COPYRIGHT AND CITATION CONSIDERATIONS FOR THIS THESIS/ DISSERTATION

○ Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

○ NonCommercial — You may not use the material for commercial purposes.

○ ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

How to cite this thesis
THE DEVELOPMENT OF AN INFORMATION MODEL
FOR THE MANAGEMENT OF AN EMPLOYEE ASSISTANCE
PROGRAMME

BY

WILLEM ROESTENBURG

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MAGISTER ARTIUM SOCIALIS SCIENTIAE

AT THE

RAN DAFRIKAANS UNIVERSITY

JOHANNESBURG

SUPERVISOR: PROFESSOR M.A. VAN ZYL

CARLETONVILLE, NOVEMBER 1993
THE DEVELOPMENT OF AN INFORMATION MODEL
FOR THE MANAGEMENT OF AN EMPLOYEE ASSISTANCE
PROGRAMME

BY

WILLEM ROESTENBURG

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MAGISTER ARTIUM SOCIALIS SCIENTIAE

AT THE
RAND AFRIKAANS UNIVERSITY
JOHANNESBURG

SUPERVISOR: PROFESSOR M.A. VAN ZYL

CARLETONVILLE, NOVEMBER 1993
ACKNOWLEDGEMENTS

I wish to thank the following people:

My supervisor, Professor M.A. van Zyl for his dedicated, accurate and supportive guidance and feedback on a subject which interested us both.

The Manager at Anglo American Corporation, Employee Assistance Centre, Western Deep Levels, Mrs M Ntsamai, for allowing me to do this study in the interest of the Centre's information needs.

My wife Susan, with whom I have shared many ideas, and whose support and understanding encouraged me to complete this study.

This study is dedicated to those in Human Service Organisations who are striving to grasp the technologies of the future.

Willem Roestenburg
OPSOMMING

Die ontwikkeling van 'n inligtingsmodel vir die bestuur van 'n werknemerhulpprogram.

Die onderwerp van hierdie studie het sy oorsprong gehad in die soeke na tegnologie waarmee die voortbestaan van Maatskaplike Hulpverleningsorganisasies in die resente tyd verseker kan word. Maatskaplike Hulpverleningsorganisasies in die industrie word gewoonlik geëvalueer volgens ekonomiese en besigheids beginsels. Die oorlewing van sulke organisasies is tot 'n groot mate gekoppel aan die vermoë van die organisasie om in die eise van die omgewing op 'n effektiewe en verantwoordbare manier te voldoen.

Hierdie studie fokus op die effektiewe bestuur van inligting sodat die organisasie in staat kan wees om professionele dienste op so 'n wyse te organiseer dat aan bogenoemde vereistes voldoen kan word. Ten einde in staat te wees om 'n inligtingsmodel te ontwikkel, is behoorlike teoretiese fundering en verkenning as noodsaaklike voorvereiste gestel. Daar is gevolglik van twee denkrietings van verskillende studie terreine gebruik gemaak. Ten eerste is die Lewende Sisteemteorie as basis bestudeer, terwyl die tehnologiese betrokkenheid by inligtingsbestuur aan die Inligtingskunde ontleen is. Die analisering van beide denkrietings het die navorser instaag gestel om 'n inligtingsmodel te ontwikkel waarmee die effektiwiteit van inligtingsbestuur in 'n organisasie bepaal kan word, asook die effektiwiteit van die ondersteunende inligtingsteknologie wat gebruik word in die uitvoer van inligtingsverwante take in 'n organisasie. 'n Kort uiteensetting van die indeling van die studie volg hieronder:
In die oriëntering tot die studie in Hoofstuk 1, word kortliks aandag gegee aan die rol wat tegnologiese vooruitgang speel in die verkennings van rekenaartegnologie as hulpmiddel in die Maatskaplike Werk. Die bewustheid van die waarde van hierdie tegnologie, asook die behoefte aan die ontwikkeling van 'n inligtingssisteem in die organisasie waar die navorser werksaam is, geld as die verneemste motivering vir die aanpak van 'n studie van hierdie aard. Die verneemste doelwitte asook die beperkings van die studie word verder in hierdie hoofstuk bespreek. Laastens word twee belangrike en rigtinggewende konsepte nl. Maatskaplike Hulpverleeningsorganisasie en verantwoordbaarheid omskryf.

