (1979: 89) categorizes information resources into four groups, namely:

- Information sources (e.g. people, libraries);
- Information services (e.g. information bureaus);
- Information products (e.g. maps, cassettes, encyclopedias) and
- Information systems.

The information sources and systems are means-oriented, that is, they provide answers to the "where", "who" or "how" interrogatives, while the other two, information products and services are ends-oriented (the "what" interrogative). Horton warns that these categories overlap and that "...some ambiguity is virtually inevitable in the end" (Horton, 1979: 92).

Bryce (1987: 89) categorises information resources in three groups, namely, data, people and processes. Otten (1984: 22) defines information resources as "Everything that is involved in handling ...data and contributing to its use as information...".

Marchand *et al.* (1986: 71) define information resources as:

- Individuals;
- Information technology;
- Information facilities such as a library and
- Information providers.

It should be noted that Marchand includes information technology as an information resource. Information technology can, at most, be a storage medium or an information conduit. It will be shown later that information technology, like information systems and others, are all parts of the information infrastructure needed to facilitate the process.

The "resource" component in the phrase needs to be looked at in more detail. The American Heritage Dictionary and Electronic Thesaurus defines a resource (amongst others) as: "An available supply that can be drawn upon when needed." Burk and Horton (1988: 14) write: "A resource is something critical to achieving success and for which there is a real, potential or perceived shortage". Typical resources would be money/capital, people, equipment and supplies, land and buildings and energy. Information is placed alongside these by Burk and Horton. Identifying resources such as people and equipment is easy, but identifying the information resources of a business is not so easy as one could be dealing with something intangible. Context plays an important role in identifying any resource, but specifically with the information resource. What may be an information resource to one business, may not be a resource to another (Burk *et al.*, 1988: 26).

The question is: Can a process be classified as a resource? Lee (1987: 4) argues that a process cannot be a resource - it is a way of *using* resources. A process is a series of actions and steps and is usually applied to change something (a resource) into something else (a product). Tested against Burk and Horton's definition above, a process would qualify as "...something critical to achieve success" but would fail the second part "...and for which there is a ...shortage". It is difficult to see how processes can be in short supply, unless the absurd is considered such as no process being available to change air into gold. It can thus be concluded that a process cannot be classified as a resource.

The information resources can therefore be said to be the information products, information sources, information services, information technology and information systems. These are the resources which an individual or an organisation turn to when they needs information. It is important, though, to realise that these resources may not, in fact they will in all probability not, provide the answers to the information needs. They are, as the name says, still *resources* and they will have to be processed further in order to satisfy the needs. The process necessary for this transformation is the appropriation process where context and perspective are added. When this happens, data are transformed into information.

"Information Resources Management" therefore deals with the management of information resources and the management of the process of informing would, strictly speaking, have to be excluded from its ambit. The emphasis is on the resource side - the input side - and no reference is made in the term to the process dimension. IRM focuses on the management of the information sources, products, services, technology and systems. It does not focus on the process following the creation of the resources, that is, when appropriation and the addition of context and perspective take place. It further ignores the importance of knowledge and where it fits into the picture and that the ultimate aim should be not the creation or even the management of the information resources, but in their application.

The term "managing information as a resource" is also sometimes use in popular literature and language. It seems as if it is often used by businesses when they become aware of the importance of information and as a response, then want to manage information as a resource (Development Bank of Southern Africa, 1989: 4). The phrase "managing information as a resource" exhibits the same limitation as IRM, namely that the management of information is limited to the management of the resource dimension only. IRM and this phrase are therefore treated as synonyms for the purposes of this study.

4.3.2 Information management

Marchand (in Broadbent, 1984: 216) writes that the management of the information process has to do with "...how well the members of the organisation interact with the data resources and supporting technology for decision making and analytical purposes". Management of the other dimension of information management, namely, of data resources emphasises "...control of the physical manifestations of the organisation's information process". With reference to the views of Marchand, Broadbent (1984: 217) points out that the management of the data resources corresponds to the definition of information as a commodity while the management of the information process corresponds to the definition of information as a process of informing. This view supports the view of information-as-thing and information-as-process.

Woodman (1985: 98) describes information management (unscientifically, yet pragmatically) as: "...all about getting the right information, in the right form, to the right person, at the right cost, at the right time, in the right place, to take the right action". The *National Telecommunications and Information Administration* (in Drake, 1982: 227) has the same idea: "Information management not only deals with the need of individuals and organizations to convert data into information but it also deals with the problem of getting the right information to the right people at the right time and in the right form". These definitions highlight an important aspect, namely the information process in contrast to the definitions of IRM which focus on the resource side.

White (1985: 21) gives a "working definition" of information management as: "The efficient and effective coordination of information from internal and external sources". Arvel (in Levitan, 1982: 236) says that information management involves: "...the administration of all corporate information, of all manual and automated data, and of all methods used for the communication, manipulation and presentation of information used in the course of doing business". Wilkinson (1987: 275) writes: "...we can define information management as being concerned with the effective use of information in organisations".

Drake (1982: 227) writes that information management "focuses on the information needs of individuals and the delivery of a product to fulfil those needs". Again, the idea of a process is evident.

Levitan (1982: 227) enthusiastically states that information management "...can be viewed as the keystone of information science and technology". She then describes its activities as information systems design and development, document and knowledge representation, database organisation and the storage, retrieval, dissemination and marketing of information. Information management can be considered as a logical enhancement of management information systems (MIS), "... but goes beyond MIS to provide techniques for planning, budgeting, staffing, organizing, and directing the full spectrum of information resources in an organization" (Levitan, 1982: 228). Despite the promising statements she made at the start, it seems that, essentially, she limits information management to the management of information systems.

Cronin (1985: viii) writes the following on attempts to define information management: "There are as many definitions of information management as there are supporters of the concept. This is only to be expected. Definitions of information abound; definitions of management are many and varied. Put the two together and one has a recipe for terminological confusion". In an earlier article, Cronin (1984: 115) writes: "Information management is a chameleon term. [It requires] ...a willingness to apply an integrated or holistic approach to the management of an organisation's total information need."

Lewis (1986: 244), once a leading authority in Britain on the subject, apparently agrees with Cronin and Bailey when he writes about defining information management: "I believe there is no clear-cut and unambiguous definition". He then offers the following description: "IM [Information management] is the integrative management of a broad range of information/data/library, human, financial and technological resources, for the satisfaction of user need, in pursuit of improved effectiveness, increased profits, better services". Bailey (1984: 246), writing on information management after attending a conference on the topic, says: "To try and define 'information management' is to put it in a straight-jacket".

White (1985: 29) uses the term "information management" rather than "information resource management" because he feels that "the concept of a resource is implicit in management". He writes that he usually uses the term "information resource management" when he is talking to data processing professionals, "...who increasingly are adopting the title of Information Manager in an attempt to show their function in a better light". He notes that he would rather refer to them as Data Resource Managers instead of Information Resource Managers. This rather snub remark points to a real phenomenon, namely, that information management and IRM are very often just information technology management and information systems management in disguise. Sometimes the disguise is not even present.

Lundeberg (1995: 83) defines information management as a field as "...about persons' use of information technology in business processes". This definition limits information management severely by specifying "person", information technology" and "business processes".

The important themes coming through in most of the above definitions are the management of the "process" (Bryce, Marchand), "focusing on the needs" (Drake) and "satisfaction of user needs" (Lewis). These definitions therefore go wider than just management of the information resources. The focus is on the satisfying of information needs and this is done through a process and not by focusing on the resources side only. Satisfying information needs means management of the input, output and process, all integrated into a system.

The input side of the system is the tangible information resources (people, products, systems and services) whereas the output side is knowledge and information (intangible). The process is the transformation of the resources into products and takes place through appropriation, interpretation and adding context and perspective to the information resources.

It needs to be recognised at this point that the process is facilitated through the use of information technology, but also through libraries and even radio and television. These form the infrastructure or environment supporting the process. They must, of course, also be managed and forms part of the holistic view of information management. It is, however, extremely important to realise that information management is not the same as information technology management, information systems management or library management. The management of these entities is important in their own right and all are components of information management, but it must be understood that management of these entities alone will not result in information being managed. They are necessary for successful information management, but not sufficient.

4.3.3 Information management defined

Defining information management is not easily done. As was pointed out in chapter 2, definitions of information abound. Variations in the definitions of management are fewer but one can expect that the two terms put together will produce a fair number of variations, as confirmed by Cronin. The definitions of information management generally all boil down to the process of allocating the inputs (that is, resources) of an organisation by planning, organising, directing and controlling for the purpose of producing outputs desired by its customers so that the organisation's objectives are accomplished (Thierauf and Reynolds, 1982: 7).

It is clear from the definitions that information management is concerned with satisfying the need for information; be it an individual, a business or a nation. This is achieved through effective and efficient management of the information resources, but also of the equally important information process and the associated infrastructure. *Information management is defined as the cost-effective management of the information process, the information resources and the information infrastructure in pursuit of predetermined goals* . It can be seen from this definition that information management is seen as being wider and more-encompassing than, for instance, the definition proposed by Lundeberg (1995). Information management cannot be limited to an individual, technology and business.

Three important concepts are mentioned in this definition: Information resources, process and goals. The *resources* are the information products, services, systems and sources. The goals are the goals (e.g. of the business) and in order to achieve those goals, each individual must be equipped to contribute meaningfully. This contribution takes place through the use of *knowledge*. The *process* is therefore the transformation of information resources into knowledge. Whereas IRM focuses on the input side, information management, as defined here, focuses on the entire system: Input, process and output.

It must be stressed that information management does not end with the provision of information. It ends with that information to be transformed into knowledge but, equally importantly, for that knowledge to be applied to achieve a goal, that is, resulting in some action. Unless information and, by implication, knowledge are goal directed, it cannot be said that information has been managed effectively. That is to say: Information management is not putting a report on a manager's desk, nor is it manipulating data with a computer.

This definition can be applied to both individuals, to businesses or on a national basis. It was shown in chapter 3 that people are dependent on information just in the same way as businesses and nations are. Hence, the definition is therefore applicable to an individual, a business or a state. In the cases of a business and a state, the information resources must be optimally utilised so that the business goals and objectives are achieved. The aim of information management in a business sense is therefore to apply and utilise all the information resources at the disposal of the business so that the business objectives are achieved.

4.3.4 The management of information

Lastly, a crucial distinction must be made between information management and the management of information. In any organisation employees are allowed the use of resources within a certain policy and procedural framework. As such they then become responsible and accountable for their utilisation of the assigned resources. The responsibility to manage such resources is their's and no one else's, ie. a personal responsibility. The resources could be human resources, financial resources, equipment and material or information resources. The management of resources can therefore be said in the first instance to be the responsibility of each employee allowed the use of such resources. In terms of the information resources, the management thereof would be the responsibility of each employee using information.

Having said that, it is necessary in most organisations to have a central function for the facilitation and coordination of resources management. As such a human resources function (managed by the Human Resources Manager), a financial (resources) function (managed by the Financial Manager) and other functions are found in most organisations. The responsibility of the human resources manager is to formulate human resources policies and to ensure that they are applied, the recruitment and appointment functions, staff induction functions and so on. The financial manager has a policy formulating and coordinating role to play with regards to the financial resources of the organisation. Of course, the human resources manager and financial resources manager both have personal responsibilities for the management of the resources allocated to themselves, but, in addition to that, they also have an enterprise wide facilitating and coordinating function to fulfil. Resource management, therefore, is essentially providing a framework to the organisation for the effective and efficient decentralised management of resources.

Likewise, information management in an organisation is the responsibility of a certain individual or of a certain post. However, every single worker, from the lowest operator to the most senior manager has the task to utilise those information resources made available to him - the management of information. It is the task of a specific post, or posts singled out for this function, to facilitate the information process from start to finish, that is, someone in the organisation is assigned the responsibility to see to the effective and efficient utilisation of information by others. Information management is, therefore, a centralised responsibility whereas the management of information is a decentralised responsibility. Information management provides the framework for the management of information to happen.

Unless these responsibilities is understood, accepted and applied, there is little hope of successful information management or management of information.

4.4 The evolution of information management

Cronin (1984: 115) contends that information management is a result of the activities of the US Commission on Federal Paperwork although he admits that information management is not a new discipline. White (1985: 21) disagrees with people claiming that the birth of information management took place on the day on which the Paperwork Reduction Act was entered in the statute books of the USA in December 1980. This act was the result of many years' work by the Commission on Federal Paperwork, established in 1974. In 1977 the final report was published and concluded that "...the heavy burden of paperwork imposed on corporations and individuals by the Federal Government was attributable to a failure to recognise information as an asset and to manage it effectively" (White, 1985: 26).)

According to White (1985: 21), the information management concept is "...at least two thousand years old" but started off as "military intelligence". Vickers (1984: 246) seems to agree with this view: "The need for information management has always been there, long before computers arrived on the scene". To White (1985: 21), information management is the efficient and effective coordination of information from internal and external sources, and, according to him, military commanders have been doing that for centuries. "Most battles have been won not by brute strength of sheer technological superiority, but rather by the careful analysis of the strength and weaknesses of the enemy" (White, 1985: 21). He quotes several examples where effective use of information made a difference between defeat and victory. He concludes that information management is not new and that it is not a "...direct consequence of the 'information economy'" (White, 1985: 22). It is something all people do, some consciously and some without realising it.

Marchand and Kresslein (1988: 396) point out that the evolution of information management was "...dramatically different from the evolution of personnel or financial management". The personnel and financial management functions were not subject to the technological forces that served as external stimuli to shape the thinking and adapting of information management. As technology in the communication and information areas is constantly changing, the "...tools and strategies of information management are in constant transition, and they play a major role in influencing the objectives, scope, and organizational significance of the information management function" (Marchand and Kresslein, 1988: 396).

Marchand and Kresslein (1988: 402 - 404) identify four stages in the evolution of the information management function in the USA and more particularly in the Federal Government and its agencies. These phases are:

- *Stage 1: Physical control of Information.* This stage began "in the late 19th century and lasted until the late 1950's" (Marchand and Kresslein, 1988: 405). The basic technologies utilised were paper, the typewriter, filing cabinets, etc., while the strategic objective was procedural and physical efficiency. The management approach in this phase was paperwork management, records management, correspondence management, office design and layout and was carried out mainly by supervisory and lower middle management on a fragmented and loosely coordinated basis.

- *Stage 2: Management of Automated Technology.* This stage lasted from the 1960's to the mid-1970's and was characterised by the use of 2nd and 3rd generation computers, word processors, electronic duplicating machines, mostly "Technology searching for uses" (Marchand and Kresslein, 1988: 403). Strategic objectives during this phase were technical efficiency and control with the management approach being the emergence of centralised data processing departments, telecommunications managers and duplicating caters. The management was carried out mostly by middle management and was fragmented, uncoordinated and with the perception that manual management of information was different from automated management of information. A gap appeared between the users and suppliers of information technology.

- *Stage 3: Information Resources Management*. This stage lasted from the mid-1970's to the 1980's. During this phase technologies such as computer, telecommunications and office automation which were up to then developing separately, were beginning to converge. This convergence resulted in the strategic objectives becoming the integration of the information technologies and the view that information had to be treated as a strategic resource. The technologies utilised during this stage were distributed data processing, voice/data networks, multi-function workstations and personal computing with desktop and portable computers. The management function shifted to higher levels up to the lower senior management and entailed the application of traditional resource management principles to the information resource and the linkage between business planning and information resource planning (Marchand and Kresslein, 1988: 403).

  It was also during this phase that the report of the Commission on Federal Paperwork appeared (1977) and also the Paperwork Reduction Act (1980). The Commission which functioned from 1975 to 1977 "moved beyond the traditional emphasis of study commissions and legislative committees that heretofore had studied federal paperwork management" and "...for the first time, placed primary emphasis on the information within the document" (Marchand and Kresslein 1988: 409).

  The work done by the Commission and the Paperwork Reduction Act culminated in the issuance of its policy circular on the management of federal information resources by the Office of the Management and Budget (OMB) in 1985.

- *Stage 4: Knowledge Management*. This stage is anticipated by Marchand and Kresslein to happen in the 1990's. The technologies utilised will be expert or knowledge based systems, decision support systems and office intelligence systems with the precipitating forces being the increased dependence upon information technology making inroads into operational and managerial decision making at all levels. They envisage that managing knowledge resources becoming a "...basic part of general management philosophy ...adopted by all levels of management" (Marchand and Kresslein, 1988: 404).

Looking at conferences to track the evolution of information management, as early as 1966 a conference was held at Lehigh University in the USA with the title "Information management in Engineering Education" (White, 1985: 27). The proceedings of this conference showed a remarkable understanding of information management as it was seen later on. The first conference on information management in the United Kingdom took place in London in 1979. Although more than eighty delegates attended it, the next significant event in the UK only took place in 1982 with the event of the Information Technology Year (White, 1985: 31). Lewis (1986: 244) reported in 1986 that the following had taken place in Western Europe:

- The development of a curriculum at the European Institute of Information Management in Luxembourgh;

- The formation of a body called WERTID - the Western European Round Table on Information and Documentation - to which representatives from Belgium, the Federal Republic of Germany, France, the United Kingdom and the Netherlands belong.

He lists numerous activities in the USA and the UK indicating that the management of information was attracting a lot of attention and progressing to the point where University degrees were offered on a masters level (Lewis, 1986: 244 - 245).

Broadbent (1984: 217) contends that the management of information evolved from the coalescence of four interrelated factors, namely:

- the growing awareness and recognition of the importance of information to the individual and to the organisation;

- improved accessibility to the information resources of governments;

- the attempts, particularly by government to reduce paperwork; and

- the availability and convergence of information handling technologies.

Attempts over the past decade to professionalise information management have taken place with the emergence of numerous professional organisations (Levitan, 1982: 233). These organisations originated from the disciplines of information science, data processing and archives and records management. Levitan (1982: 233) lists the following associations in the USA dealing directly with information resources management:

- Associated Information Managers (AIM);
- Association for Federal Information Resources Management (AFFIRM);
- Association for Systems Management (ASM);
- Association of records Managers and Administrators, Inc. (ARMA);
- Society for Management Information Systems (SMIS).

A number of other organisations deal with IRM indirectly (e.g. Datamation). In addition, a number of journals appear with articles about the development of information management and IRM.

Information has been managed since the earliest days, even though perhaps not purposefully and consciously. The development of information technology provided a tool to mankind with which he could harness more and more data. Thus was born the concept of "processing data" and turning it into "information" by using information technology. This "information" was nothing more than data summarised and processed, but it was not yet information as it is defined in this study. Nevertheless, this emphasis on "information" and the ability of machines to manipulate information gave rise to IRM and information management and, indeed, to the concepts of the information economy and the information society. Information management is a by-product and a consequence of the information society. As the importance of information grew, the need to manage information was a logical consequence.

4.5 Characteristics of information management

4.5.1 The dimensions of information management

Cronin (1984: 115) identifies two dimensions for information management, namely, the management of the information process and the management of the data resources used by the organisation. Marchand (in Broadbent, 1984: 216) agrees with this view. The management of the data resources of an organisation is but one of the dimensions of information management; the other dimension being the management of the information process.

White (1985: 34) identifies three "components" of information management, namely:

- information resources, or the identification, assessment and use of internal and external resources;
- technology, or the methods of creating, storing, retrieving and distributing information; and
- management, involving strategic planning, human resource management, interpersonal communication, accounting, budgeting and marketing.

In chapter 2 it was shown that information itself has two main dimensions, namely, the resource dimension and the process dimension. The resource dimension included both tangible and intangible information (information-as-thing and information-as-knowledge). Information management would therefore logically also have these two dimensions, in line with the above viewpoints. The concept of IRM would not be able to include the process dimension as shown earlier on.

It must be realised that information management starts off with the data resource. This then gets transformed into information resources through a process of data manipulation. This first process can be done by either human or machine or, as it is mostly done, through a combination of the two. The next process is the transformation of the information resources into information and knowledge. This process involves only a human and is done through interpretation, appropriation of the information resources and by putting them into context and by adding perspective. These two processes do not take place in a vacuum but are strongly facilitated by the use of information technology, systems and libraries or archives, but also through training and education which add to a person's experience and knowledge. This infrastructure or environment is also integral to information management but it cannot be seen as another dimension. White, in the first definition, acknowledges the technology as a component rather than a dimension.

It can be concluded that information management has two dimensions: The resource dimension and the process dimension. The management of both these dimensions is facilitated by an information infrastructure; a supporting environment without which information management cannot take place.

4.5.2 Objectives of information management

Marchand (in Broadbent, 1984: 217) says that the aim of information management is: "...to promote individual (or group) effectiveness by enhancing the capabilities of the individual (or group) to cope with the demands of its internal and external environments in dynamic as well as stable conditions".

Drake (1982: 229) writes that the function of managing information is: "...to support the organization and its staff in achieving corporate goals". She suggests that the effectiveness of the information management effort can be evaluated by measuring the satisfaction level of the users.

Based on the work done by The Diebold Group, Inc., Levitan (1982: 237) lists the following as objectives for IRM:

- To establish an environment where only relevant information flows into corporate decisions. It should be noted that this objective clearly states that only the *relevant* information should flow into the decisions and not all information. Too much information leads to information overflow. This view implies a distinct selection process when collecting information;

- To establish and practice techniques whereby the cost of creating and collecting information can be compared with the benefits derived from its use;

- To effect changes in attitudes, policies and practices reflecting that information is viewed as a major asset of the organisation;

- To acquire information technology only after requirements have been analysed;

- To legitimize the role of the information manager;

- To prepare managers and workers for the implementation of the IRM program by providing training and education programs and career enhancements;

- To give users responsibility for their information production activities by including them in systems design, by charging them for the services they receive and by making them responsible for staff, facilities and other resources;

- To identify research and development opportunities aimed at improving ways in which information resources can be utilised to improve corporate decision making;

- To fix accountability for the efficient and effective acquisition and utilisation of information resources and the disposal of excess resources;

- To take the corporate information needs in doing business into consideration, such as making decisions about marketing strategies, plant locations, etc.

It can be concluded that the main objective of information management is to support the achievement of goals by facilitating the processes of transforming data into information and information into useful knowledge in a cost-effective way. This objective implies that information needs must be carefully analysed, that information rather that data be provided and obtained, that information must be treated as another valuable resource with a cost attached to it, that, if warranted, the facilitation of the process should be done by a person specifically assigned to it and, most importantly, to ensure that knowledge gained in the process is applied in support of goals. The objective applies to an individual, a business or on a national basis.

What is also important to note is that information management is a means to an end and not an end in itself. The danger of becoming an end in itself has been evident for many years when one looks at how the information infrastructure, for example, information technology or libraries, has been managed. These services have often been elevated to a stand-alone level which was not always in support or in line with business goals. Information management must be one hundred percent in line with business goals as the definition states.

4.5.3 The benefits of information management

Jonscher (in White, 1985: 24) concludes that improvements in the way information is handled by organisations will have a greater impact upon productivity than better and new techniques in manufacturing. In a survey done by the Wall Street Journal/Europe among a European panel of Chief Executives (White, 1985: 24) 98 percent out of 200 respondents indicated that they regarded improving information management as one of their top priorities.

Vickers (1985c: 157) lists the following possible benefits:

- Management information systems can be designed better by being better matched to management's needs and being designed by utilising skills from the data processing as well as information science disciplines;

- Information from the organisation's "corporate memory" can be accessed faster;

- External information sources can be utilised more effectively and economically;

- The information systems of the organisation will become integrated and accessible through common channels and devices;

- The use of the organisation's resources: People, equipment and sources, will become cost-effective.

Drake (1982: 227) points out that information management involves converting data into information. She contends that this approach adds value in the following ways:

- The value of the information centre output increases. Some information centres, e.g. public libraries, only provides data and not information, but information management changes that;

- By providing information rather that data, the (opportunity) cost associated with diverting the user's time away from his primary task, is saved;

- Productivity is increased.

Bryce (1987: 89) writes that information resource management "focuses on enhancing productivity within a corporation by taking a comprehensive view of systems development". Lee (1987: 4), commenting on the article by Bryce, writes that IRM "goes beyond productivity as an information systems objective to include strategic considerations".

Lewis (1985: 16) refers to a study done in 1982 by Hayes and Erickson at the University of California. Their study showed that there was a distinct relationship between the profitability of a company and its investment in information services. Lewis also feels that managing information properly leads to increases in productivity. The meaning of information management according to Lewis (1986: 244) states that it is "...for the satisfaction of user need, in pursuit of improved effectiveness, increased profits, better services". It can be deduced from this argument that the benefits of managing information would be improved effectiveness, resulting in increased profits and, in general, improved services to the users of information.

The main benefits that may be derived from the proper management of information will be an increase in productivity of people and improvements in the quality of decisions made as well as improved cost-effectiveness. These benefits will, in general, result in an improvement in profitability of the profit-oriented organisation. However, productivity improvement can not and must not be the ultimate benefit neither to the business nor to the individual. The business' or individual's greatest benefit must be to cope with its environment, whatever the environment may turn out to be. By making use of available information resources, the business or individual should be in a much more advantageous position to survive and prosper than without it.

Another benefit has to be empowerment. Neither citizens nor workers can be empowered without giving them the necessary information. If a person's knowledge is expanded (by giving him the necessary information), that person is better equipped to deal with situations at hand, be they work related or otherwise. Such a person has become more "knowledgeable" than before. Decisions taken by such a person will be of a higher quality (assuming rational decision making) and his actions will be more focused, resulting in higher productivity. The catch, however, is to get the person to apply such knowledge. It must be understood that by simply providing someone with the necessary information resources so that knowledge can be gained, the process is not completed yet. Unless the knowledge is applied in support of a goal or to result in some desired action, all that happened was an increase in a person's knowledge with no real benefits. (It is conceivable, though, that the goal could have been simply to gain knowledge with no real action following, but even this is still in accordance with a pre-determined goal.)

Productivity is the ratio of useful outputs to available inputs (Marx *et al.*, 1991: 304). An increase in productivity is therefore nothing but a better utilisation of inputs (resources). Increased productivity is not limited to increased output by humans, it applies to the other resources such as financial and natural resources. The bottom-line benefit of information management is therefore the improved utilisation of all the other resources. This is why Cronin (1985b: 137) and Carlson (1980: 6) claim that information conserves other resources. The way it achieves that, is to add to a person's knowledge through the provision of relevant data.

Another benefit of proper information management is that it contributes directly to the profitability of a business. The cheaper and more efficiently information can be obtained by any business, the more profitable such business has to be as it lowers the overheads (Prendergast in Norton, 1994: 28). Information management focuses on cost-effectiveness in terms of the information resources, information processes and the information infrastructure and, if successfully implemented, costs must be lowered.

4.5.4 Principles of information management

Information management must rest on a firm basis in order to be applied successfully. Unless these "pillars" are in place, information management will not be possible, or it will take place in a haphazard and fragmented way.

Meltzer (1981: 152) contends that information management is based upon the following doctrines:

- Information is the ultimate management resource. If one accepts that management is essentially the making of decisions and that information is essential for making sound decisions, then it follows that information has to be a very valuable management resource, if not the *ultimate* management resource. Francis Bacon (in Meltzer, 1981: 152) already coined the phrase: "Knowledge is power" in 1597 and by stating that, he introduced the idea that information is important. Spencer (in Meltzer, 1981: 150) writes: "The ability to convert business information to sound judgement is distinctively human. Even that intuitive, gut-level, 'sixth sense' that we sometimes call 'a good head for business' is actually the ability to assimilate and analyze information so quickly as to seem unconscious" while Meltzer himself writes: "A manager maintains authority by demonstrating his ability to put information to work". Keller (in Meltzer, 1981: 152) sums it up: "Without question, information is the essence of effective management".

- Information is a personal, organisational and national resource. Meltzer (1981: 152) points to the value of information as demonstrated in the buying and selling of information in the marketplace.

- Information is a basic human need. Humans need information to survive, e.g. what food is safe to eat (Meltzer, 1981: 153).

These "doctrines" as Meltzer calls them, were extensively argued in chapters 2 and 3.

Based upon these doctrines, Meltzer (1981: 153) lists 15 principles of information management, as follows:

- Utilisation of information. The efforts in the acquisition, processing and distribution of information are wasted if the information is not used to its best advantage. The information workers should be allowed "...to use information in innovative ways" (Meltzer, 1981: 154). This agrees with the argument put forward in section 4.3.3 where is was argued that it is only when information (resources) are put to use by converting it into knowledge so as to achieve goals when information becomes truly important.

- Access to information. Access to information must be encouraged and the efforts in obtaining the information minimized. It should be a fundamental right for people to have access to information, as was argued in chapter 3 (section 3.6.3; an Information Bill of Rights).

- Safeguarding of information. The rights of individuals and of the organisation must be protected as related to the acquisition of the information. A distinction must be drawn between what is needed to be known and what is wanted to be known. The latter should only be provided within the context of privacy considerations.

- Centralisation and decentralisation of information. Meltzer feels that the information source should be brought as close to the user of the information as possible. He therefore prefers decentralisation.

  It is assumed here that Meltzer means the *use* of information must be decentralised and not necessarily the management of it. Whilst it is every person's responsibility to manage (and use) the information available to him, proper information management also calls for a centralised management function from where the process is facilitated, planned, organised and so on; a point made earlier on.

Bringing information closer to the user of information is important. Not only does information enlighten a person, it also empowers him.

- Anticipating information. The needs for information should be anticipated rather than just reacted to. Specifically when time is of the essence, the needs should be anticipated, not only to provide the information but to know where to find it.

- Information format. The format in which the user wants the information is of vital importance. The format usually changes with the level of management under consideration. "Dumping of reams of computer printouts on managers' desks burdens the users with irrelevant information that hampers their jobs" (Meltzer, 1981: 155).

- Information and the manager's span of control. The use of information technology makes it possible for the manager to control a wider range of activities and more subordinates. This, in turn, improves communication resulting from a flatter organisation structure.

- Accepting information. There must be an open-mindedness towards new information; even if the new information contradicts prior decisions, opinions and beliefs.

- Information flow. Information must flow freely throughout the organisation and even to and from the outside. "Today all members must be aware of what is going on and how they should contribute to the overall goals of the company. Management must listen to the information provided by nonmanagement personnel, customers, and other groups outside the formal organization" (Meltzer, 1981: 155).

- Recognition of the information manager. It is necessary for the organisation to recognise the need for an information manager to manage the information management function. This manager "must be recognised as an integral part of the organisation" and he/she must have the support of top management.

- Information as an agent of change. Decisions are made on available information. As new information becomes available, the decision may be reinforced or possibly negated. New information on regulations and emerging or disappearing markets must therefore constantly be collected, analysed and distributed. Information can therefore assist in bringing about change in the sense that people's ideas about something may be changed thereby facilitating to break down resistance to change.

- Information and productivity. A workforce that is well informed is conducive to higher productivity levels.

- Information as a motivator. Making sure that workers are informed about what is expected by management, how the company does and about the mission and goals of the organisation, motivates them to achieve their set goals. Workers feel that they belong when fully informed and that helps to motivate them further.

- Information requires investments. In order to have up-to-date information, management must be willing to invest in capital and labour. Professional staff and state-of-the-art technology must be at hand to man and facilitate the information centre.

- Information requires management insight. "No matter how quantitative or clinical the information is, managers must still use their education, training, experience, and management insight to put information to work most effectively" (Meltzer, 1981: 156). Whilst managers use information in their jobs, the information is useless without managers with vision and insight to put the information to its best use.

Meltzer (1981: 153) warns that these principles should not be seen as if they are "...cast in concrete; to be effective, they must be flexible and adaptive to the needs of managers. They are not offered as an exhaustive, all-encompassing dictum of management conduct, but a suggested list of sound management practices".

Lewis (1988: 37) lists nine, what he calls "propositions" for the management of information:

- Information must be viewed as a basic social, economic and industrial resource.
- The sole purpose of information systems (not limited to electronic form) is for the satisfaction of a user need.
- Information has a cost, a price and a value.
- Information is defined such as to embrace all the forms by which knowledge is transferred.
- Technology must be seen as only a tool.
- New developments do not necessarily replace existing systems and procedures, but lead to incremental advances.
- Appropriate standardisation is essential to continuing development.
- Effective information management leads to significant changes in the power structure in the organisation.

- The information intermediary has a finite, but sometimes a very long, life-span.

He argues for two basic principles to be taken into consideration, namely, strategic thinking and integration. Strategic thinking reflects the need to look at the organisation as a whole and integration points to the need to take a holistic view of the totality of information management to the whole organisation. If these requirements are met and the propositions accepted by the organisation, it usually leads to the appointment of a "Chief Information Officer", on the same organisational level as the Chief Financial Officer and reporting to the Chief Executive (Lewis, 1988: 37). Cronin (1984: 115) also stresses the need for "...a willingness [by information managers] to apply an integrated and holistic approach to the organisation's total information needs."

Marchand and Kresslein (1988: 412) contend that a strategy is required to build bridges between the "building blocks", or areas of responsibility of information resources management. These "building blocks" are, in fact, the information resources. He therefore argues for a holistic approach taking the entire spectrum of information resources into consideration.

The management of these areas have generally developed "...in a haphazard and uncoordinated manner" (Marchand and Kresslein, 1988: 412) and can be seen as "islands", lacking bridges between them. To build the bridges, the following principles have to be kept in mind:

- Information is an organisational resource. Information is not a free good, but costly and valued, to be shared where appropriate.

- Accountability in the use of information resources and technology must be clear and consistent.

- Business planning and information resource planning must be closely linked. This principle leads to two basic conditions, namely, that "...both the visibility and credibility of the IRM function to be elevated to a level comparable with other resource management responsibilities" and that the IRM manager "...be involved in coordinating information resource planning with the basic plans" of the organisation (Marchand and Kresslein, 1988: 415).

- Integrated management of information technology is required. The focus should therefore be on the use and application of technology and not on the technology itself.

- Maximizing the quality, use and value of information in the organisation is a strategic objective.

Vickers (1985c: 152) lists the following, what he calls characteristics of information management:

- Information must be accepted as being a resource and should be managed like the other resources, such as money, manpower and material. This corresponds to the first principle of Meltzer.

- Someone must take responsibility for information management. This is a logical outflow from the first characteristic. Any resource needs proper management and if it is accepted that information is a resource, then it follows that it should be managed. This does not, however, mean that every organisation needs an information manager as such. Smaller organisations could combine this function with others but someone should have "...the responsibility and authority to manage the information resource, and they should be adequately trained to do this" (Vickers, 1985c: 153). The call for an information manager corresponds with that of Meltzer.

- Information management should at least entail planning and controlling of the use of information handling skills, information technology and information sources and stores.

  Vickers (1985c: 153) notes that information handling tasks today are "...scattered among information scientists, librarians, data processing personnel, systems designers, statisticians and records managers working in a variety of separate departments". He also points out that things have worsened with the introduction of cheap microcomputers.

- Expenditure on information systems and resources should be coordinated. Vickers (1985c: 154) contends that the information manager should control the budget for information management, but he acknowledges that organisations might find this difficult to accept.

- Information management entails keeping up to date on the latest developments, more specifically in the areas of technology and external information sources.

- Information flow within the organisation should be understood. The information manager must use methods for measuring and monitoring the flows within the organisation and evaluate their efficiency. Tools to do this are emerging (Vickers, 1985c: 154).

It can be said in conclusion that the principles on which information management is based, are as follows:

- Information is a special and very valuable management, organisational, personal and national resource. This statement can be made without any fear of contradiction because no human being, no organisation (profit-oriented or non-profit-oriented) and no state can survive without information. Being such a valuable resource, it follows logically that it must be managed properly.

- Organisations, having accepted the first principle, must assign responsibility within the organisation for the management of its information. This responsibility must, firstly, be the (centralised) planning, organising, leading and controlling of the data and information resources and the management of the process of transforming data and information resources into knowledge. Secondly, each worker must have the (decentralised) responsibility for the management of the information resources allocated to them within the centralised information management framework.

- Information management calls for an holistic approach; taking data and information resources, the information process as well as the information infrastructure into consideration and a fundamental understanding of where each one of these components fit into the overall information management scheme. Most importantly, the reason for and purpose of information management must be understood, namely, that data, information and knowledge all stand in support of an overarching achievement of a goal; regardless whether that goal is on a personal, organisational or national level.

- Information management takes cognisance of the fact that data have a cost and information a value. Hence, cost-effectiveness of the information management function is paramount.

4.6 Implementing information management

Once an organisation has accepted the principles of information management, it should be put into practice. To introduce information management effectively in an organisation, Vickers (1985c: 159) suggests that the following changes might have to take place :

- People's attitudes might have to change in terms of their views towards information and information systems. (The principles of marketing management will apply well in this regard);

- Systems and procedures might have to be changed;

- Information media might have to change;

- The organisation itself might have to change; especially its structure;

- Management might have to change.

Peterson (in Levitan, 1982: 239) recommends the following steps in introducing information management into an organisation:

- Establishing a management philosophy covering the objectives and utility of corporate information resources;

- Identification of all the functional groups that are involved in information processing;

- Determination of the interfaces and information flow between these groups;

- Preparation of a set of coordinated objectives for each group so as to eliminate unnecessary duplication, overlap and blocked communication;

- Ensuring the cost-effective functioning of each group by measuring performance.

The Diebold Group, Inc. (in Levitan, 1982: 240) recommends three approaches to effective information management implementation:

- Establishing of the IRM SWAT (Special Weapons and Tactics) team. This team would be interdisciplinary and would convene when major decisions regarding system upgrades or acquisitions, office automation or other information technology-related projects must be initiated;

- Directing the consciousness of top management to the electronic information environment;

- Selectively disseminating information for middle managers and key professionals.

Marchand and Kresslein (1988: 416) acknowledge that different organisations will implement information resource management differently as objectives, operations, the management style, current and projected uses and investment in information technology differ from company to company. The departure point, pace of implementation and the migration will also differ. They suggest six different scenarios as reasons for wanting to implement information resource management, as follows:

- Management wants information management. According to Marchand and Kresslein the management of many organisations realise the value of true information management. Many big-name companies "...are adopting information resources management as part of their competitive strategy" (Marchand and Kresslein, 1988: 416). Other companies, such as banks, are forced to do it as their businesses have become heavily dependant on information services for survival. In the US Federal Government, laws are forcing agencies to adopt information management.

- Proliferation and rising costs of information technology. Upwards spiralling costs of information technology, telecommunications and office automation sparked senior management to question the cost effectiveness of their investments and the appropriateness of Data Processing and of other business units.

- Office automation requires information resource management. The effective implementation of office automation "...requires an interdisciplinary expertise approach to the information management problems of the office" (Marchand and Kresslein, 1988: 417). Information resources management offers a means for introducing and using office automation.