In opvolging van 'n kort bespreking in hoofstuk 2 van die omstandighede wat aanleiding gegee het tot die soek na nuwe tegnologie in die bestuur van inligting, volg 'n definisie van die konsepte sisteem en inligtingsisteem. 'n Bespreking van die verneemste eienskappe van 'n organisasie as sisteem, asook die indeling van die organisasie in verskillende tipes sisteme, vorm die agtergrond waarvolgens die bestuur van inligting in die volgende hoofstuk bestudeer word.

Hoofstuk 3 word gewy aan die samestelling van 'n inligtingsmodel volgens die Lewende Sisteemteorie, met die insluiting van Inligtingssisteemkomponente soos ontleen aan die Inligtingsteorie. Die belangrikheid van hierdie hoofstuk word gesien in die proses van ontleiding wat die formulering van 'n inligtingsmodel voorafgaan. Hierdie ontleiding bestaan uit die omskrywing van nege kritiese subsisteeme verantwoordelik vir die prosessering van inligting, ses primêre subsisteemprosesse, asook die identifisering en omskrywing van spesifieke inligtingskomponente relevant tot elke subsisteem. Laastens volg 'n uiteensetting van 'n aantal indikatore van elke subsisteem soos gedurende die ontledingsproses geïdentifiseer is.
In hoofstuk 4 word 'n induktiewe proses gevolg wanneer die implikasies van die inligtingsmodel vir bestaande konsepte in die bestuur van inligting in die Maatskaplike Hulpverleningsorganisasie bespreek word. Die volgende konsepte naamlik sisteem, inligtingssisteem, verantwoording en Maatskaplike Hulpverleningsorganisasie word in hierdie hoofstuk krities beskou ten einde die bestaande konseptuele raamwerk onderliggend aan beide Lewende Sisteemteorie en Inligtingsteorie te veroor. Die implikasies van die inligtingsmodel vir beide genoemde teoretiese perspektiewe word beskou aan die hand van die raakvlakke tussen die teorieë, asook terreine waar die gebruik van een teorie 'n besliste voordeel vir die navorsingsproses ingehou het. Ten slotte word 'n aantal aanbevelings aan die organisasie gemaak rakende die gebruik van die Inligtingsmodel in die analisering en bestuur van organisasieinligting, die rasionaal van die model, asook die stappe van implimentering. Die aanbevelings word aangevul deur toepaslike praktiese voorbeelde soos dit in die organisasie mag voorkom. In die samevatting word die mate waartoe die navorsingsdoelwitte soos uiteengesit aan die begin van die studie evalueer.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS

OPSOMMING

LIST OF TABLES

LIST OF FIGURES

Chapter 1

ORIENTATION TO THE STUDY

Introduction .............................................. 1
1.1 MOTIVATION FOR STUDY .......................... 2
1.2 RESEARCH AIMS AND QUESTIONS ............... 3
1.3 RESEARCH DOMAIN ................................ 4
1.4 NATURE OF RESEARCH .......................... 5
1.5 LIMITATIONS OF THE STUDY ................. 6
1.6 CONCEPTUALISATION ............................ 7
  1.6.1 The concept of Human Service Organisation. 7
  1.6.2 Accountability: ............................... 9
1.7 CONCLUSION ..................................... 11

Chapter 2

THE HUMAN SERVICE ORGANISATION FROM A SYSTEMIC PERSPECTIVE ........................................ 12
Introduction. .................................................. 12

2.1 CONCEPTUALISATION ......................................... 13
  2.1.1 The concept of System. .................................. 13
  2.1.2 The concept of Information System. .................... 15