- Distributed data processing begs information resource management. As end-users are asking for and accepting more responsibility for the use of computers in their organisational units "...a corresponding pressure emerges to redefine the responsibilities of the organization" (Marchand and Kresslein, 1988: 417). Information resources management offers a means to accomplish this.

- Introduce information management, but don't call it what it is. This can hardly be called a reason for information management, but may be a good strategy when contemplating the introduction of information management. Such an approach may be due to political or cultural aspects.

- Prestigious or authoritative groups are recommending information resource management. This can be called the "wait-and-see" approach. Some managers do not want to be on the "bleeding edge" of change and wait until it is clear which organisations are recommending the implementation and which organisations are accepting it. In other words, should prestigious consulting firms, such as the John Diebold Group, or Booz, Allen and Hamilton advocate information resource management, they might be prepared to implement it in their organisations (Marchand and Kresslein, 1988: 417).

Marchand and Kresslein (1988: 418) identify three distinct phases through which organisations as a general rule go through when implementing information resource management.

- Integration of information technology management responsibilities. Most organisations have more than one unit or department performing some aspect of information management, such as data processing, telecommunications, office automation as well as library services. Many times the planning, procurement and operations are not coordinated within the organisational structure and leads to fragmentation and no-one having overall responsibility for the information management problems.

  The first step usually involves the development of a charter and a strategic plan for the organisation regarding information resource management. The second step is a logical result of the first with the realigning of the organisational structure "...to identify and integrate responsibilities for IRM" (Marchand and Kresslein, 1988: 418). The next step will be for senior management to make the organisation aware of the information management idea.

- Emphasis on user support tools and needs. During this stage maximum advantage is taken of end user support tools in using information technology. The DP or MIS department is now actively assisting end users "...in getting easy and timely access to corporate data bases" (Marchand and Kresslein, 1988: 420).

  When this stage is reached, users have become convinced that information is a valuable corporate resource and are making increased demands to get access to computer resources within the organisation. This, in turn, places pressure on senior managers to develop plans for integrating information technology into the strategies of the organisation.

- Emphasis on information use and content. During the third phase users are made aware of the use and value of information "...in enhancing individual and organizational productivity" (Marchand and Kresslein, 1988: 421). This stage thus also introduces knowledge management where "...senior managers are concerned about developing and optimizing the use of data and information in the organization to maximize productivity, and at least in the business sector, profitability and growth" (Marchand and Kresslein, 1988: 422).

In conclusion it can be said that the implementation of information management will vary from one organisation to the other, depending on the kind of organisation, its culture and its management style, but will in all probability include the following steps:

- Establishment of a management philosophy and policy for the organisation. This could be done by an interdisciplinary team.

- Identification of the functional units involved in information handling and determining the interfaces and flow of information between them. This may mean that the organisational structure must change to accommodate the information management department (in larger organisations).

- Preparation of objectives, systems and procedures for the different units, ensuring their cost-effective functioning and measuring their performance.

4.7 Factors constraining information management in organisations

Woodman (1985: 98) lists the following factors which constrain information management in most large organisations:

- People do not know what they need. Woodman observes that the more senior a person in a large organisation is, the less his/her information needs can be predicted. They only know what information they need once a certain set of circumstances arose and then they "want specific information instantly" (Woodman, 1985: 98).

The typical reaction to this need is to store every element of data that may be relevant to the organisation, but the costs makes this an unviable option.

- Information is not readily accessible. Data and information sources are not stored in one physical form. It can be on paper, microfilm, magnetic tape or disk, optical disk, or even in people's heads. To complicate this, it is also held in different degrees of updatedness, with differing accuracy, with differing degrees of secrecy and communicated in different languages (Woodman, 1985: 98). Data are increasingly being kept in machine-readable form and computers are linked by means of national and local networks, but often lack of standardisation proves to be a problem even though data are in machine-readable form.

  In order to obtain the right information for the user, this lack of order and discipline mean that "people have to depend on human memory and ingenuity to pull together all the relevant elements of raw data" (Woodman, 1985: 98).

- Misinterpretation of information. To get an idea (information, knowledge) from one person to the next, language is needed. As was pointed out in chapter 3, language can quite often be ambiguous, even more so when information resources are produced by means of a computer where it lacks context. In conversation, context can usually be resolved (through a hermeneutic process), but not always in the case of written reports or books.

  Woodman (1985: 99) points out that "pseudo-officialdom" occurs where people who receive computer printouts tend to believe the information just because it was produced by computer. With the advent of the personal computer, it became possible for everyone to produce such an official-looking report.

- Information "overload". The computer and the photocopier are excellent producers of paper. Woodman (1985: 99) tells of a large organisation which found that 40 copies were made of each piece of paper by workers, "of which 15 were kept indefinitely". Another organisation calculated that it "printed 500 sheets of paper per employee per day" (Woodman, 1985: 99).

  It is an open question how much notice people take of all these pages of photocopies and printouts and what the true costs of producing, filing, and retrieving are. The manpower needed to undertake these actions of creating, storing, moving, reading, indexing and disposing it, is seldom known to organisations (Woodman, 1985: 100).

- Politics and power. As pointed out in chapter two, possessing the right information can put someone in a more powerful position relative to others. It is not uncommon for people to guard this kind of information jealously. People become used to the flow of information in the organisation and each one earns his place by having certain information. This establishes the "pecking order". Breaking open these niches of information is "one of the most difficult jobs" (Woodman, 1985: 100).

  This issue was dealt with extensively in chapter 3 (information and power and information and organisational politics).

- Organisational inertia. When it is needed to change the information flow in the organisation, it is necessary to make people see something beneficial to them for the change to be successful. People normally experience change as uncomfortable and it is therefore a prerequisite to a change of the information flow that the people involved recognise the need for the change.

  Woodman (1985: 100) notes that it is often the data processing department who might have this organisational inertia. Systems professionals might tend to prefer the design techniques they have acquired earlier on rather than taking advantage of the state-of-the-art information technologies.

- Ownership is often ambiguous. The right of ownership is often ambiguous when information is shared between many departments and especially if the information is held in a computer. Each user claims exclusively the right to update it, create it and the right to decide who else might be allowed access to it. Conflict might arise if these ambiguities are not resolved.

  Systems designers face the danger of compromising in such a situation. This compromise usually depends on the politics, power and organisational inertia. This "...extends information management beyond the association of logic and data to include organisational behaviour as well" and "...is unlikely to be in the best interest of the organisation as a whole" (Woodman, 1985: 101).

- Information "float". Information "float" is "...the time-lag between an event occurring and the information that it has occurred reaching the person who needs to know about it in order to take some action" (Woodman, 1985: 101). The smaller the "float" the better informed the organisation.

  Telecommunication networks, using satellite technology, has a radical impact on organisations by drastically reducing the "float".

- Legislation and external pressures. Privacy legislation is in various stages of introduction in various countries as a result of an increasing awareness on the part of individuals and organisations on their rights. Transborder data flow is also receiving attention. Countries, such as Canada and the Scandinavian countries, are thinking of taxing data similar to goods when it passes over their borders. This prevents the free flow of information across national borders (Woodman, 1985: 101).

- Information value is intangible. Although it is possible to determine the value of information in a quantitative way, information also has a intangible value. Often this intangible value is far greater than the quantifiable value. Unless a quantified business case can be presented to management, business leaders find it hard to invest in information management.

- Cognitive styles of users. "Individual people have different preferences for the form in which information is presented" (Woodman, 1985: 102). Some prefer text, some graphs, some pictures, some numerical analyses, etc. The information systems, whether computerised or otherwise, seldom make provision for each and every preference. This leads to a constraint from achieving ideal information management.

Marchand and Kresslein (1988: 428) also warn that the introduction of information resource management into the organisation will, like the introduction of any new management strategy, most probably encounter constraints. They list the following interdependent and overlapping constraints:

- Conceptual constraints. Two ideas about information might be encountered. The first is that information is not manageable because of its (partly) intangible nature. The counter argument is that management have always been trying to manage at least the tangible information resources for many years. Also, when financial and human resources management were introduced at first, it encountered the same misgivings (Marchand and Kresslein, 1988: 429).

  The second argument is that information resource management will lead to information manipulation and excessive control with the resulting stifling of creativity and even the threat to the privacy rights of the individual. The counter argument is that the current situation is more likely to cause this than an attempt to manage information as a resource. Proper information management must prevent abuse. They acknowledge that misuse may occur even with information resource management in place as it depends on the values and perspectives of the people advocating the change. "The real problem is trying to balance these inherent risks in managing information with the benefits. Information resource management as a management strategy does not ignore or try to overlook the risks, nor does it overstate the benefits" (Marchand and Kresslein, 1988: 430).

- Methodological constraints. This constraint is usually found in the government circles. Government executives need information to formulate policies and operate service programs and argue that the value of this information cannot be measured in economic terms.

  The counter argument is that information resources management acknowledges the importance of applying non-economic criteria in placing a value on information. Information resource management at least provides the opportunity to apply cost criteria to the evaluation of information and represents a better alternative to the "free good" approach. Marchand and Kresslein (1988: 431) acknowledge that, whilst tools for accurate valuation of information use are very limited, this does not warrant to completely discard the management of information.

- Political constraints. Because information provides people with a power base, people may not want to give up the current information handling procedures and thus corroding their power base. "Data processing personnel, for example, may regard IRM as a threat to the existing ways of operating computing facilities..." (Marchand and Kresslein, 1988: 431).

- Structural and functional constraints. Information resources management as a management discipline is still in its infancy and will therefore be in "constant flux" (Marchand and Kresslein, 1988: 431). The organisation should move forward carefully and well-planned.

- Legal constraints. In some countries laws control the management and use of information resources. This could limit the organisation in its use of information (Marchand and Kresslein, 1988: 431 - 432).

- Fiscal constraints. One of the objectives of information management is to bring the information technology costs under control, but implementing information management may need financial resources. Where organisations have fiscal constraints, the implementation may be constrained (Marchand and Kresslein, 1988: 432).

- People constraints. It is natural that people might resist the change to information management. Implementing information management will in all probability mean that the job descriptions of certain posts will change. To some this will be a welcome change, but (like with most change processes) some people might resist such change (Marchand and Kresslein, 1988: 432 - 433).

It is clear that information management will not happen unless a conscious effort is put into making it happen. The question is: What is absolutely necessary to get right in order to succeed with information management? Marchand and Kresslein (1988: 433) list the following critical success factors for implementing information resources management:

- Understanding the business environment. Senior managers mostly do not have a good understanding of how the business is supported by the use of information resources. It is, however, of the utmost importance for these managers to be aware of and to fully understand how the information resources contribute to the success of the organisation as well as to know of the opportunities for the improvement of the effectiveness and productivity of the organisation.

- Treat information resources management as a management issue and not a technical one. The emphasis should be on the management side of information and not only on the technical side. Marchand and Kresslein (1988: 433) warn that people, and particularly data processing people, should not see information resources management as just another term for data processing or MIS.

- Implementing information resource management requires a long term strategy. "Quick results" and technical fixes" should not be the only concern. Proper information resource management "...will require long-term strategies of organizational adjustment, coupled with short-term milestones for dealing with pressing information problems or technological decisions" (Marchand and Kresslein, 1988: 434).

- Information resource management strategies should be attuned to the political, economic, and management concerns of the organisation's leadership. "Since IRM is by definition a top-down approach to information management, its introduction and implementation ...requires sensitivity to the ...political culture, fiscal condition, and management style" (Marchand and Kresslein, 1988: 434).

- Information resources management must be implemented incrementally and not all at once. It is unrealistic to address and resolve issues in all the affected areas at once. Marchand and Kresslein (1988: 434) suggest a phased approach, based on the priorities within the organisation. Although different organisations may have the same objectives for information resources management, the sequencing of their action steps may differ.

- Implementation requires early attention to the administrative changes that may be needed. People may have to be moved and retrained or new people may have to be hired. All these steps take time and have to be completed before new tasks can be assumed (Marchand and Kresslein, 1988: 435).

- Implementation requires consistency in executive leadership. The implementation of information resource management can take from three to five years, frequent changes in the executive leadership will probably result in inconsistent behaviour in objectives and plans. During these years it is therefore important for the executive team to be consistent and stable (Marchand and Kresslein, 1988: 435).

Introducing and implementing information management in organisation or national context is not going to happen easily. Many factors contribute to prevent it from happening and pitfalls are plenty. The mere fact that one is dealing with something which could be very intangible such as knowledge, makes it difficult to get top management to "buy in" or, even more so, to allocate financial resources to it.

In order to have any chance of success or a degree of success, it is essential to treat information management as a management issue and not as a technical one. The fact that it is supported by an infrastructure consisting of, amongst others, information technology, is incidental and so is the fact that, in many cases, the idea of information management would come from the information technology side of the organisation. These facts do not make it a technical issue. Information management is a business issue and should never be allowed to be high-jacked by information technologists or librarians for the sake of those disciplines.

4.8 The consequences of the mismanagement of information

It appears that information management with respect to organisations and on a national level is necessary. This leads to the question of what happens if information is not properly managed? Are there any grave consequences if we carry on like we have been doing for many centuries? Horton (1979: 47) offers the following consequences as the result of the failure of an organisation "...to treat data and information formally as a manageable resource":

- People higher up in the organisation constantly "burden" the workers lower down the organisation with excessive demands for information;

- The cost of handling information and paper-work increases to the frustration of top management, the board and the stockholders;

- Because requirements for data are not coordinated between divisions and departments, duplication and overlap results;

- The credibility of the organisation is questioned by stockholders and customers because similar facts are collected by different departments and divisions and information issued by these departments and divisions is not always consistent;

- The formal and informal communications channels of the organisation are clogged by irrelevant data which cannot be separated;

- Poor information leads to poor decisions with the result that the organisation assumes unnecessary risks and loses opportunity;

Vickers (1984: 246) agrees with Horton and notes that without proper information management the danger exists that information systems become compartmentalised. He proves his point by quoting several examples where this has happened in organisations.

It is true that we have been managing businesses for centuries without any form of formal information management. During that time thousands of businesses have been very successful. Governments have successfully led many nations without it. Yet, it would seem that the situation is changing. During the late nineteen-seventies the United States realised that their "paperwork" was getting totally out of control. This led to the Paperwork Reduction Bill (1980) in an attempt to rationalise the hundreds of data bases being created and duplicated and the burden the state was putting on its citizens. This was a direct attempt to manage information.

On the business front, decision makers are confronted with situations where they need information from many and varied sources so as to effectively take such decisions. "Act globally" has become the catchword. Businesses are "outsmarting" each other through creative and innovative ways of utilising information available to most. Gone are the days where only a little information is needed to manage not only the big corporations, but also the smaller, more specialised business. The "cottage" industry, if it should ever become a factor, will need information about the market, the players and the competition in order to survive. Rising costs of uncontrolled use of information and paper will force organisations to take a second look at how they utilise information.

Information cannot be left to itself any longer. It needs to be managed as a valuable resource and process.

4.9 The practice of information management

A lot is being said and written about information management. The question, however, remains: Is it being practised?

White (1985: 34) feels that real information management is not yet widely accepted and practised in the United Kingdom and writes: "The majority of UK executives seem still to live in a land where 'information management' is the combination of an IBM PC and Lotus 1-2-3!". Vickers (1984: 245) writes the following on definitions of information management: "...it would be more true to say that several kinds of information management have arrived at the same time. A certain amount of confusion reigns as various professional groups try to attract favour for their own particular brand of IM. The librarians and the information scientists, the information technologists, the computer experts and the record managers - all have their own views".

It is interesting to note how books having the title "Information Management" or "Information Resources Management" vary in their contents. The book by Hussain and Hussain (1984: ix - xiii) has the title *"Information Resources Management"*, but contains detailed discussions of computer resources, their acquisition, system development, etc. A book with the title *"Information Management: The strategic dimension"* edited by Earl (1988: vii - viii) concerns itself with six sections, each describing an aspect of information technology management. One can conclude that, in their opinion, the management of information technology is equivalent to information resource management. Many other books show the same tendency. Some devote the entire book to information technology matters while others have most of the book devoted to it.

The tendency of writers to equate the management of information technology with information management must be seen as a severe limitation to the concept of information management. Information resource management, or information management for short, has to do with the management of all of the information resources and, whilst it is acknowledged that information technology plays a major part in information management, it is definitely not limited to information technology alone.

The term "information management" is often misused. White (1985: 27) quotes the example where advertisements for computer systems analysts and programmers were placed under the banner of information management in the 1984 "Sunday Times". Horton (1979: 49) seems to agree with this and warns that information management is not the same as information manipulation. He writes that people might view information management as "... a return to the Orwellian 'big brain' idea" whereby people are manipulated as a result of information which is held on individuals by "Big Brother". He lists the following as not being information management:

- Theft of information (bugging of telephones and offices);
- Distortion of information;
- Fabrication of information (forging);
- Misuse of information;
- Misrepresentation of information (lies);
- Concealment of information ("hush" money);
- Suppression of information (keeping the lid on investigations) (Horton, 1979: 49).

Judging from the literature, one feels that the concept is often not understood in the terms it was defined in this work. Talk to someone from the computer industry and most will understand the term to mean the management of information technology. Talk to a librarian and he would probably understand it to be the management of a library. On the practical side, it is therefore difficult to make a judgement as to the state of information management. An educated guess would be that information management is not practised as is proposed in this thesis.

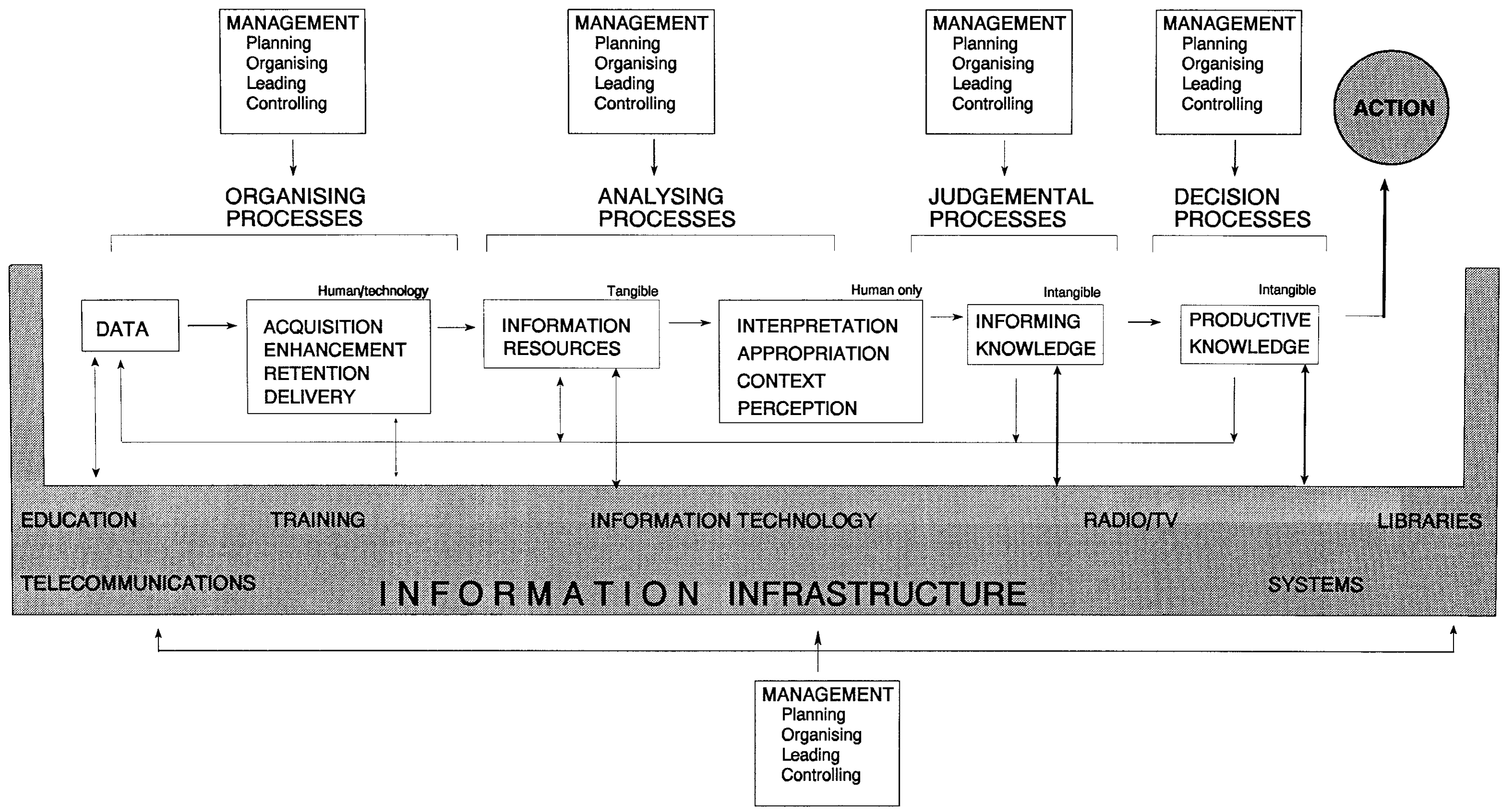
4.10 A model for information management

Having defined information management and its characteristics, a model can be built to show the relationships between the different components of the system. This is diagrammatically shown in figure 4.1.