2.2 CHARACTERISTICS OF THE HS ORGANISATION AS A SYSTEM. 19
  2.2.1 Goals and purposes. .................................... 19
  2.2.2 Measure of performance. ................................ 20
  2.2.3 Inputs. .................................................. 20
  2.2.4 Outputs. .................................................. 21
  2.2.5 Clients. .................................................. 21
  2.2.6 External constraints. .................................... 22
  2.2.7 Boundaries and environment. ........................... 22
  2.2.8 Subsystems. .............................................. 23
  2.2.9 Components and Interrelations. ......................... 23
  2.2.10 Decision maker. ........................................ 24
  2.2.11 Designer. ................................................ 24

2.3 CLASSIFICATION OF THE HS ORGANISATION IN DIFFERENT TYPES OF SYSTEMS ..................................... 25
  2.3.1 The HS Organisation as Abstract System. ............... 25
  2.3.2 The HS Organisation as Concrete System. ............... 27
  2.3.3 The HS Organisation as Open System. .................. 27
  2.3.4 The HS Organisation as a Probabilistic System. ........ 27
  2.3.5 The HS Organisation as a Human/Machine System. ...... 28
  2.3.6 The HS Organisation as a Purposeful System. .......... 28
  2.3.7 The HS Organisation as an Adaptive System. .......... 29
  2.3.8 The HS Organisation as Complex System. ............... 30
LIST OF TABLES

TABLE 3.1: COMPARISON OF THE NINE CRITICAL SUBSYSTEMS THAT PROCESS INFORMATION AND ELEMENTS OF AN INFORMATION SYSTEM ................................................. 36

TABLE 3.2: INFORMATION COMPONENTS DERIVED FROM THE SIX PRIMARY PROCESSES ACCORDING TO LIVING SYSTEM THEORY. .......................................................... 48

TABLE 3.3: ABBREVIATIONS AS USED TO INTEGRATE PRIMARY PROCESSES WITH CRITICAL INFORMATION PROCESSING SUBSYSTEMS .................................................. 74

TABLE 3.4: INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: RELATIONAL PROCESSES. ....... 76

TABLE 3.5: INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: ADJUSTMENT PROCESSES. .... 78

TABLE 3.6: INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: EVOLUTIONARY PROCESSES. ......... 82

TABLE 3.7: INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: GROWTH, COHESION AND INTEGRATION. .... 83

TABLE 3.8: INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: PATHOLOGICAL PROCESSES. .......... 86

TABLE 3.9: INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: TERMINATION AND DECAY. ............ 90

TABLE 3.10: QUICK REFERENCE OF THE DISTRIBUTION OF PRIMARY PROCESSES AND SPECIFIC ORGANISATIONAL SUBSYSTEMS ........................................................................ 92

TABLE 4.1: EXAMPLES OF THE DIFFERENT INFORMATION PROCESSING SUBSYSTEMS AS FOUND IN THE EMPLOYEE ASSISTANCE CENTRE ............................................. 139

TABLE 4.2: EXAMPLE OF A FEEDBACK-LOOP AS APPLIED TO A SPECIFIC CLASS OF SERVICE. ................................................................. 143
LIST OF FIGURES

FIGURE 3.1 THE PROCESSES PERFORMED BY THE NINE CRITICAL INFORMATION PROCESSING SUBSYSTEMS: LIVING SYSTEMS THEORY .................................................. 70

FIGURE 3.2 SUBSYSTEM PROCESSES FROM A MICRO SYSTEMS PERSPECTIVE ................................................................. 71

FIGURE 3.3 MATRIX OF INTEGRATION OF PROCESSES WITH SUBSYSTEMS ................................................................. 73

FIGURE 3.4 A COMPREHENSIVE VIEW OF THE INFORMATION MODEL ................................................................. 124

FIGURE 4.1 GRAPHIC REPRESENTATION OF A FEEDBACK-LOOP ................................................................. 143
Chapter 1.

ORIENTATION TO THE STUDY.

Introduction

The impetus of this study originates in two very important motivating but also guiding concepts. The one is the concept of technology: "Technological genius is one of the glories of mankind. It has reduced the separations that are due to distance by means of flight and communications, expanded the range of human capacities with the computer and its software, opened up new biological frontiers with DNA recombinant technology, and made it possible, via the green revolution, to produce sufficient food to prevent famine and starvation." Geiss & Viswanathan (1986:xxii). Technology opens up the world to mankind. The second concept is that of entrepreneurship: "...entrepreneurship in society...requires above all application of basic concepts, the basic 'techné', of management to new problems and new opportunities." Drucker (1985:58). Thus, technology can be managed in such a way as to create or provide a service which did not exist before, or improve an existing service to a new level of effectiveness.

Managing technology in the interest of an organisation, is thus an innovative process: "Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service." Drucker (1985:32). One such technology which, if managed effectively to enable exploitation of change is that of Computerised Information Systems. Computers have been around for a long time, in fact, they have become part of our everyday life, we are now almost dependent on computers to make our lives easier for us. But, the use of computer technology in Social Work organisations is still done on a limited basis only. This was
the conclusion reached by some authors such as Geiss & Viswanathan (1986) and a previous research study done in South Africa on the subject of computer usage in Social Work organisations by Ruth Katz in 1992. (Katz, 1992: 192-194). In fact, resistance is shown to the extensive use of computer technology in Social Work organisations by an author such as Steiner, who wrote as late as 1977, that an increased focus on the management of information could negatively interfere with the quality of service delivery. Significant developments regarding the use of Information Systems in Human Service Organisations, suggest that this technology is increasingly integrated with Social Work Services.

For instance, the successful use of computerized Information Systems at Human Service divisions at large such as the Chamber of Mines Social Services Department, ESKOM and ISCOR to name some of those known to the researcher, has proven that computer technology is locally applied to good use in human service settings. How effective these Information Systems are put to use, prompted the researcher to examine this very question.

1.1 MOTIVATION FOR STUDY

The motivation for this study was provided by several stimulating events which made the researcher aware of the pressing need to examine Information Systems in Human Service Organisations. These were:

* The introduction of a Computerized Information System at the Chamber of Mines, Social Services Department, whilst the researcher was employed there as a therapist;
* The researcher's involvement with evaluating the effectiveness of services at a branch of the above organisation during a period when issues such as cost
effectiveness and other environmental pressures, threatened the survival of the branch;  
* The researcher’s current involvement with Organisational Information needs analysis and subsequent System development at the Employee Assistance Centre at Anglo American Corporation where he is currently working;  
* and a strong need to be innovative in an area that receives as yet, very little attention from Social Workers in the field. The opportunities for verifying and improving service delivery, responding to environmental needs and planning services accordingly, are countless. Not to mention the speed at which these often statistical calculations can be done with the aid of a computer!

The researcher thus believes that in accordance with the statements made in the orientation to this study, meaningful information use is the key to managing the Human Service Organisation effectively. The study was put into motion when the opportunity was seen to assist the Management of the Employee Assistance Centre at Western Deep Levels in the development of a computerized Information System. Permission was granted and the study could commence.

1.2 RESEARCH AIMS AND QUESTIONS

The main aim of this study is to develop a model which can be used to evaluate the effectiveness of Information Systems in different Human Service Organisations. The model is not supposed to

---

1 The EMPLOYEE ASSISTANCE CENTRE at Anglo American Corporation’s West Rand Region, Western Deep Levels was created when several employees from the Chamber of Mines Social Services were taken over by Anglo American when several of the so-called Centres for Human Development were closed down during 1990. As part of the Health Services of Western Deep Levels Hospital, the Employee Assistance Centre has to develop ways in which it can prove itself accountable and effective.
measure the application of computer technology alone, but has to measure the way in which information is managed by the organisation from a Social Work point of view. More specifically the aims of this study are as follows:

* To describe the Human Service organisation from a Social Work point of view.
* To describe the Organisational Information System from an Information Theory perspective;
* With the use of the Living Systems Theory, to develop an Information Model for use in the Human Service Organisation/Division;
* To determine the Information System structures and processes which play a role in the management of information.