The process starts off with data as the primary input. Data can be anything the senses perceive: Figures or words on a piece of paper, a painting, a piano recital or pain when touching a hot stove. Data are transformed into

Figure 4.1

THE INFORMATION MANAGEMENT MODEL



information resources (information-as-thing) through a process. This process can be summarised as acquisition, enhancement, retention and delivery. These steps do not all have to be present, but it still remains a process. This process furthermore can be done through technological means, for instance, a computer program to summarise raw data into logically grouped data. The end result can be called an information resource. This is not information yet: Data must first be put into context and perspective - meaning must be added - before it becomes information and that always involves the human mind. Structured data are not information, as we are reminded by Boland (1987: 371).

Information resources are information products, services, sources, information technology and information systems. People are also seen as information resources because they are the "carriers" of knowledge and information in intangible form. In terms of the model, information technology and information systems have been made part of the information infrastructure rather than information resources. The reason for that is that these are information resources used to manipulate data; information *handling* or *processing* resources, in other words.

These information resources become input for the next process, namely the process of transforming the information resources into information. This takes place through interpretation and appropriation of data from the information resources and the addition of context and perspective. This second process can only be done by a human as only a human being can add meaning. No machine can do this, although it is acknowledged that a machine, as part of the infrastructure, can make it easier for the human to perform the process. The product at the output side is information in the mind of a human. Should this information be added to the human's existing knowledge, like adding pieces of a puzzle, knowledge is created.

Up to this point the processes have not added any value except, perhaps, by adding to a person's knowledge. This kind of knowledge is called "informing" knowledge by Taylor (1986: 6). Should such a person apply the knowledge gained in the process towards some goal, either personal, business or nationally directed, value is being added in a general sense. Taylor calls this "productive" knowledge. The ultimate aim of information management is to apply the basic resource, data, to attain some goal or to cause some action.

The knowledge gained by a person (intangible) may also be transformed back into data or as an information resource (tangible). The process is therefore reversible, but also iterative. An example of such reversal would be a person writing a book or an article. The knowledge in his head in its intangible form, is thereby transformed into an information resource in a tangible form. This resource could then become input for a second person thereby to be transformed into information or knowledge for the second person. Transforming knowledge into data is also possible: To a person seeing another person running down the stairs instead of using the elevator, may be totally meaningless. Such a person recognises that the person is running down the stairs, thereby acknowledging the fact that he is doing so, but because it has no meaning to him, it remains data. The person doing the running, on the other hand, may be doing so because he knows (i.e. he has the knowledge) that there is a fire in the building and that using the stairs would be risking the elevator getting stuck.

This transformation of knowledge into information and data is a very important concept for, *inter alia,* information systems development, as pointed out by Dahlbom and Mathiassen (1993: 29 *et seq.*) Describing a manual process or practice in writing means transforming knowledge into information and information into data, but it is not always easy: "We have no idea how we do a lot of things that we know how to do" (Dahlbom and Mathiassen, 1993: 33). Be it as it may, the model clearly shows the forward transformation and the reversal.

It is important to realise that these processes do not take place in a vacuum. An environment or infrastructure is needed to support the processes. This environment consists of information technology and systems (including telecommunications technology), libraries (a store for information sources such as books and services) and education and training. The latter two add to a person's knowledge base. This environment is integral to the process, but from a supporting point of view.

Where does management come into the picture? Management is necessary for the two processes, but also for the infrastructure and for the resources. In practice this means that the management of, for instance, information technology, is necessary and important, but the aim is to facilitate and not to dominate. The aim is to achieve the goal through the application of the knowledge in the person's mind. This shows why management of a library or information technology, or the management of information systems development cannot be equated with information management. Management of these functions focuses on a component of information management and even though management of these functions is *necessary*, it is not *sufficient* for information management.

Management of the first process - acquisition, enhancement, etc. - is usually not too difficult, provided that the needed data are readily available. Data are transformed in this process into some product or service, therefore something tangible (product) or measurable (service). However, the second process, the human process of appropriation, is far more difficult. How does one manage the process of knowledge creation?

Firstly, the organisation needs to realise and acknowledge that knowledge is a valuable asset - accepting the concept of human or intellectual capital. Secondly, acknowledging it means that it must be treated like any other asset of the organisation, taking the differences into consideration. "Managing know-how is not like managing cash or buildings, yet intellectual investments need to be treated every bit as painstakingly" (Stewart, 1991: 43). Once the intellectual assets have been identified, the intellectual needs need to be matched with the organisation's strategic plans. If the marketplace is changing and there is a need for other skills and knowledge, it must be found. It is of paramount importance that the knowledge present in any company is mobilised and not just present. It needs to be put in action. "intellectual capital is useless unless it moves. It is no good having some guy who is very wise and sits alone in a room" (Macdonald in Stewart, 1991: 60).

Information Resources Management (IRM), in terms of the definition earlier on in this chapter, can clearly be seen in the model as only a subset of the total model. It covers the management of the first process (transformation of data into information resources) and the management of the information infrastructure. Information management, on the other hand, looks at the total picture and concerns itself with the important matter of how the information resources are being utilised to achieve some goal. Unless the information resources are being used meaningfully, very little of value, if anything, has been achieved.

It is also important to see from the model that the first process as well as the information infrastructure are the high cost elements in the model. Acquiring and manipulating data into information resources invariably has a significant cost implication. The second process involves the human mind and even thought time can also be measured in monetary terms, such cost will in all probability be less than the cost involved in the first process. The real value, on the other hand, lies definitely on the output side, namely, when the knowledge gained by the individual is applied to some goal. It follows therefore, that, should the process not be followed through until the goal stage, little value is gained and what is more, it is gained at great cost.

Analysis of figure 4.1 shows why effective management of information technology or information systems, or even IRM, would not be considered successful information management. If information is to be managed successfully, the entire model must be taken into account and not only parts of it. The infrastructure (technology, systems, training, education etc.) must most certainly be in place as a necessary condition, but the process, data and information resources and the achievement of goals must also be managed. Failure to recognise this, would mean failing to manage information.

The information management model is applicable to both the individual and organisation (business or otherwise). In the case of the individual the processes and management are less formal and the resources are fewer than in the case of organisations. Even in the case of organisations, the extent of the processes and resources will vary greatly, depending on the nature of the organisation and its size. Nevertheless, the model is generically applicable.

The model takes into consideration what was chosen in chapter 1 as a point of departure with respect to society and social change. The radical humanistic paradigm was chosen as the most appropriate. The model certainly treats the human as prominent; in fact, as the most prominent component of all. Subjectivity is evident throughout the model. Even though machines can assist in the process, machines are not absolutely essential. It is the human who enables and who makes it happen.

The model is also radical to a large degree. Ever since the industrial age the perception grew that machines could take over from the human. For decades it was believed that machines could be produced that would render the human almost useless and unnecessary. The model contradicts that proposition in a radical way. It proposes exactly the opposite, namely, that only humans can make information management happen. Implementing information management the way the model proposes means that the human must once again be recognised as the main cog - as the driving force of the organisation. The model acknowledges that machines can play a supportive role, but it also shows that they can never be more than just that.

The model is also radical in the sense that it calls for elements of the business to be managed holistically. It calls for an end to fragmentation, yet for empowerment of the people. It calls for a view of information that spans the entire organisation and means that barriers that exist between business units, such as the library and computer departments, be broken down. This is not going to be easy for obvious reasons.

The information management model therefore fits well into the radical humanistic paradigm.

4.11 Conclusion

The term "Information Management" (IM) has become part of the business vocabulary. Another term, "Information Resources Management" (IRM) made its appearance for a while and then fell into disuse, having been surpassed by the shorter "Information Management". The implication locked in the concept is clear, namely, that information (or at least, the information resources) ought to be managed.

Although the two terms are often used synonymously, careful analysis show differences between them. IRM has a strong reference to the resource side and apparently ignores the process side. It could be implied by the term that information must either be managed as a resource, or that information is a resource, or both. The fact that it *should* be managed as a resource, still does not necessarily mean that is *has* to be resource. In fact, it could indicate that, even though it is *not* a resource, it *should* be managed as one.

The term "Information Management" on the other hand does not have the implication of a information being a resource, but it does not exclude it either. It therefore allows for a wider interpretation, obviously including the resource concept. It encompasses IRM. IRM is therefore a subset of information management.

It was argued in this chapter that IRM means the management of the information resources. These resources are herein defined as the information products, information sources, information systems and information services. The necessary information infrastructure usually needed to transform data into information resources, would be included in the definition of information resources. The fact that one is dealing with resources, implies that one is dealing with the input side of a system.

Information Management, on the other hand, is argued to go beyond the input side and includes the process and output side of the whole system. Information was shown to have essentially two dimensions, a resource dimension and a process dimension. IM includes both these dimensions. Information management, therefore, is defined as the cost-effective management of the information process, the information resources and the information infrastructure in pursuit of predetermined goals. It is clear from this definition that the input side (the resource), the process and the output side (predetermined goals) are all included. This is done on purpose: IM is a holistic concept and should definitely not be watered down to anything less.

Another subtle differentiation should be made between the terms "Information Management" and "the management of information". The difference lies in responsibilities. In organisational terms each and every worker dealing with information in some form or the other, has the responsibility to manage the information at his disposal, that is, decentralised. This is called "the management of information". However, the responsibility for information policy, coordination of the information function and so on, is a centralised one. This is Information Management. This difference is not unique to information, the same applies to human resources and financial resources.

The need to manage information was felt in all probability soon after the invention of the first printing press, but this need got heightened with the advent of computer technology and photocopying machines proliferating the workplace. It started off as records management in the 1950's and continued through the years until the situation got so bad that legislation was passed in the USA in order to reduce (federal) paperwork. Even though the obvious need to manage information was expressed, the "how to" remained elusive, perhaps even until today.

Information management has the objective to enable the attainment of goals, be that a personal goal, a business goal or a national goal. It achieves that by facilitating the process of transforming data into information and information into knowledge so that the knowledge thus gained will be put to work. If this can be achieved, the potential benefits are clear: Empowerment through knowledge, increased productivity and profitability and, in general terms, the better utilisation of other resources. The area to look at when trying to measure the effects of information management has to be the quality of decisions. Data, information and knowledge are all essential inputs into the decision making process and, assuming rational decision making, the higher the quality of the information, the higher the quality of the decisions.

Information management is based on a few principles. The first principle to accept is that information is a special and valuable management, organisational, personal and national resource. Secondly, an organisation must assign responsibility to someone for the planning, organising, leading and controlling of its data and information resources and the process of transformation. Thirdly, information management must be approached in a holistic way. For too long have we tried to manage information in a fragmented way by having computer resources managed on its own, the library function on its own, allowing each person to acquire, enhance, retain and deliver information products and services with no central coordination and with no framework.

Implementation of information management in organisational terms will depend on the type of business, but it will probably have to include the establishment of a function within the organisation to take responsibility for information management, the establishment of an information management philosophy and policy, the division of responsibilities and the preparation for objectives, systems and procedures. It must be realised that implementation is not always going to be easy. Certain factors may hamper implementation such as a poor understanding of the business environment and how information contributes to the successes of the business, treating information management as a technical issue rather than a management one, expecting quick fixes, ignoring the organisational culture and leadership and trying to implement everything at once.

At least from a theoretical perspective it would seem that it is important to manage information - the reason being that information is a vital resource and process to business. The question is: How will one know that one is not managing information properly or, conversely, how will one know that one is managing it properly? Both questions are equally difficult to answer as proper information management cannot be related directly to any business performance indicator. Although it must obviously contribute to the success or the failure of a business, in most cases it cannot be singled out as the one and only contributor.

The result of not managing information can readily be identified though. A chronic demand for information from higher echelons of the business on the lower levels is indicative of information not being managed. Equally bad is when different facts are being given by different divisions of the business (in all probability because of duplication of data and systems). Another indication is the constant increasing cost of paperwork without increased output in terms of revenue or profits.

It is difficult to establish whether information management, as defined in this study, is practised by individuals, business and government. It can be assumed that information is being managed to a certain degree by individuals in their daily lives and as workers and managers in their working lives. The question, however, is: Are they managing information in the "information management" sense or in the "management of information" sense? There can be no doubt that we are all managing the information resources at our disposal to the best of our abilities. We are therefore reasonably successful in our ability to manage information. But does information management take place?

For the individual it would not be feasible or necessary to practise information management in his daily live in the formal sense. But, as it was proposed in this study, it is necessary for organisations to practise information management. The problem is: How do we know when information management is being practised successfully? Where do we measure it? It is doubtful though that information management is practised as proposed in this thesis. It may be done partly through information infrastructure management and through the management of information, but information management in the true sense of the word, is unlikely. Why is that? One reason may be that people do not know how to do it. The literature is also not very helpful as much confusion reigns. There is no general agreement yet as to what information management really is or should be. As long as this confusion exists, it will be difficult to either prove or disprove that information is being managed. A common understanding and definition is needed and only then can one proceed to the next step.

It is proposed in this thesis that information management means the management of the information resources, the information process and the information infrastructure. The process starts off with raw, unevaluated facts and ends with knowledge being applied to some predetermined goal. This process is enabled though the use of an information infrastructure such as computers, radio and TV or libraries and the use of humans to transfer information into knowledge. Management is needed at various stages of the process, but also for the overall process. Proper information management means management of the entire process and not only parts of it in a fragmented way. As long as we continue to compartmentalise information into disjunct pockets of information and to manage the infrastructure separately, we will not be able to claim that we are managing information.

In this chapter information management and the related activity of the management of information were explored and defined. It is now clear what is meant by these terms. In the next chapter one last issue needs to be addressed, namely, whether the principles of (general) management can be applied to information. Only if this issue is resolved can there be clarity regarding the manageability of information.

CHAPTER 5

5. THE MANAGEMENT PROCESS APPLIED TO INFORMATION

5.1 Introduction

In chapter 4 information management as a concept was explored. After evaluating different definitions, information management was defined as the management of the information process, the information resources and the information infrastructure in pursuit of predetermined goals. The definition highlights three aspects which need to be managed: The information process, the information resources and the information infrastructure.

But what do we mean by "to be managed"? Once management has been defined, it is necessary to apply it to the information process, information resources and information infrastructure so as to find an answer to the question of whether information can be managed according to the accepted principles of management.

The model for information management as proposed in chapter 4 will be taken as a point of departure and this model will be tested against the management steps. The model basically looks at the resources, the infrastructure and two processes. It will be attempted to apply each step in the management process to the data, information, knowledge and infrastructural resources as well as to the process of transforming data into information resources and transforming information resources into knowledge.

Over and above applying the management process to the information management model, the applicability of the process on an individual, a business and on a national level will be explored. The business level is the one which will be concentrated on mostly seeing that this is the level where it has the widest application.

5.2 The management process

In "classical" terms, management means planning, organising, leading and controlling. This is also referred to as the command-and-control model of management. More recently another model has emerged. This was partly due to the successes of the Japanese management approach and by an increased awareness of human rights and dignity and a stronger focus on information, knowledge and information technology. This model is called the empowerment model (Tromp, 1993: 34).

Tromp (1993: 56) proposes a collaborative approach to management based on the empowerment model. He identifies six management functions: Leading, curating, facilitating, building, integrating and interfacing. In his description of leading, one can identify the planning, organising, staffing and decision making steps. Curating is described as caring, mentoring and tutoring, counselling, informing and provision of resources. Facilitating focuses on group functioning. Building means working in teams, performance management, reward systems and recognition. Integrating means integration of the individual and groups and interfacing provides the link between subordinates and the outside world (Tromp, 1993: 57 *et seq.*).

Even though the collaborative approach is significantly different from the classical command-and-control model in that the emphasis and classification are different, the same steps (actions or activities) are involved. For the purpose of this study it is therefore not necessary to compare the different management models with one another. It is acknowledged that one model may lend itself better to the information management concept than the other, but the purpose of this chapter is to determine whether the management steps (called functions by Tromp) can be applied to information.

If information is to be managed the four steps (planning, leading, organising and control) must in some way or other apply to information. Not only must they apply to the resource dimension, but also to the process dimension.

It was indicated that the management of the information infrastructure forms an integral part of information management. The four steps must therefore also apply to these elements.

5.2.1 Planning

5.2.1.1 Introduction

Any management system must pay attention to the planning process. Sikula and McKenna (1984: 130) write: "The efficient utilization of organizational resources - human, capital and technological - does not just happen without the continual estimation of future requirements and the development of systematic strategies designed toward goal accomplishment". Planning is the process of deciding what action is going to be taken in the future (Horton, 1979: 123). "Without planning there is no control..." (Gannon, 1982: 57). Ackoff (1970: 1) writes: "Planning is the design of a desired future and of effective ways of bringing it about". There is a distinct difference between planning and forecasting: Forecasting does not normally make any attempts to influence the future whereas planning actively tries to do that. Planning is the logical first step in the management process.

Planning usually involves four activities:

- Determining the mission of the organisation (Gannon, 1982: 57). Griffin (1987: 107) adds purpose, values, environment and experience to this.
- Determining long-term goals and short-term objectives in light of the mission;
- Developing strategies and tactics to achieve the goals and objectives;
- Implementing policies, procedures and rules in accordance with the missions, goals and objectives; and
- Updating plans in light of changing circumstances.

When the planning process is applied to information management it leads to the following:

- Defining the information purpose, mission and vision statements in line with those of the business or country.

- Formulating an information policy The policy must address the entire life cycle of information; from data to knowledge as well as the information infrastructure. The Diebold Group (in Marchand and Horton, 1986: 195) suggests that the following be addressed in an information policy:

    - strategic issues (how information relate to business goals, new products and new markets),

    - functional issues (role of information in support of business functions such as marketing, inventory control, etc),

    - privacy and confidentiality issues and fair practices (need to know) and

    - technical and procedural issues.

- Linking of the information plans with business plans. Of specific importance here is the planning of information requirements. The objective is to have the right information at the right time, in the right form... but the trap to avoid is to collect data indiscriminately. More information does not mean better information and, apart from that, costs will probably prohibit this.

5.2.1.2 Planning applied to information management

Planning is a crucial step in the management of information as this is where a future situation is defined. If the vision of the future is mundane and without ambition, there is little hope of achieving the objectives of information management. On the other hand, the plans must be realistic, taking into consideration the needs and resources available to satisfy those needs. Going back to the model for information management, planning must be done in terms of the data, information, knowledge and infrastructural resources identified in the model. The requirements of an organisation in terms of knowledge resources are satisfied through the specialist skills and knowledge vested in human resources. Planning for the resources is therefore a straightforward process and should not present any difficulties.

Meltzer (1981: 79) suggests a five step approach, namely, a scanning of the information industry for products and services and specifically the trends, an assessment of the information needs of the organisation and the prioritising of these needs, the determination of a strategy so as to satisfy the needs, a critical evaluation of the information resources already available within the organisation and, lastly, review and updating of the plans. Stewart (1991) agrees with this view. The ever-changing marketplace must be examined continuously and the necessary skills be employed to cater for these changing needs.

Planning must also be done for the two processes proposed in the model. The first process - transforming data into information resources -means in terms of planning, that the acquisition, enhancement, retention and delivery of information resources must be planned for. To plan for the second process - transforming information resources into knowledge - is more difficult as the process takes place inside the human mind. For this to happen successfully, an environment conducive for learning to take place, is necessary. For creativity to develop and prosper, it is necessary to have an environment where ideas can freely emerge and flow. This calls for a non-conforming environment where humour is present, curiousness and risk taking is appreciated, the atmosphere is relaxed and management is democratic (Van Loggerenberg, 1989: 242 *et seq.*, Hudson, 1993: 147 *et seq.*). Such an environment will not happen automatically, it has to be planned. It may not always be easy to have this kind of environment present in a highly competitive, fast moving business situation, but even if this is the case, some parts of the organisation (e.g. research), may lend themselves more to such an environment than others.

Unfortunately, even with such an environment present, there will still not be a guarantee that information resources will always be transformed into knowledge. Even if it does happen, application of such acquired knowledge into business goals, may still not happen - informing knowledge transformed into productive knowledge. It may help to design an appropriate reward or idea recognition scheme in a business environment so that bright ideas can be seen to be appreciated. The Kaizen approach which originated from Japanese businesses comes to mind.

Information planning also means having and living an appropriate mission and vision for the information management function. The objectives must be clear and also who the customers are. This is essential to ensure a focused approach.

5.2.1.3 Planning applied to the management of information

Every staff member in the organisation use information to perform his duties, regardless of the position in the hierarchy or the content of the post. Planning needs to be done in terms of what data or information resources will be needed in order to effectively and efficiently carry out his functions. Should training or education be required in terms of the use of information, such training or education must be planned and carried through.

The acquisition of data or information resources needed takes careful planning so as not to waste financial or other resources in the process. Data collection from external sources could be a costly exercise and should be done with responsibility. Should an information system or systems be needed to either store the data or perform manipulation on the data, such system, as part of the infrastructure, should be planned with care and in cooperation with the information management function.

5.2.1.4 Planning applied to the individual, business, national and international levels

- The individual level

  Planning of information management and the management of information on a personal and individual level outside the workplace, is a very informal process. Intuitively each individual knows to a large degree what information he needs to survive and what he finds interesting and no formal planning is necessary to obtain it. Usually there is not a substantial investment or effort needed to satisfy such needs.

  With the number of information resources - books, magazines and newspapers - ever increasing, a little more formal planning may be in order. The same applies to the different media on which these resources become available. Accessing bibliographic material through networks (perhaps on the information highway) or on CD-ROM may be more efficient than the traditional paper format.

- The business level

  Planning in terms of information management and the management of information on the business level has been dealt with above. The entire information management model is applicable and so is the section on the management of information.

- The national level and international levels

  Most of what applies to business would also be applicable on a national level as the government is but another form of organisation. The most important aspect to be given attention to though, is the formulation of an information policy for the country. An Information Bill of Rights may also be necessary. The influence of information technology on the economy, social structures and culture needs to be planned and not left to follow its own course.

On an international level international organisations should play a major part in shaping the information realm. Such organisations should act as watchdogs with regards to the use and, more specifically, misuse of information. The "gap" between the information rich and the information poor and the consequences going with it, should be watched and corrective action taken where necessary. Privacy and confidentiality issues are important areas to be guarded and internationally accepted policies and standards should be developed for these areas.

5.2.1.5 Conclusion

Planning for information management and the management of information is not only possible, it is essential. Without proper planning in place, very little makes sense beyond that. Planning is the first, vital step in the management process. It must be realised, though, that planning is not an event that happens once a year. It is a continuous process as plans are brought in line with changing circumstances.

5.2.2 Organising

5.2.2.1 Introduction

For effective functioning, management must work within an organisational structure with a design which is compatible with the objectives and mission of the organisation (Gannon, 1982: 211). Whereas planning guides the organisation's activities to achieve the goals, organising is necessary to undertake these activities. It is a process consisting of the analysis of the activities and resources, the grouping of similar activities, the allocation of resources and the determination of relationships between the activities and people (Marx *et al.*, 1991: 283).

Griffin (1987: 265 *et seq.*) lists 5 steps or building blocks to organisation (after the needs of the organisation have been determined). The first step is to acknowledge work specialisation, or the breaking down of work into smaller, component parts. Unless carried to extremes, this will contribute to productivity gains. The second is departmentalisation or the grouping of jobs into manageable units. This can be done by function (e.g. marketing, production, finance), by product (e.g. 3-series, 5-series and 7-series BMW's), by location (eg Europe Division, Far East Division) or by type of customer (large accounts, agricultural sector). Other groupings may also be possible.

The third step is to allocate authority relationships. Each worker needs to know what his or her job entails, what authority he has and what the relationship is between his job and others in the organisation. The fourth step is to determine the span of control. Span is a function of manager competency, physical dispersion, the number of nonsupervisory duties, required interaction, standardised procedures, similarity of tasks, frequency of new problems, preferences of both supervisor and subordinates and the extent of technological aids.

The last step is to determine staff and line positions. Line positions generally work directly towards organisational goals whereas staff positions assist and advise.

5.2.2.2 Organising applied to information management

Horton (1979: 209) writes: "The form and structure of the information organization ...is absolutely crucial to the organization's goal achievement". He suggests that the following must be taken into account when designing a structure for information management:

- The nature of the business. In terms of information management, this question relates to the role of information *vis-a-vis* the role of the other resources of the organisation. This role will differ from the one organisation to the next. Also, the form and substance of data and information needed will differ from one to the other and will have an influence on the structure. Some organisations are far more dependent on accurate and timely information, for instance, the financial markets as opposed to a restaurant.

- Make vs. buy considerations. Some organisations are in a position to generate most of its own needed data and information, while some may have to rely on outside sources.

- The quality of available professional information human resources. Horton (1979: 210 - 211) makes the point that quite often, "...the key to an effective organizational structure lies in the strength, drive, foresight, and initiative of a few strategically placed individuals who have the stamina and power of their convictions". He points out that many organisations have this problem with their librarians traditionally being "poorly equipped by temperament and training to enter the ring with computer center chief to do battle for today's tight budget dollar." He continues to suggest that, where an organisation has someone strong, the organisation be built around that individual rather than the other way round. "Organizational placement and functional authority do indeed go a long way to helping establish new programs, but in the end people run programs" (Horton, 1979: 211).

Horton (1979: 203) observes that the information function can be located anywhere in the company and can still be effective, provided "...information resources policies are strong; top management becomes directly interested and involved in spelling out the company's information programs; and necessary financial and human resources are budgeted to support the information unit". He also contends that the information unit should be placed on the same hierarchical level as the other resource management functions, such as financial, human resources and materials.

It was pointed out that the management of information is the responsibility of each person as opposed to information management which is the responsibility of an individual or unit in organisational context. The design of such a unit will now be investigated.

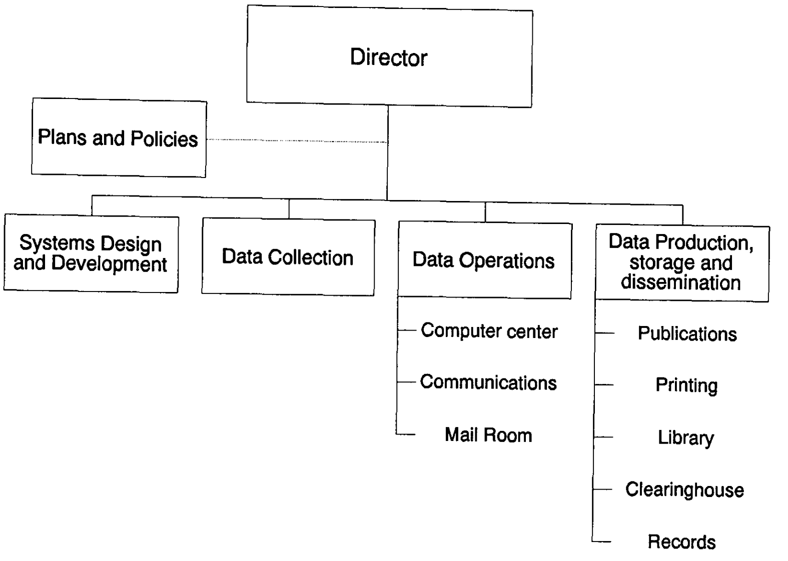
The design can be done using a functional approach, a conventional approach or a mixed approach (Horton, 1979: 203 - 209).

- **A functional approach**

The functional approach uses the end-service to be provided as a guide to the design. Such a design is illustrated in figure 5.1. This structure may be suitable for a typical Federal Government agency (USA), but Horton points out that this may not be the best structure for every organisation. He acknowledges that, for instance, librarians may feel uneasy being "lumped together" with clearinghouses and others. Other functions may have the same objection to this design. Horton (1979: 205) concludes that this method of designing the organisational structure is neither "pure" nor "preferred" and can even be misleading being based on the assumption that all the different functions can be accurately described and defined. He calls it " a simplistic approach".

Horton also writes that, with regard to the library function, the functional design might work better for "scholarly" institutions than for organisations having to do with process control. "Where the library is a crucial information resource, for example to scholarly pursuits, then we might well see the primary breaks for the information unit oriented to documents and literature, and not simply data" (Horton, 1979: 205). The role of the information resource must also be taken into account. In the airline and banking industries, up-to-the-second information has to be available for the survival and success of the

Figure 5.1
Functional Structure



Adapted from Horton, 1979: 204

organisation. The computer and communication network become crucial in such operations and may have to occupy a much more prominent role. In such organisations, the library might play a minor role (Horton, 1979: 205).

- **Conventional approach**

The more conventional approach to organisational design has the conventional activities, such as the library, computer centre, printing facility and mail room together as individual organisational units. The library has traditionally been an entity accountable directly to top management for the acquisition, storage, retrieval and dissemination of literature sources, while the computer centre was responsible for the data sources and development of information systems. Each one of these units had its own specialised way of information management although it was perhaps not called that (Horton, 1979: 206).

The convergence of computer, communications and other technologies, such as word processing, caused the boundaries between these organisational units to become blurred. This called for new approaches to organisational design and companies trying to cling to the conventional way, have been experiencing problems (Horton, 1979: 206).

- **A mixed, transitional structure**

Horton (1979: 206) proposes an organisational design between the fully functional approach and the conventional approach and calls it a "mixed, transitional" structure (figure 5.2). In this structure, information storage and processing functions are partly consolidated across media and mode lines, while the collection and dissemination functions still follow the traditional approach. In the design of this structure, it is attempted to manage common-purpose data as far as possible. Information analysis and systems development functions were treated as higher-order activities for which different skills and a management systems were required. Inherent in this structure is the fact that its physical files and records are not separated from the data management function, nor is mail handling separated from communications (Horton, 1979: 209).

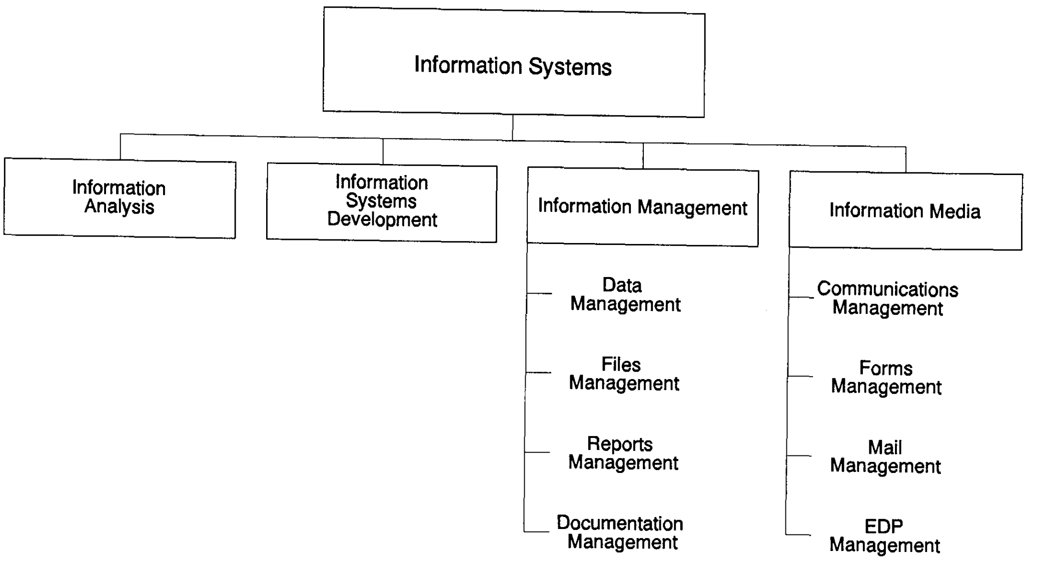
- **A new structure**

The organisational structures proposed by Horton do not seem to fit the information model very well. His "mixed transitional" structure has a number of out-dated concepts in the structure which may have been current at the time of writing, but have fallen into misuse. Data management today, as an example, certainly has a very different meaning than what it had in 1979. Taking the information management model to guide the design of the structure, it is easy to identify the functional elements of the information infrastructure as Information Technology, Information Systems, the Library and Documentation and some more may be added depending on the nature of the organisation.

Over and above the infrastructure one can identify the two processes of transformation from data to information resources and from information resources to knowledge. The information resources (products, services and

Figure 5.2

A Mixed, transitional structure



Adapted from Horton, 1979: 208

sources) must also be managed.

A structure is proposed in figure 5.3. This is certainly not the only possibility. In fact, the different functions do not even have to report to the Chief Information Officer (CIO) directly. It is quite conceivable to envisage a matrix structure where information technology, systems, the library and so on all report to different lines, but having dotted lines to the CIO to serve on information related teams, managed by the CIO.

The important point to stress is, firstly, the fixing of responsibility in a post and secondly, taking a holistic view so that all the information related activities in some way or the other can be managed by this post. The design of the structure is something that will depend on a number of variables within the organisation. These variables may differ so widely that a generic organisational structure would be rendered meaningless.

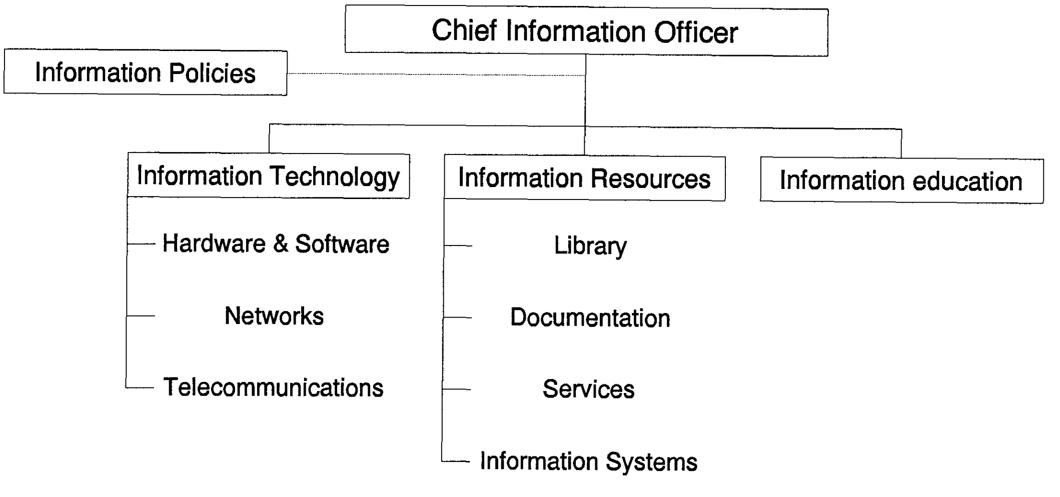
5.2.2.3 The Information Manager

To manage information in organisational context, a person must be given the responsibility. A name often found in the American literature for such a post is the Chief Information Officer (CIO). The term "Information Manager" will be used in this study, but synonymous to the CIO.

The Information Manager is the person responsible for facilitating and

Figure 5.3

A New Structure



coordinating the information management process in the organisation. He "concentrates on long term strategy and leaves the running of computer systems to technical experts" (Bock, 1986: 162). He is responsible for selecting, acquiring and deploying all computer and telecommunications technology, writes Bock. He must be able to view the organisation from the top down, he must understand its mission and objectives and must be "tuned in to the strategies articulated to implement these objectives and the policies put in place to achieve the organization's goals" (Brinberg).

Meltzer (1981: 122) writes that the Information Manager is the person responsible for the efficient acquisition, processing and utilisation of information resources so that the organisation can attain its goals. He has the all-encompassing responsibility for the information needs of the organisation. Meltzer is not drawing a clear distinction between information and the management of information. The role of the Information Manager is far more on facilitation than on actual "doing".

The Information Manager must have the following characteristics:

- He must be familiar with all aspects of the Information Industry. He must understand and be familiar with information technology (Meltzer, 1981). He must understand the needs of information users and must be willing to make the information user a hero (Brinberg).

- He must have the education and training of a manager and not of a specialist or technician (Meltzer, 1981). He must know technology but also business. He is "...more interested in what works than how it works" (Weiner in Bock, 1986: 161).

- He must be an organisational entrepreneur, working with the organisation and not for it. The interdivisional nature of information requires that the Information Manager must not be blocked by an arbitrary organisational structure (Meltzer, 1981). This emphasises the importance of taking a holistic view across the entire organisation.

- He must be sensitive to the organisational culture and ethics, public responsibility, attitudes towards the marketplace and integrity of its products and service (Brinberg). To this can be added the need to understand organisational politics and that information can be a base for power (chapter 3).

- He must be a marketeer, offering service in stead of information. This means he must be a good communicator on all levels, inside and outside the organisation (Brinberg). He must have the ability to explain to business people how to make best use of technology while making technical staff understand what management wants (Bock, 1986: 162).

It is clear from the above that the Information Manager is a rather special breed of person with a background and understanding of many disciplines, ranging from the "hard" scientific world of computer technology to the very "soft" issues of education but also the social aspects of information technology and systems. Understanding of the business is also essential.

The Information Manager is not a technocrat, nor is he a bookworm. He is primarily a businessman with sensitivity to and understanding of the other issues.