Research questions which are prompted by a study of this nature are:

* To what extent does the Computerized Information System contribute towards the effective management of information in the organisation?
* If the Computerized Information System components are in place, does it mean that the organisation is managing its information well?
* If the organisation manages its information well, can it be attributed to the effective application of a Computerized Information System?

1.3 RESEARCH DOMAIN

For the purposes of this study, research is limited to an appreciation of two different theoretical directions, that found in the Living Systems Theory and that found in Information Theory. The

---

2 Information Theory is one of the theories contributing towards an explanation of Information Systems. The Information Systems field is seen as eclectic, drawing from various disciplines from the exact sciences, technology and the behavioural sciences. (Ahituv & Neumann, 1991:4).
convergence of these theoretical areas is achieved in the final chapter, where concepts are defined which are derived from the research of the different perspectives.

The model that is developed in this study has a wide range of application and can be used in any organisation that qualifies to be a Human Service organisation as defined later on. (see page 7). With certain alterations it could easily be made applicable to other types of organisations, since it examines general aspects of Information Management.

The model has not been tested and requires further development and refinement before it could be applied. It was however not the purpose of this study to test the model as empirical validation would far exceed the extent of a study of this nature.

1.4 NATURE OF RESEARCH

The ultimate goal of this research is to explore a relatively unknown field in Social Work (Information management in Human Service Organisations). Authors such as Polansky (1960:51) and more recently Mouton & Marais (1988:43) describe Exploratory research as having the following goals:

* To obtain new insights on a specific domain,
* To conduct preliminary investigative research before more structured research is done,
* to develop existing central concepts and constructs,
* to develop new hypotheses for existing phenomena.
The most essential guidelines for a study of this nature is the use of the methods of literature study and theoretical analysis to develop an Information Model which can be further developed and tested in a follow-up study. In this research a literature study is conducted on Information Management from two different theoretical perspectives. The one perspective was obtained from Information Theory, and the other from Living Systems Theory. In the analysis following the literature study, a guiding model is developed and partially operationalized for future use in evaluating the effectiveness of organisational Information Management.

In conclusion, exploratory research is done by using the following methods:

* A study of existing applicable literature from two theoretical perspectives;
* An analysis is conducted using these two perspectives as guideline;
* A model is constructed that can be developed for future testing.

1.5 LIMITATIONS OF THE STUDY

Since the subject of study is still relatively unknown in South Africa, the researcher had to rely mainly on overseas studies and reference material of the subject. A South African study that explores the use of Computerised Information Systems in Social Work Organisations (Katz, 1992), provided meaningful information for use in this study. Another local resource which was also extensively consulted in the analysis of this study, is the study on the application of the Living Systems Theory in the Assessment of Communities. (Delport, 1992).

A further limitation to this study is the fact that the model as is developed, has not been tested in practice. Although it is not the objective of this particular research to further develop and test the
model, the prospects of doing so appear to be exciting. In spite of this limitation, the researcher was still able to make recommendations regarding the implementation of the Information Model in the Human Service Organisation. The study also contributes to the expansion of existing concepts relevant to the organisation as System, but also to the concepts as found in Living Systems Theory and Information Theory.

1.6 CONCEPTUALISATION

Two basic terms have been used in this study so far which should be clarified at the start. These are the concepts of Human Service Organisation and Accountability.

1.6.1 The concept of Human Service Organisation.

Since the Human Service Organisation is the primary unit of study, it is imperative that this type of organisation is adequately defined. Caputo (1988:71) describes a Human Service Organisation as:

"...a loosely used term for those not-for-profit organisations in the public and private sectors which fall under the rubrics of health, education and welfare." The range and diversity associated with such organisations makes it difficult to speak of them as a uniform concept. This author distinguishes among several common characteristics separating these organisations from other types. These are:

1) They work for people by processing or changing people individually or collectively. Activities and decisions undertaken by these organisations are ideologically based and address the moral and value systems of the people that are processed. This characterization lends contextual body to the term Human Services.