5.2.2.4 Organising applied to the management of information

The management of information is an individual responsibility in organisational terms and no organising as such should be necessary. It may, however, be necessary for the individual in organisational sense to put some structure in place which will provide him with the needed information resources. Such a structure could be internally or externally to the organisation.

5.2.2.5 Organising applied to the individual, business, national and international levels

- The individual level

  Organising does not apply to the individual level as no structure is needed on this level.

- The business level

What has been said above about information management and the Information Manager apply very definitely to business or any other organisation. Business is the area where it finds most application.

- The national and international levels

As is the case with business, some organisational structure on a national basis is necessary for the information management function. The responsibility will, however, be limited mostly to policy formulation and application matters with little or no attention being given to facilitation of the information management processes themselves. The national information resources may be necessary to address from a strategic point of view.

There would be no international structure as such although international organisations could perform such as function on an agency basis.

5.2.2.6 Conclusion

Organisation, as another step in the management process, can be applied very well with respect to the information resources and the process of informing. The design of the information management function will be determined by the organisation itself and its peculiarities and needs. "There is no ideal organisation", writes Meltzer (1981: 113). What is important in this design is that the structure must allow a holistic view of the organisation. Furthermore, the design should bear in mind that the purpose of information management is to facilitate a process and no elements of "doing on behalf of others" should be allowed.

Organisational culture will have a definite impact on information management and its success or failure. Organising for the management of the data, information, knowledge and infrastructural resources will not be difficult. Organising for the process of transforming data into information resources through acquisition, enhancement, retention and delivery will also not be too difficult. However, organising for the process of transforming the information resources into knowledge and ensuring that the knowledge gained in the process is applied to the advantage of the organisation, is more challenging.

It was pointed out when dealing with the planning function that a certain environment will be conducive for knowledge creation and its application. This calls for a specific organisational culture to be present. Organising alone will not guarantee the desired culture. Leadership by the senior managers, *inter alia,* is needed for that.

The post heading up the information management function requires special attention. It calls for knowledge of many disciplines - library and information science, information technology, education and training, communication - and few people have knowledge of all these disciplines. Added to this is the requirement that intimate knowledge of the business is paramount. Meltzer contends that the information manager is an organisational entrepreneur, a provider and user of information, a policy maker, a change agent, a researcher and a resource mobiliser; "...a mover and shaker" (1981: 138 *et seq.*). The information manager has a very specific task, namely, to promote a culture in the organisation conducive for information to be treated as valuable and to be managed as such.

5.2.3 Leading

Leadership is about three concepts: Power, influence and authority. Power is the potential ability to affect others, influence is the ability to consciously or unconsciously exercise power and authority is power created by an organisation. Power can be obtained in five ways: It could be granted by the hierarchy (legitimate power), through the ability to give or withhold rewards (reward power), through the ability to punish (coercive power), through identification, imitation or charisma (referent power) or through information or expertise (expert power). Leadership is the skilful use of power and leaders use this power to influence the behaviour of others (Griffin, 1987: 421 - 422).

The relationship between power and information has been pointed out in chapter 3. Expert power specifically has close and direct links with information. A person withholding or distorting information can strongly influence another person's behaviour. Griffin (1987: 424) points out that this way of exercising power is very dangerous. Firstly is it generally considered to be unethical, but secondly, when it is found out, it leads to distrust and a lack of confidence.

Groups and group behaviour form important components of leading. Groups can be functional (eg human resources department), task oriented (e.g., project team), informal or people having a common interest. Many reasons exist why people join informal groups, but one of specific importance is to obtain information. The "grapevine" is a very effective communication channel in any organisation (Griffin, 1987: 472). A communication channel, naturally, exists to enable information to flow.

Another component of leadership is communication and as was shown in chapter 3, it has close links with information. Communication is, in fact, the process of transmitting information from one person to another (Griffin, 1987: 487).

5.2.3.1 Leading applied to information management

The above proves that information plays a very important role in the leadership process. But how is leadership applied to information management? In this sense leadership means educating the organisation with regards to the role information plays in the organisation. In chapter 3 it was pointed out that people will not easily share information if that gives them a power base from where to operate. It is the task of the information manager to educate and convince people that they have to share information in order for the business to be more successful. This requires a leadership role.

As information management has not really "taken off" in businesses, a strong element of leadership is going to be required to make it successful. Meltzer (1981: 138) claims rightfully that the information manager must be an organisational entrepreneur. He must be willing to walk a road that no-one has walked before him and, above all, he will have to have the courage to convince other managers, above and below him, of the benefits of information management. In this he will not only need courage, but also the will to persist (and perspire).

Alone and on his own he will not succeed - he will need the support and active involvement of other senior managers and especially the chief executive. Unless the chief executive and other senior managers commit themselves to the principles of information management, it is destined for failure. Paying lip-service only will also not work. Senior management must be seen to "walk the talk" and manage the information at their disposal. Setting an example is of paramount importance.

Strong leadership on the business, national and international levels is therefore crucial for information management to be successful. Such leadership will have to come from the information manager, but with strong support and involvement from senior management. Leadership does not apply to the management of information.

5.2.4 Controlling

5.2.4.1 Introduction

Control in organisational sense means regulating organisational activities so as to attain goal achievement (Griffin, 1987: 522). It is usually done in terms of the resources of the organisation, but it could focus on any activity or set of activities. Information (in resource terms) therefore has a direct relationship to control. Control of resources means controlling inventory levels, controlling quality and controlling equipment and other infrastructural resources (such as office space).

Control of resources generally can happen at three points: At the input stage (preliminary control), the process stage (screening control) and the output stage (postaction control). In preliminary control, the quality and quantity is controlled before the resources become part of the process. Postaction control is generally not as useful as the other two types, yet it provides valuable information for future planning. A typical organisation would be making use of all three types of controls, depending on the nature of the business and the products.

The control process has four steps. The first step is the setting of standards. This forms the basis against which measurements will be made. The second step is to measure performance. The third is to compare the performance against the standard while the fourth step is to evaluate and taking the necessary action.

It is clear to see that planning and control are closely related. Planning sets goals and strategies to achieve those goals. Control makes sure that it happens. Planning and control should therefore be integrated. Control should furthermore be flexible to accommodate changing circumstances, it should be accurate, it should be timeous and it should be objective.

Griffin (1987: 536) points out that employees generally do not like control much. They seem to have a natural resistance to control. Reasons for this can be found in organisations tending to overcontrol, especially in terms of employee behaviour. It may also be focused inappropriately, thereby leaving no room for discretion. Depending on how it is used, control could lead to inefficiencies. Effective control means accountability, showing up poor performance and highlighting problems. Control systems should be designed to minimise these resistances, for example by allowing employees to participate in planning and controlling.

5.2.4.2 Control applied to the information management model

Control is important in any business and regarding any resource or process. For information (as resource and as process) control has special meaning. It is not widely realised that data and information have significant costs associated with them - they are mostly being treated as free. With such a point of view as background, usage of such a free good mostly has big wastage as a consequence. Proper information management must change this perception as data, information and knowledge have large costs associated although such costs are usually hidden in overhead costs and therefore not clearly visible.

Control in terms of information management means that the data, information and knowledge resources must be controlled. As with any other resource, an oversupply in inventory is a waste. It must therefore be determined what data, information and knowledge resources are needed, when they are needed and at what cost they are going to be acquired or created. People have the tendency to collect all sorts of information resources "just in case" it is needed. This temptation must be resisted. Information resources must also not be obtained before they are actually needed. One of the characteristics of information is that it goes through a certain life cycle over time and as it progresses through the cycle, the value changes. Proper information management means that the information must be made available at the right time; not too early but not too late.

Controlling the processes of transforming data into information resources and information resources into knowledge ranges from simply controlling the acquisition of data and information resources to the more complex controlling of the creation of knowledge. Controlling a process taking place in the mind is impossible and, at best, the control should therefore lie somewhere else. The control must lie on the resources flowing into the process (input) and the application of the knowledge gained (output).

It is clear from the above that a special relationship exists between control and information. On the one hand information is needed to control; without information control becomes impossible. On the other hand, information, seen as a resource or as a process, needs to be controlled. This leads to the argument that information about information is needed in order to control information.

In order to control more effectively, mechanisms have been devised over time. Three of these mechanisms are accounting, budgeting and auditing.

5.2.4.3 Information accounting

As was shown in chapter 2, information carries a cost with it. It is therefore possible to express it in terms of financial figures. Burk and Horton's (1988) information mapping technique suggests that an information inventory be built consisting of information resource entities (IRE's). They suggest that for each IRE, the cost of that IRE is determined. This cost must be reflected in the organisation's financial accounts.

This linking of the cost of an IRE to the chart of accounts may be problematic: Firstly, because of the fact that these costs are often hidden in overhead costs or, secondly, that one may take the existing accounts and fit them to the IRE's without making the necessary distinctions. For instance, the cost of a particular information system (an IRE) is not the same as "Data Processing costs" as typically found in a chart of accounts. If one is to undertake this exercise seriously, it may be necessary to create some new accounts. Even though it may be difficult, Burk and Horton plead that, if information is to be managed as a resource, the proper allocations of costs must be undertaken. Marchand and Horton (1986: 226) remark that the cost-identification process distinguishes between internal costs and external purchases of information resources so that it is possible to allocate costs either as expenses or as assets.

Treating information as an asset rather than an expense forces the organisation to look at the value side rather than the cost side (Burk and Horton, 1988: 30). Marchand and Horton (1986: 208) show that it is possible to produce a balance sheet showing the information resources. They contend that it is even possible to value the information (knowledge) in people's heads as an asset; the human capital concept. It is, however, not an easy or straightforward task; not the cost nor the value. If properly done, the cost of information could be shocking to an organisation. They quote examples of cases where 4,000 staff members (in a high-tech company) spent 30 to 50 per cent of their time managing information at a cost of between $700,000 and $1.2 million per week!

The big problem of putting information as an asset on the balance sheet lies in the measurement: How to measure human or intellectual capital. Current accounting systems and principles do not apply well to something as intangible as information and, even more difficult, knowledge (Stewart, 1994: 28). Yet, some companies are already doing it. The Canadian Imperial Bank of Commerce, Skandia, Dow Chemical and Huges Aircraft have done remarkable work in this field, proving that it is possible (Stewart, 1994: 29).

A particular problem for accountants is measuring the return on intellectual capital. Any investment usually has to pass the test of return on investment (ROI) or return on assets (ROA). Ordinary capital investments can be readily expressed in terms of ROI and ROA, but presents a problem for intellectual capital. James Tobin, a Nobel Prize winner from Yale University, introduced the q-ratio as the ratio between an organisation's market value (stock price times shares outstanding) and the replacement value of its physical assets. The q ratio, although not primarily developed with intellectual capital in mind, provides an indication of what is not on the balance sheet and that includes intellectual capital. Physical capital intensive companies will have a lower q

than high-tech companies. Comparing q values of similar industry companies provides a relative measure of intellectual capital (Stewart, 1991: 50).

The purpose of accounting for information is to make management aware of cost and value pertaining to information with the ultimate aim being to control. This is an essential step if information is to be managed as a resource, albeit a difficult step. Standard accounting principles do not provide mechanisms to measure intellectual capital directly and it may be necessary invent a new way of accounting for information and knowledge.

5.2.4.4 Information budgeting

Part of control are the budgeting and auditing functions. Budgeting means expressing a set of planned activities for a particular period in financial or quantitative terms (Griffin, 1987: 580). The information budget should be the product after a careful analysis of the organisation's information plan (Marchand *et al.*, 1986: 218). It should include the titles of all information collections and acquisitions, the acquiring department, where it will be acquired from and at what cost. As requirements will constantly change, the budget will not remain fixed during the period. Marchand and Horton point out that the information resources must be subject to the same rules as the other resources: Should the organisation find itself having to reduce costs by cutting back on the use of resources, the information resources must also be trimmed.

5.2.4.5 Information auditing

Auditing plays an important role in control. There are mainly two types of auditing: Compliance auditing, where a check is done against set policies and procedures and advisory auditing, where users are made aware of existing systems and practices and where the emphasis is on improvement of these. Ellis *et al.* (1993: 134) contend that the information audit tends to follow the advisory model although the compliance model is also used. They claim that the information audit must have at least the following:

- Establishing the major goals of the organisation as well as the constraints;
- Determining the needs of the users;
- Building an inventory of the resources available;
- Putting the first three together to form an holistic picture.

This can be accomplished by using different approaches (Ellis *et al.*, 1993: 135 and further). The first approach is a cost-benefit methodology where the cost of obtaining the information is balanced against the benefits derived from its use. Alternative ways to obtain the same information or the same benefits must be evaluated against the cost of these alternatives. Another approach is the geographical way. Here the major components are identified and mapped in relation with each other. It starts with the education of users and it ends with needs being mapped against resources. Cost-benefit analysis does not form part of this approach.

The third approach is the audit of management information. Here the management reports produced by the information systems are analysed in terms of circulation lists, stated purpose and then by identifying weaknesses and areas of improvement.

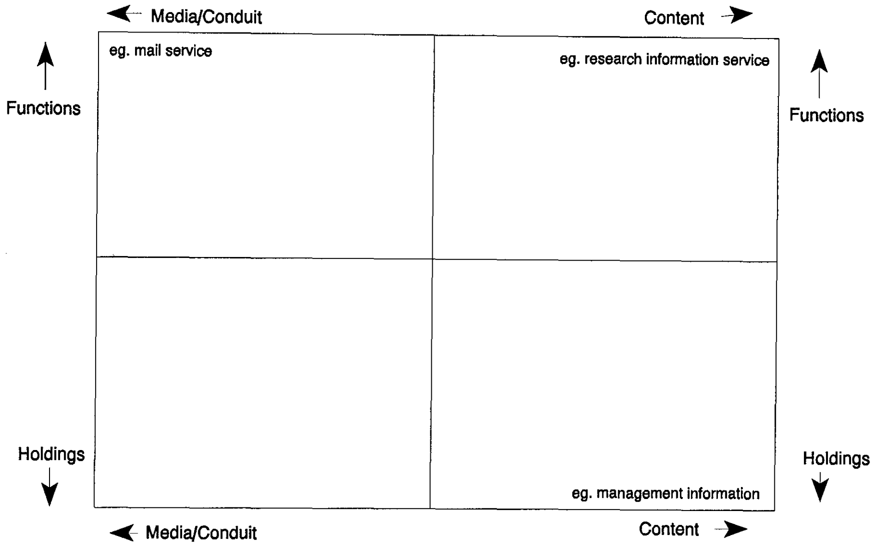
The communication system of the organisation also needs to be audited for efficiency. Interpersonal communication, management-employee communication, the public relations activity and an assessment of the effectiveness of these matters must be undertaken. The information technology and its effectiveness must also be put under the spotlight.

Information mapping is a term frequently used. Ellis *et al.* (1993: 149) point out that definitions of what information mapping is, vary, but it generally means the identification of the information resources of the organisation. These are then usually "mapped" graphically so that every employee understands where information resources are and who is responsible for them. These maps, like road maps, must be easy to understand.

Burk and Horton (1988) wrote extensively on the subject. The process starts with the identification of the Information Resource Entities (IRE's) and by "mapping" them on a matrix grid. Each IRE is identified in terms of its function (e.g. service) as opposed to holding (e.g. product) and media/conduit

Figure 5.4

Map of Information Resources Entities



Adapted from Burk and Horton, 1988: 142

(e.g. its container) as opposed to content (e.g. meaning) (figure 5.4).

Analysis and examination of the map thus produced may show up duplications or areas lacking. The main benefit of this technique is a single page view of the information resources and their characteristics. Meltzer (1981: 88) points out that making sure that the information is available is not enough. The audit must also reveal whether the information is available when it is required and how quickly.

Information audits are particularly useful tools. It assist in determining the value, functioning, evaluation and utility of information entities in an organisation. It should also determine how the objectives of the organisation as a whole and those of individual business units are supported by the information entities (Lubbe *et al.*, 1992: 215). Meltzer writes: "The information audit is not only helpful in addressing known problems dealing with information, but aids in identifying potential trouble spots that cause serious problems in future. The information audit can serve as an 'early warning system' to identify those information resources that should be obtained now so they will be available to the organisation when they are needed in the future".

5.2.4.6 Controlling applied to the management of information

Every individual in organisational sense needs to be prudent in the way he acquires, use and dispose of information resources. It takes courage not to collect every piece of information "just in case it is needed" just as it takes courage not to make one more photocopy for the same reason. That is the challenge to the management of information as an individual responsibility within organisational context. Control is what is needed to achieve this.

5.2.4.7 Controlling applied on the individual, business, national and international levels

- The individual level

  Control in terms of information management finds little application on the individual level.

- The business level

  What has been said above regarding control in terms of the information management model, applies to business or any other organisation.

- The national and international levels

  Control on national and international levels is closely link to the planning process. Control makes the planning happen and therefore monitoring and evaluating on these levels are indeed necessary. Both nationally and internationally care must be taken so that the "gap" between the "information rich" and the "information poor" stays within acceptable levels. The misuse of information and the abuse of people by obtaining power based on information should be monitored and controlled. National information resources should be protected for the generations to come. All of this calls for proper planning, a proper organisational structure, effective leadership and, lastly, proper control in order to ensure that it happens as planned.

5.3 Management functions

The previous section looked at the tasks of the manager; the process of management. Any manager must plan, organise, lead and control. Over the years though, certain functions within the organisation emerged as specialist areas. Marx *et al.*, (1991) identify eight such functions: Production management, procurement management, human resources management, information management, financial management, external relations management and marketing management. The eighth one he calls general management and corresponds with the steps in the management process.

It seems that some of these functions, namely production management and marketing management, have a direct bearing on information and information management. It was shown that information management is the management of the process of transforming data into information and then into knowledge. Production management and especially the principles underlying production management will, for example, be explored with a view of investigating whether those principles could be applied to information management.

The same applies to marketing management. Organisations are, generally speaking, information illiterate meaning that there is no conscious, coherent effort to manage the information resources and the information process. The information manager therefore has a special marketing task to make people aware of information, its role and its potential.

The other functions, such as human resources management and financial management will be dealt with as one. The reason for that is that human resources and financial resources can be reduced to the similar principles, namely those of resources management in general.

5.3.1 Production management

The primary function of production management is to optimise productivity. Productivity in this sense is taken to be the ratio of useful outputs to the available inputs (Marx, *et al.*, 1991: 304). In order to increase productivity the aim is to increase the outputs while reducing the inputs. The aim of production management though is not to maximise, but to optimise productivity, meaning that the market for the outputs (products) has to be taken into account.

Production management involves the following steps:

- Forecasting the demand. This is normally the task of the marketing manager, but he is assisted by the production manager. Various quantative and qualitative methods exist for forecasting the demand.

- Following on the demand forecast, is the production plan and production budget. The production budget normally consists of the production quantity budget and the production cost budget.

- This leads to the production workplan. Machine capacity (loading) and machine scheduling form part of this plan.

- The plan is followed by implementation of the plan; dispatching the work and controlling it by means of expediting and progressing. It also involves material management (management of the activities and people involved in the movement of material), quality management (managing those variables in the production process that have an influence on the quality of the end product) and proper maintenance of the machines and equipment.

  An important part of material management is procurement management, that is, obtaining the resources and other production factors necessary for the production process from the right supplier, in the correct quantities, at the right price and on time.

The above generic description of production management has much relevance for the managing of information. Essentially, managing information is also a production process. The raw material is data. This is converted through a process into information resources. The process involves machinery (computers, for instance). This process is followed by another process where information sources are transformed into, firstly, informing knowledge and the, secondly, into productive knowledge. This is a very special process as only a human mind can successfully do the transformation. It is furthermore a complicated process over which management has little control and one where the results are not always predictable. Irrational behaviour during this process is not uncommon.

Nevertheless, the principles involved in production management are applicable to the management of information. The demand must be forecast, a plan must be produced as to how the demand will be satisfied, equipment may be necessary to facilitate and assist the process, inventory of (information) resources must be established and maintained, control over the resources and processes must be maintained and so on.

When one looks at the infrastructure side in the information management model, one finds that production management has wide application in the areas of information technology and systems and also in the area of library management. Running a computer center or developing information systems is essentially nothing but a production line. A library also has a strong production application in the sense that bibliographic material is being ordered, received, catalogued, classified and then made available to users under strict controls.

Production management therefore speaks strongly to information management and it will greatly benefit the information manager to study and apply the principles in the information domain.

5.3.2 Marketing management

Marketing is a total system of interactive organisational activities aimed at the establishment of demand satisfying goods and services to current and potential clients through the determination of a price structure, its distribution and its introduction through marketing communication (Marx, *et al.*, 1991: 473). Marketing therefore rests on four pillars: Product, price, distribution and communication.

Marketing as a process is firstly defining the target market and, secondly, determining the right combination of product, price, place and using the right communication to get the message across.

In order to be effective with marketing, it is important to know the market's requirements and needs so that opportunities can be exploited. It is necessary to take cognisance of the market's cultural backgrounds, the social structures with its behaviour patterns, customs, peculiarities and characteristics of individuals in the market (gender, personality, experience, perception, attitude and motivation). All of these play important roles in the decision to buy the product or service. The customer buys a product more to satisfy a need than the product itself and the marketing strategy must take this into account in order to be successful.

It is also important to know the competition in order to be more effective in the marketing effort. Both knowledge of the market and knowledge about the competition call for marketing research to be undertaken. This can be done through direct observation, by doing experiments or through surveys.

Once the market and the competition is known, decisions must be made in terms of the product, its price, its distribution and marketing communication. The ideal product or service range is the range an organisation has at its disposal to achieve its sales growth, market share and profitability targets. Price determination is finding the balance between what the consumer is willing to pay and the cost of the product.

Distribution decisions deal not only with the channels to get the product to the end-user and the people involved in the process, but also with the service that goes with the product. Marketing communication has to do with the conveyance of a message regarding the product or service. It could take many forms, for instance, personal selling, advertising through the mass media, verbal communication through informal discussions with customers and publicity, for example through articles in periodicals.

Any product goes through a life cycle starting with the introduction phase, then the growth phase, the mature phase and the declining phase. The marketing strategy is different for each of the four phases.

Marketing plays an important role in the management of information. The aim of information management is to satisfy the need for information with the ultimate aim to add to an individual's knowledge so as to achieve set goals. Paradoxically as it may sound, people must be educated in their use of information even though they have been consuming information since the day they were born (through sense perception). Part of the marketing is "consumer education", that is, to raise the person's level of information awareness; getting him more "information literate".

Difficult as it may be, the users' needs for information must be fully understood in order to provide in these needs. The normal techniques of doing market research can be applied to determine the need. Exactly the same aspects as above need to be taken into consideration is determining these needs: Culture, customs, needs, gender and so on.

One would think knowledge of the competition may not be applicable to information management. Even though the information management department may not have official competition inside the organisation, competition may be present in the form of the user looking elsewhere (outside the organisation) to obtain the information he needs, be it on the golf course, the library or an information brokerage house. In the worst case, ignorance can also be considered as competition. The user may not even bother to search for the information he needs and rely on his limited knowledge.

The principles involved in marketing management are therefore very much applicable to the management of information.

5.3.3 Human Resources and Financial management

Human resources management and financial (resources) management can be reduced to making available to the organisation the optimum level of human and financial resources. In terms of human resources management it means making available the staff (through proper manpower planning, task analysis, recruitment, selection, placement and induction) and to maintain those human resources (through training and development, remuneration and benefits, motivation, task design, industrial relations and personnel administration) (Marx, *et al.*, 1991: 359).

Financial management basically means obtaining the necessary financial resources to meet the demands of the organisation (capital structure) and making sure that these resources (assets) are utilised in the best possible way (investment decisions, financial control and dividend decisions).

The principles involved in human resources and financial resources management must obviously relate closely to information (resources) management. Resources are always obtained after having determined the demand for such resources. These resources are then utilised in the production process in the best possible way, from managing the inventory level to managing the quality of the end product. This means that resources, in generic terms, are acquired, enhanced, retained and delivered.

Many writers (Horton, Lewis) contend that information (as a resource) must be put on par with the other main resources of the organisation, namely, human and financial resources. Many organisations subscribe to the idea and declare information to be a "major resource". Very few, however, put this notion in practice. One reason for this may be that information cannot be treated in exactly the same way as human and financial resources. Whilst financial and human resources management have established themselves firmly as disciplines over many decades, information management is still in its infancy and little is available as to the "how" to manage this special resource.

What is the relationship between the different resources of an organisation? Griffin (1987: 524) argues that the financial resource takes center stage. He bases his argument on the fact that all other resources are expressed and controlled in terms of the financial resource. Too much inventory, for instance, is bad to the organisation as financial resources are tied up unnecessarily. Meltzer (1981) on the other hand, calls information the "ultimate" resource; it is an economic resource, a personal resource and a national resource. Cronin (1984) says the information resource conserves the other resources. One can think of arguments why human resources practitioners may call human resources the ultimate resource as without the human resource, no other resource would have any meaning in the first place.

It seems like a futile exercise to try and value one resource above the rest. The resources are interrelated to the extent that management of the one becomes impossible without the others.

5.3.4 Management of the information infrastructure

The information infrastructure consists of a variety of disciplines. Any discipline that supports the process of adding to a person's knowledge could be considered to form a part of the information infrastructure. In this respect one can think of education and training, library management and the management of information technology and information systems.

These disciplines have been studied and documented extensively and even though differences in opinions may still exist when it comes to implementation, it can be said that they have firmly established themselves. These disciplines are therefore not going to be dealt with in detail.

What is important though, is to realise that the management of the infrastructure is not synonymous to the management of information as it was defined in this study. It is a necessary precondition for effective information management, but not a sufficient condition.

5.4 Conclusion

Management has been defined and described by a multitude of academics and writers and even though new approaches to the concept will appear from time to time, there seems to be consensus that management means planning, organising, leading and controlling. These functions can be subdivided into many more subfunctions, such as decision making, curating, integrating and so on and more or less emphasis can be placed on different subfunctions. Some writers may elevate some of these subfunctions to the level of functions but in the end, only the emphasis changes and not the function or subfunction itself.

For the purposes of this study, this command-and-control model was arbitrarily chosen: Planning, organising, leading and controlling. If it is then proposed that information must be managed, it follows logically that information management must involve these four functions or steps. It was also proposed that information management means management of the information resources, the process and the infrastructure. The management of these three elements must therefore imply that they must be planned, organised, lead and controlled. It was explored in this chapter if this, in fact, applies.

Planning means preparing and positioning for the future. It means that for information to be managed, the purpose, mission, vision and policy issues for information management must be developed. It also means an integration of the business plans with the information plans with the latter being in support of the first. Proper planning must be done in terms of the information needed by the business. Data must be acquired or created and it must be enhanced into information resources. Planning must also be done for knowledge creation to be facilitated. This can be accomplished through education and training of the workforce and by creating an environment conducive to learning and the generation of ideas.

Organising is necessary to realise the plans made in the planning phase. The available resources - in particular the human resources - must be allocated in an optimum way so that goals will be realised. The organisational structure for the information management function must reflect the information management model. That means that all the related activities must report to the same position. This position becomes responsible for the facilitation and coordination of the information resources, processes and infrastructure. This calls for a person having a broad range of skills and knowledge, but care must be exercised that the position does not become a technical one. The emphasis is still on the management side and, as Weiner stated, the person must be more interested in what works than in how it works.

The information manager will have to exercise strong leadership as very few businesses seem to have made any significant progress with respect to information management as it is proposed in this study. Leading is therefore close to the heart of the information manager. Leading also relates strongly to power and the information manager will have to understand the relationship between power and information as a base for power.

Control means making sure than plans are followed so as to realise the goals set. Control of anything is impossible without information about what one wants to control. Control and information therefore go hand in hand. Control of the information resources of a business is a difficult concept to sell as most people perceive information (data) to be a free good. It is just natural for humans to collect all sorts of data and information "just in case". Control in information management terms means that this perception must change.

Control also means that proper accounting must be done of the information resources. It is suggested that information (even knowledge) must be treated as an asset rather than a cost item. Like for other resources, information (data) must be budgeted for. Information auditing, as part of the control function, means that rather than compliance auditing, advisory auditing must be undertaken.

Over and above the four management "steps", there are some specific management functions that have developed as "specialist" areas and whose principles can be applied fruitfully to information management. These are production management and marketing management. In addition, financial, human resources and information infrastructure management all have significance for information management.

It can therefore be concluded that the management principles can all be applied with relative ease to information management. This leads to the conclusion that information can in fact be managed. Not only can it be managed as a resource, it can also be managed as a process. This, at first glance, may sound logical and taken as a given. However, the special nature of information - the fact that is a resource and at the same time a process, that it is sometimes tangible and sometimes intangible - required the assumption that information can be managed to be questioned.

The above, however, has hopefully now proved that information *can* be managed. More, that information *must* be managed.

This concludes the main arguments in the study. In the next chapter the conclusions and suggestions for further research will be addressed.

CHAPTER 6

6 CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS

6.1 Introduction

In this last chapter the work preceding it needs to put into perspective and conclusions must be drawn. Certain objectives have been set in the first chapter and it is here where these objectives need to be reviewed so as to determine whether they have been met. Original research such as was attempted in this study, should have implications for various groupings and related subjects and these must be spelled out. Lastly, it is highly likely that research will open up new fields and pose new questions.

All these aspects will be covered in this chapter.

6.2 Research objectives and research questions revisited

It is proposed in the literature by experts and consultants that information should be managed analogous to the other resources, such as financial and human resources. The reasons for this proposition clearly stem from the importance information plays in the "information era" and in the "information society". Managing information in this way, so it is claimed, will lead to the true satisfaction of the need for information amidst a glut of data.

As the first objective to this study, it was necessary to evaluate the proposition that information can indeed be classified as a resource. Is information perhaps more than just as resource, or is it not a resource at all? Clarity had to be obtained regarding this issue.

Having clarified the issue of being a resource or not, the next proposition that had to be researched, was the question of manageability. Even if information is proved to be a resource, it might be such a unique resource that a resource with such characteristics must be managed in a very special way. The possibility that information is so unique that it is impossible to be managed, could not be ruled out completely.

Answers to these two objectives were necessary in order to determine whether the proposition that information must be managed can be substantiated.

6.2.1 Objective 1: Is information a resource?

6.2.1.1 What are the nature and characteristics of information?

Data are attributes with no apparent meaning. Data originate from anywhere: From documents, people, the environment and so on. It is perceived through the use of the sensory organs. Data have the potential to take on meaning, but in itself it has no meaning.

When data are put in context and perspective added so that the data become meaningful, it has been transformed into formation. This makes information something very personal and subjective and something only a human can do. De Bono (1992: 29) puts it beautifully: "...information comes wrapped in concepts and perceptions". Information itself is therefore intangible; it only exists in the mind and only a human being can transform data into information as only humans can add meaning. Technology and other means can assist in the process, but it can never create information all by itself.

This then explains why the same data can become information to one person while it remains data to another. Meaning is inseparably attached to a human being and only that human being and no-one else can make it meaningful to himself.

The primary source of information is data, that is, data become the resource for the creation of information. Data packaged in some form or another so as to ease and facilitate the process of converting data into information, can be called information resources. This packaging can come in a variety of forms: Books, conversation, speech and sound recording, video and film, shape, appearance and taste. It must be understood that these information resources are not information itself - they are only resources used to create information from.

Data and information resources are therefore one and the same thing, the only difference being that information resources are data that have undergone some or other organising process.

Hence, information is defined as data put into context and perspective.

Information created in the mind is added to other information previously created through similar processes. This addition takes place every living second of a human being - even while asleep. Collectively these "pieces" of information is called knowledge. It is a body of beliefs. Hence, knowledge is therefore defined as justified, true beliefs. Every human being has such knowledge; the justified truth in which he believes. Similarly, a common set of justified and true beliefs exists for groups of humans and even the entire human race. This becomes common knowledge; those pieces of information accepted and proven over the years and which we take to be true either through popular belief or through scientific proof.

Every human, as was shown, possesses knowledge in varying degrees. Through some mechanism, some humans have the ability to link different "pieces" of such knowledge with each other to show great insight in some or other matter or subject. This ability is called wisdom. Wisdom does not depend on the amount of knowledge the person has, it depends on the ability to connect whatever he possesses together to form new knowledge. Hence, even an uneducated person can be called "wise".

6.2.1.2 Where does information manifest itself in a narrow context?

Information (as a generic term) passes through various stages beginning with its creation (as a fact) and ending when it is being disposed of. The timeliness is an important characteristic of information and one to be taken cognisance of, especially with respect to information systems and information management. Information has other characteristics, some of them unique. These include simultaneity of ownership and the fact that it is both compressible and expandable.

The purpose of information is to share it with others and, in the process, to gain more knowledge and insight into a given situation. Information needs to be productive and not only informative. The uses of information are varied and many. It is used by individuals, business, governments and societies. Its use in decision-making is obvious as it reduces uncertainty.

Information has a very definite cost, but also a value. Cost usually rises with the rise in quality. Valuing information presents many difficulties due to its timeliness and the subjective nature. It is, however, possible to determine the value, albeit subjectively. To measure information is difficult as there is no handy, universal unit of measurement.

6.2.1.3 Where does information manifest itself in a broader context?

Human beings and information are interlinked and cannot be separated without life becoming meaningless. During the learning process, the teacher or instructor has to transform his knowledge into information or even into data, which can then be communicated to the learner. The learner has to transform this data into information and, eventually, into knowledge. For any individual to be completely cut off from information is to be reduced to little more than animal status. Individuals therefore need information.

It follows that society also became dependent on information. Societies are information intensive. Culture is shaped through the sharing of information over centuries.

The change in the economy from an industrially driven economy to a services driven one, made information indispensable as knowledge became central. Economies and societies lacking information, run the risk of being reduced to third-world status.

Businesses, from the early days, depend on information in order to survive. It is used extensively in decision-making, but the notion that more information produce better decisions, is not always valid. The solution is to have the right information at the right time.

Individuals, societies, nations and governments need information. Information therefore has wide application.

6.2.1.4 Is information a resource?

Having then defined the terms data, information knowledge and wisdom, we return to the question: Is information a resource? It is clear that information is necessary to form knowledge so it is correct to argue that information is a resource, at least in this respect. Information, however, is dependent for its creation on the existence of data (external stimuli), other information or knowledge already present in the mind of the person (internal to the person). In most cases all three would be necessary. In this respect data are resources which can be tangible (e.g. a book) or intangible (e.g. a sound) while information and knowledge can only be intangible resources.

Common (popular) understanding of the term information usually does not distinguish between the terms data, information, knowledge and wisdom. The terms information is mostly used interchangeably for these concepts. If that is taken as a point of departure, it is correct to argue that information (as the umbrella term) is a resource.

This, however, does not mean that information has only one dimension. In the process of transforming data into information, then transforming information into knowledge and, ultimately, to show wisdom, a person is being "informed". This "informing" (or "informating" as Zuboff called it) process is referred to as the process dimension of information: The process of in-forming. It focuses strongly on the communication process; a view supported by the field of semiotics and, to a lesser extent, hermeneutics. It is an important dimension and one mostly ignored - hence the proposition by some to manage information "as a resource" and information "resources" management.

The fact that information has two dimensions, a resource and a process dimension, does not distract from the resource concept and the two are certainly not mutually exclusive. Far more, they complement one another and, importantly, belong together.

In conclusion then: Information can be seen as a resource even though it is not *only* a resource.

6.2.2 Objective 2: Can information be managed?

The second objective was *"to research the proposition that information is something which can, in fact, be managed"*. This led to the following research questions:

6.2.2.1 What is information management?

Accepting that information is an important and scarce resource and an important process in the lives of individuals, organisations, nationally and internationally, it follows logically that such resource and process must be managed. This introduces two concepts. Firstly there is the term "information management" (also sometimes called information resources management) and, secondly, the term "the management of information". Although they may appear to be identical on the surface, they differ substantially on the application side.

Information management takes information in its broadest context and avoids fragmentation and compartmentalisation. It takes the process of informing as the point of departure and covers the entire process: From data through to knowledge, including and focusing on the application of knowledge. Once knowledge has been created in the mind, it has the potential to trigger some or other action. This is called productive knowledge. While it is locked up in the mind and not being applied to satisfy some objective, it is called informing knowledge.

Informing knowledge is a pre-requisite for productive knowledge and is clearly important to exist, but unless it is being applied so that some or other action is triggered, it has little practical value.

Information management focuses on productive knowledge. It looks at the processes involved in transforming data into information resources and information resources into informing and, eventually, productive knowledge. It also acknowledges that these processes are facilitated by an information infrastructure consisting of information technology and systems but also of education, training, libraries and other technologies. Information management treats all of these in a holistic way and maintains that the entire system must be managed rather than fragmenting it and managing the components discretely.

Information management in organisational terms, is the responsibility of some centralised function but, importantly, not to manage information, but to facilitate the management of information. The management of information is something that each person has as a responsibility, whether as an individual, or in organisational terms.

To expand on the management of information: Every human needs to manage the information at his disposal. In normal life, one is being bombarded with information in the form of newspapers, magazines, radio and television and through conversation. The senses are constantly transmitting data to the cerebral cortex and, somehow, all these signals must be managed so that sense is made at the end of the day. Even though we seldom think of how we manage information in our personal lives on a daily basis, it does not mean that we are not doing it. At least subconsciously, we are managing it continuously.

In organisational terms the management of information takes on meaning on a more conscious and serious level. In order to perform one's duties as an employee, regardless of the level or job, information is a vital resource. In fact, without any information at all, no job will ever get done. Obviously, the amount, diversity and complexity of the information needed, will differ widely from job to job and situation to situation.

The fact remains: Both the worker and the manager need information. In order not to be flooded by information which becomes impossible to digest and comprehend, the information must be managed. Applying filters so that only the relevant information for a particular situation is obtained and searching for information which may be needed but is not forthcoming, is what it is all about. Hence the term "the management of information".

The management of information is the responsibility of each individual while information management is the responsibility of a centralised function whose objective it is to facilitate the management of information by individuals.

The addition of the term "resources" to the terms, narrows them down. "Information *resources* management" and "the management of information *as a resource*" implies the resources dimension as the only one. This is an unnecessary limitation, one best to avoid.

6.2.2.2 Can a conceptual framework be developed for information management?

Once information and information management have been defined and put into context, a model can be built to show the relationships between the different concepts and processes. The model starts off with data as the primary input. This data are then transformed into information resources via the process of acquisition, enhancement, retention and delivery.

The information resources are then transformed into information through another process of interpretation and appropriation. This only a human can do.

Thus "informing" knowledge is created. Once this kind of knowledge is applied to reach some pre-determined goal, the knowledge becomes productive. The ultimate aim of information management is to cause action.

Knowledge can be transformed back into data or information resources.