2) They are further characterized by muddled missions stemming from the multiple
and conflicting expectations and demands from their equally pluralistic environment.

3) They are highly dependent on resources controlled by other organisations, and their services often reflect the constraints and contingencies imposed by these external units constituting the environment.

4) They lack effective and determinate technologies. Due to the ideologically based practice methods that are used, which fail to meet the accepted attributes of technology, organisational behaviour is primarily guided by ideologies rather than by technological and qualitative measures. This characteristic is often not seen as essential to the nature of an HS Organisation and is often viewed as an “undesirable” quality that necessitates revision.

From this classification stems the definition of an organisation that is composed of the elements of professional staff, who focus their ideologically based helping skills towards the changing of people within the framework of an organisational mission. There is also an element of dependency on outside resources for survival. With this broad characterization as background it is assumed that an Employee Assistance Programme Division can also be classified as a Human Service Organisation, taking human services to where the people are, namely at the workplace. The term EAP is mostly used to describe counselling programs for employees in their work setting, and they focus on helping troubled workers to return to their former levels of productivity. (Lewis & Lewis, 1991:224). They are thus a supportive service to Industry, which as a profit making organisation (usually), is the primary Resource provider of an EAP. (Masi, 1982:xiv).
The implications of the definition for this study are as follows:

1) The organisation under study is providing Human Services in an Industrial setting.

2) The analysis of Information Systems is aimed at Human Service organisations with an EAP function, but can be applied to Human Service Organisations in other spheres as well, e.g. Private Welfare Organisations, Governmental Welfare Departments and Alcohol and Drug Rehabilitation Centres.

3) Employee Assistance Programmes are usually also subjected to environmental constraints such as limited budgets, as are other HS Organisations.

In this study, the abbreviation HS Organisation is used to refer to the type of organisation as defined here.

1.6.2 Accountability:

The concept of accountability has become one of the most frequently used terms in the modern HS Organisation. Stemming from a period in Human Services when many questions were asked by Government and providing organisations regarding the legitimacy of these organisations, it has become a term that is strongly used in conjunction with the terms efficiency and effectiveness of organisational programmes and financial accountability.

Common questions associated with accountability are: What will (Social Welfare) programmes do? What are the costs and benefits? How can Human Service Agencies better evaluate their performance and thereby make sounder strategic decisions? (Gruber, 1981:8). These, and other similar questions refer to the accountability of HS Organisations. But what is meant with the term accountability? A definition quoted by Katz (1992:34) refers to "...a mutual responsibility that two parties have towards each other for the frequency and quality of service, also time, energy, manpower and money spent on service." In the case of the HS Organisation, this agreement exists between the resource provider, which can be the state, local government, fund raising
organisations, foundations or corporations, providing funds for which the service provider, or HS Organisation takes responsibility to manage the process of delivering a service to clients or the community. (Slavin, 1985:141).

This concept further implies that the service provider should be able to report on the financial and non-financial matters that are the direct result of their service delivery operations: "...those providing services are then required to show that available resources are spent on the most pressing problems with maximum effectiveness and efficiency." (Slavin, 1985:139). In this regard, an author such as Caputo (1988:94) stresses that besides the resource provider other parties such as the consumers, the community, the profession, one's superiors and oneself might also have an interest in the standard of functioning of the organisation.

Besides the various management modalities that have been adopted from Systems Theory to deal with improved accountability, such as MBO and PPBS (see page 32), the importance of Computer technology and Information Systems for the organisation, have been effectively described by Glastonbury (1985:83): "The significance of computer technology to the ordinary agency lies in its potential for integrating the process of evaluation with delivery of services, thus increasing agency accountability."