All the processes involved in the transformation of data into knowledge take place in an environment consisting of technology and systems, libraries and many other enabling disciplines. Management is applied to the processes as well as to the resources.

It is therefore possible to construct a model for information management.

6.2.2.3 Can the management principles be applied to information?

Before applying the management principles to information, it is necessary to determine exactly what needs to be managed. Looking at the processes involved in the transformation of data into productive knowledge it is found that there are organising processes, analysing processes, judgemental processes and decision processes. These processes and the resources are the ones which must be managed. In addition, the infrastructure needed for the successful transformation processes to happen efficiently and effectively, needs to be managed.

The command-and-control model of management (planning, organising, leading and control) was shown to be applicable to all the processes, resources and to the infrastructure. Management of the first two processes - the organising and the analysing processes - are relatively straight forward. The judgemental and decision making ones are more difficult as one is dealing with an intangible entity (knowledge) existing in the mind of human beings and one is trying to manage the processes taking place in the mind.

6.2.2.4 Can information be managed?

Accepting that information can be classified as a resource and that it should be managed, the question still unanswered is: *Can* it be managed? Information is certainly a resource with very unique characteristics and, coupled with the fact that not only is it a resource, but also a process, it cannot be assumed that anything so unusual can be managed in the normal sense of the word.

The research questions could all be answered positively. It is possible to accurately define what is meant by information management and its associated term the management of information. A model can be built to show the processes, the resources and where management fits into the scheme. The principles of management can all be applied to information.

It can therefore be concluded that information can, in fact, be managed.

6.2.3 Conclusion

Returning to the research objectives, namely, to determine if information is a resource and whether it can be managed, the answer to both is a qualified "yes". It is qualified in the sense that it hinges on the definition of information and information management. As information and information management have been defined in this study, the answer is positive.

6.3 Implications

Having satisfied the research objectives, the implications of the research must be explored.

6.3.1 Implications for the individual

Even though it could be argued that statements that we are living in an information era and that we have become an information society are over dramatisations, few, if any, individuals will contest the fact that they are increasingly being confronted with more and more information (data, to be more correct) every day of their lives. There is no indication that this will cease. For years we have become used to "junk" mail and, more recently, "junk" faxes. The telephone is increasingly being used for marketing purposes leading to "junk" calls. The envisioned "information highway" will provide a mechanism to distribute and receive information (data) on a global scale in seconds.

The individual will find it increasingly more difficult to deal with all the data being aimed at him. In a certain sense it is going to be "managed" on his behalf by businesses realising the dilemma in which the consumer finds himself. Already magazines specialise so that consumers don't have to scan through thick magazines to find what they are interested in. The next step will be personalised magazines with personalised advertisements aimed at the individual taste of the individual. (Localised versions of more popular magazines such as Time are good examples of this.) The technology to do this already exists.

The individual can, therefore, rely on business to manage his information for him. However, business, generally speaking, is profit motivated and cannot cater for individual tastes and interests entirely. Its efforts may have to augmented by the individual's own. One can buy vegetables at the green grocer, but it may be life-enriching to grow it yourself.

The implications for the individual are as follows:

- The individual will have to exercise his options more consciously with regards to what he is interested in and what not. It will be impossible to deal with the volume of data he is being confronted with and, more importantly, to obtain the information he is interested in, unless the available data are managed.

On the other hand, this abundance of data and information presents the information-hunger individual with immense challenges to explore this gold mine full of data. It is up to the individual to enrich his life by refining this data into productive knowledge.

- Individuals deprived of relevant information will find it impossible to compete with those having access to it. Without any access to it, life will become little else but subsistence existence (which is fine if one chooses to do so).

- The individual will find increasingly that more and more of his personal data will become the target of businesses. Attributes such as names and addresses will be expanded to include details such as income, spending and travelling patterns, personal preferences and tastes. This will lead to more and more invasion of his privacy and emphasises the question of who the real owner of such data is. It will also lead to more and more trading with personal data with or without the consent of the individual concerned.

- Even though it may be difficult to determine the size of the services sector in the economy and even more difficult to determine the size of the information sector itself, it is abundantly clear that shifts have taken place in the economy and are continuing to take place. There is no doubt that most developed countries are firmly in the post-industrial economy. The economic "good" in this economy is knowledge and information and the "machine" is a knowledge worker.

  These changes taking place in the economy have implications for the individual. Whereas physical labour was used in the industrial economy, it shifted to intellectual work in the post-industrial economy. This allows for various minorities to be absorbed in the workforce.

  To the individual this is the time to re-skill and re-tool.

- It is not only in the economy where changes are evident. Changes are taking place in society. The buildings we work and live in are getting "smart" in the way energy is being utilised; motor cars are "intelligent" enough to adapt to changing road conditions; there is talk about "smart" cities and "smart" roads; our telephones follow us wherever we go and put us in touch with our homes and offices; our electronic mail does the same. Already the "information highway" is being built so as to link everyone with access to a computer together on a global scale.

  And we have made adjustments already: Banking, as an example, has become "faceless". The young, with enthusiasm, and the old, with reluctance and distrust at first, have both taken to automated teller machines instead of the friendly bank teller behind the counter.

  All of the above changes will not leave the individual untouched. The changes call for a universal language and non-English speaking societies find themselves locked out. TV and radio broadcasts across international borders are seen as posing a threat to existing cultures and already countries are taking steps to limit such activities.

  Individuals need to be aware of these changes and the effect it will have on them. It calls for a certain level of computer literacy just to keep up and needs a whole new set of skills if one really wants to take advantage of what becomes available. It also calls for a censorship mechanism that parents will have to exercise themselves if values and culture are to be protected in a technological world where "anything goes".

6.3.2 Implications for business

Whereas data have a cost, information has a value and people are willing to pay for it. The booming publishing industry is proof of this. This poses big challenges to business: To provide individuals with the information they find interesting and to provide businesses with information they desperately need in order to survive the onslaught of competition on a global scale. Those who have identified this opportunity have grown rich and will grow richer in future years.

Business as a consumer of information originating internally and externally to the business will have to put in a conscious effort to manage this information. Flying by the seat of the pants is not good enough any more. Competition from other businesses all over the world means that management and workers must be able to respond with minimal time delay. Decisions cannot wait until the next morning and therefore need to be made in "real-time". Decisions use information (in generic sense) as the primary resource and with the use of technology such information can be made available instantaneously, provided information is managed properly.

Businesses therefore need to get the information resources and information processes under control. This means that staff and especially managers must accept their responsibilities in terms of the management of information. It further means that information management must be put in place so as to facilitate the management of information. Depending on the size of the business, it may call for the appointment of a "Chief Information Officer" to take on this challenge. The potential benefits are huge: The business which can harness information to its advantage, stands to gain competitive advantage on a global scale.

This calls for management to involve themselves in information management principles and to make it happen. Paying lip-service or writing it in strategy documents will not by itself make it happen. It calls for management with vision regarding information as a major resource. This study provides a conceptual framework for information management and businesses can apply the principles to their advantage.

6.3.3 Implications on a national level

As with business, information as a power base for government is too important to ignore. This does not mean that governments must use information to rule ruthlessly over its citizens, on the contrary, governments must use information prudently to the benefit of the people they govern. Information can be used to protect citizens in times of conflict (warfare supremacy), but, more importantly, it must be used to empower its citizens.

Modern information technology has the potential for allowing citizens to share in decisions affecting them. Apart from the ordinary daily newspaper reporting on government activities, electronic bulletin boards enable citizens to share in information. Technology enables participation and it is up to governments to utilise it to the benefit of their citizens.

Because of the significant effect information can have on societies and even on culture, it is the duty of government to take an active stance on this issue. Transborder radio and TV broadcasts are already receiving attention in many countries. With the deployment of international data communications networks and, eventually, the information highway, this will become more difficult to control. Censorship will become impossible and the only hope to have some control is to have an information policy to guide developments.

Apart from the potential to influence and change cultures and for empowerment in general, the need for a national information policy is also driven from other issues. The "gap" between the information rich and the information poor (usually between developed and developing countries) is a cause for concern and unless governments take an active interest to manage this gap, it is likely to worsen rather than improve. The introduction of trading and investment in information technology must also be managed by way of a policy. Information, warn Du Plooy and Roode (1993: 2), is never neutral. Protection of local industries and exploration of what is available on the international markets must be balanced. The potential of information technology to replace people needs special attention and must be guided by a policy framework.

Furthermore, government must involve itself in data ownership, privacy, access and accuracy issues. One way to deal with this is to have it embedded in legislation. Another is to have it entrenched in an "Information Bill of Rights".

It is important that the aim of the development and implementation of a national information policy is not only to protect and disallow. It must also be positive and promote what is in the national best interest.

6.3.4 Implications on an international level

The imbalance between the use of information and information technology by developed and developing countries and the effect large transnational businesses may have on developing and under-developed countries is firstly the responsibility of each national government. It can, however, be governed and facilitated by the international organisations of which there are a variety.

UNESCO has already played an important role in this regard. Conflicting interests arose between what is desired by groupings of countries and individual countries. In this regard a good example is the NWICO proposals of UNESCO causing a flood of negative responses by the USA, UK and others. This should not stop the good intentions and the efforts of these international organisations. It is necessary to obtain the ever important balance between what is good for the people and what could be gained in the short term by some nations.

6.3.5 Implications for the management of information

The management of information is the responsibility of each individual and every worker and manager in organisational terms. This responsibility cannot be delegated to anyone else: It is something every person must do. This means that the individual must do the necessary to obtain the right information in the right form, at the right time and at the right cost.

Even though we tend to do this in our normal non-organisational lives with relative ease and by using mainly intuition, we may be forced in future to take this more seriously as we become swamped with data and have to extract the relevant information from that. In organisational sense the management of information cannot be left to intuition. The stakes are too high to revert to intuition.

What is necessary is for organisations to embark on a programme to make staff on all levels aware of what it means to manage information and then to implement it with the active facilitation by the information management function. Training in the use of information and information technology, but also in other related disciplines, is essential. It calls for a paradigm shift to treat information as a scarce commodity as opposed to the more popular belief that information is a free resource.

The management of information is often confused with information management. This study emphasised the differences. These are two different functions and performed in organisational terms by different people.

6.3.6 Implications for information management

Information management is a widely used term and one with many meanings to many people. This study provides a conceptual framework for information management. It investigated information and its related terminology, it looked at it in context and where it fits into a broader scheme and then proposed what information management *should* be.

For too long too many disciplines have been using this term to suit their own disciplinary purposes. And no doubt each one of those was dealing with a valid view, albeit a limited view, one restricted to the single discipline. It is time that a holistic approach is followed as suggested in this study.

The information management model proposed in this study does not negate the importance of each one of these disciplines. The library and information sciences still has its rightful place and so does computer science, communication science and all the others. They are, however, components of a bigger system. The challenge is to get all these components to contribute individually but collectively to achieve the overall purpose of information management: To create productive knowledge. This unambiguously implies that *action* is the ultimate aim.

6.4 Further research work

The following is suggested as possible themes for further research:

- This study covered a very broad range of subjects. It started with definitions of information, it put information in context, defined information management and then tested the concept against the management principles. Each one of these aspects could conceivably be the subject of a study on its own. However, for the purposes of this study, only the most essential elements of each aspect had to be extracted so as to arrive at a conceptual framework, but based on all these aspects.

- A major question still largely left unanswered by this study is: *How* information management must take place in practice. This study defined the *what* and even though a conceptual framework is now available, a model for information management has been developed and it was proven that information *can* be managed, the *how* is not entirely clear yet.

  It would be beneficial to place information management on par with the other resources management disciplines, that is, financial and human resources management. When the management model (planning, organising, leading and controling) is applied in practice to human resources management, it leads to specific actions such as recruitment, selection, induction, renumeration, organisation development and others. The same goes for financial management: Capital structure, accounting, auditing, budgeting, reserves and dividends and so on. Similarly, the management model needs to be applied in an equal amount of detail to information. This study showed that it can be done, but more detail work needs to be done.

The "how" part was specifically excluded from this study as the scope would become too wide. It would, however, complement this study if further work could be done on this very important part.

- This study does not include any empirical evidence to support what is mostly theory. Taking the framework and the model for information management as a theoretical basis, it could be investigated whether it supports what is happening in reality by doing a few case studies at organisations who seem to be managing their information well. This is, however, more difficult than it sounds as explained in the next point.

- A further question is: How do we know when information management is done by an organisation? Where does good information management show up? It would have been nice to have a measuring device which could be used to measure the effectiveness of information management in an organisation. That would enable the Chief Information Officer to go in, measure the effectiveness and based on that, devise a plan to improve it, if necessary.

  Again, to use financial management and human resources management as analogies, poor financial management shows up clearly in financial statements. Using a variety of ratios show up disequilibrium and causes for concern. Poor human resources management results, *inter alia,* in absenteeism, high turnover rates and so on. Good human resources management has good staff morale as a result. Where does good or poor information management manifest itself?

The fact that an organisation has appointed a Chief Information Officer and that it says that information management is practised, still does not guarantee that it is managed well. It does not even warrant that it is being managed at all, at least, not as it was defined in this study.

One argument is that a financially successful business is in all probability practising information management fairly successfully. It is obvious that the cheaper and more efficently an organisation can obtain its information, the more profitable it must be. One could therefore arguably take such a company and investigate whether it is managing its information. A positive finding could then be used as proof that information is in fact being managed. This would, however, not necessarily be the case as success can be attributed to many causes and not only to information being managed well.

It remains an open question as to how good or poor information management will be measured. Research to provide such a measuring tool would provide a major missing part of the jigsaw puzzle.

6.5 Contribution

Never in the history of man has information received so much attention as now. The shift from an agrarian to industrial economy and, lately, from an industrially based to a services based economy (with a consequential changes in society) must be seen as a major factor contributing to the importance being attached to information. Also contributing to this phenomenon are the changes presently shaping the business community: competing globally requires the availability of and access to vast information resources. Governments, under pressure from unions and other groups, but also from ordinary citizens through the democratic processes, need information in order to ensure prosperity to its citizens and to stay in power.

One expects to find that information is well understood and equally well managed because of its importance to individuals, businesses and governments. Yet, when one attempts to implement information management in practice, it is not at all clear what one needs to do. Worse, when turning to the fundamentals, it becomes clear that much confusion reigns with regards to the components of information management. This may indeed precisely be why information management is not practised properly.

The contribution of this study is that it defines information and its related terms, data, knowledge and wisdom by taking into consideration definitions and viewpoints from all the relevant disciplines. It puts information into narrow and broad context to make it even more clear. Using this strong base, a conceptual framework for information management is developed. In this framework the transformation processes, from data to information to informative knowledge, finally to productive knowledge and back again, as well as the resources and supporting infrastructure are shown.

Such a model or framework provides the basis to determine whether information, taking its unique attributes into consideration, can be managed along the lines of management principles. It is shown that information can indeed be managed and that it should be managed.

This study did not attempt to explore the "how". It concentrated on the research question preceding the "how", namely, the "what". It is clear that the "how" cannot be addressed before the "what" is understood. Now that the "what" is addressed, the "how" becomes a logical suggestion for further research.

Introna (1992: 5:30) proposes a number of criteria to be used in evaluating a theory. Although this study does not make a contribution in terms of the development of a theory, it does propose, *inter alia,* a conceptual framework. Using Introna's criteria, the contribution of this study can be analysed as follows:

- *Does the study raise problems previously not perceived, e.g. problems of an increasing depth, and does it display an ever-increasing fertility in suggesting new problems?*

  Information Management, as was shown, is not a simple matter. It deals with complex entities, the major one being the nature of information itself. Information spans across a wide spectrum of disciplines, each one of which contributes towards a complete picture. Although it was shown that information can be treated as a resource, one must never lose track of the fact that it is a resource with very unique characteristics and attributes.

  As was pointed out in the suggestions for further research, many aspects remain unanswered. In this respect the most pressing question is: How do we know when information is managed properly? Where does good information management manifest itself and how can it be measured?

- *Does the study anticipate novel facts and auxiliary studies?*

  The study showed that many misconceptions of what information management really is, exist. The computer industry (information technology and information systems) makes information management out to be how to manage technology and/or information systems. This study suggests that managing information systems and technology is but part of the information infrastructure which is but one of the components of information management. Likewise, the view librarians and information scientists generally hold of information management, is a subset of what this study suggests information management is.

The framework for information management suggested in this study is, as far as could be established, the first attempt in this direction.

This study is also the first which used generally accepted management principles to test the manageability of information. In doing so, it was possible to give a positive answer to a much debated issue in the literature pertaining to, mainly, information science.

- *Is the study more precise in its assertions and in the facts it explains than previous studies?*

Assertions are made with regards to a definition of information and its related terms, data, knowledge and wisdom as well as to what information management is. Assertions are made with respect to the processes, resources and infrastructure that are involved in information management.

The study, in general, goes deeper and wider with respect to information, its nature and putting information into context than most other referenced studies of this nature, but it does not leave it there. It then narrows it down into a single framework for information management.

- *Has the study unified or connected various hitherto unrelated problems, or concepts?*

This study went to great lengths to obtain understanding of information and its related concepts. It took into consideration epistemological viewpoints; it visited the arenas of semiotics and pedagogics; it explored the changes sweeping through the fields of economics and through societies; it touched upon ethical issues such as privacy, secrecy and ownership and, eventually, a possible information Bill of Rights. In evaluating the manageability of information, the principles of management were - for the first time as far as could be determined - applied to information.

In all of this lies, probably, the biggest contribution of this study as all these seemingly unrelated issues were combined into single framework for information management.

- *Does the study have positive and negative heuristic power?*

On the positive heuristic power side the following can be identified:

- Hermeneutics and semiotics hold special significance for information management. These must be further explored in order to make it more practical to the information manager.

- The effects and potential effects information has on society need to be explored further.

- Now that it has been determined *what* information management is, effort must be put into determining *how* it must be managed.

- Much thought has to be put into the manifestation of information management. It is often said that something has to be measured in order to be managed. How can it be determined whether a business or government is effective and efficient in its management of information? It is not impossible that such a debate may lead back to a redefinition of some of the terms used in order to define the "what" of information management.

On the negative heuristic power side, the following could be identified:

- It is felt that the definition of information, data, knowledge and wisdom have been exhausted and further attempts will add little value.

- Information management is not a mere concatenation of information and management.

- Information management is not only about information systems or information technology, neither is it pure semiotics or information science.

- *Has the study produced a new perspective on existing problems and thus created a new understanding of these existing problems?*

  A new perspective was placed on information management. It is not merely managing information systems and information technology, neither is it the management of a library. It shows why attempts in information management have failed when taking such narrow views and explain why decision-makers still claim that they do not have the information they require despite the glut of data available to them.

  The study also makes it clear that knowledge only becomes valuable to society once it is put to use. Knowledge must trigger action. The framework suggests the processes involved in getting from data to productive knowledge.

- *Has the study produced unconventional ideas, ideas that radically challenge current conceptions?*

  The study challenges popular viewpoints such as the ones that:

  - Information can be created by a non-human such as a computer;

  - Information management is synonymous to information systems and information technology management;

  - Information management is synonymous to library management.

In conclusion: The study made a significant contribution in terms of our understanding of what information management is. With this it added to the body of knowledge of this field.

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A Magna Carta for the Knowledge Age

Cyberspace is the land of knowledge, and the exploration of that land can be a civilization's truest, highest calling. Putting advanced computing power in the hands of entire populations will alleviate pressure on highways, reduce air pollution, allow people to live further away from crowded or dangerous urban areas, and expand family time.

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