For purposes of this study, accountability can thus be defined as: the contractual or value based agreement between an interested or resource providing party and a Human Service Organisation to provide certain services of a required standard in exchange for certain resources, usually of a financial nature. This organisation is then required to activate certain controlling processes, of which the Information System is one, to report on the effectiveness and efficiency with which services were provided and resources utilized.

In the next Chapter, the concept of Information System will be discussed at length from an Information Theory point of view. The study of Information Systems is according to Ahituv &
Neumann (1991:4) interdisciplinary. A variety of sciences contribute to the development of these systems. Amongst these are counted Information Theory and General Systems Theory. To clarify the role of the Information System in organisational accountability, as used above, a short functional definition by Ahituv & Neumann (1991:2), is given here: "The organisational information system thus collects, transmits, processes, and stores data, and retrieves and distributes information to various users in an organisation. To reiterate, information systems produce information that supports the operation and management of an organisation."

Another theory dealing with Information processes in the organisation is the Living Systems Theory, (Miller:1978). In a comprehensive work on this theory, the author draws from studies of processes in biological cells to give a detailed discussion of the organisation as a Living System. In Chapter 3, organisational Information processes are discussed using the Living Systems Theory as frame of reference. In essence, Miller (1978:603) has defined nine critical Information processing subsystems in the organisation which are primarily responsible for Information processing functions. The role of these Information processing subsystems in accountability will also become clear in the next sections.

1.7 CONCLUSION

Having defined the two fundamental concepts that direct the theme of this study, in Chapter 2 the HS Organisation will be defined as a system. Further attention will be given to the definition of an Information System as well as to the characteristics of a system from an Information theory perspective. In Chapter 3 a process of analysis is used to develop the Information Model up to the level where indicators are derived.

In Chapter 4 the new information that was gained through analysis is incorporated in the concepts that were discussed in Chapters 1 and 2. This facilitates the development of theory, which is one of the objectives of this research.
Chapter 2
THE HUMAN SERVICE ORGANISATION FROM A SYSTEMIC PERSPECTIVE

Introduction.

It has been argued in the previous chapter, that macro economical circumstances have led to a new and growing interest in improved structured technologies to facilitate the administration of Human Service Organisations (HSO) to a point of more effectiveness and efficiency in its functioning. Some of these circumstances originated in the quest from official and public concerns towards improved accountability of organisation programmes and funding, as well as internal organisational and service related realities that forced these organisations to change.

Out of this broad statement it can be concluded that the HSO organisation is fraught with a diversity of organisational complexities which need to be structured rationally. Since this is a characteristic of most modern organisations, certain theories and tools have been developed to deal with diversity and complexity. (Ahituv & Neumann, 1991:74). In this chapter the concept of the Organisational Information System is proposed as a rational, objective and procedural alternative of information collection and dissemination towards achieving the above organisational objective.

In the conceptualisation of terms it is stressed that central to the concept of Organisational Information System is the concept of system. A full discussion of this concept is therefore rudimentary to defining an Information System. The line of argument will attempt to place the HSO organisation within the systems view as conceptual framework, thereby clarifying the interactions between the organisation and the Information System.

The central theme of this study should be kept in mind in that:

* an Information model is to be designed, with which the nature of existing Computerized Information Systems and information processes can be studied.
Stemming from the need for more accountability, recommendations ought to be made regarding the management of information in the organisation under study.

2.1 CONCEPTUALISATION

2.1.1 The concept of System.

According to Ahituv & Neumann (1991:73) a system is defined as: "... a set of interdependent components (sub-entities) that create a whole entity. The components are dynamically linked." With this definition the authors value the particular linkages, or reciprocal influences between sub-entities as an important characteristic of a system. As defined by Caputo (1988:24), this dynamic link is focused towards the attainment of goals and purposes: "A system is a set of components operating together to achieve a common purpose." It is therefore clear that the dynamic interaction between components towards a common purpose are the primary characteristics that makes an entity a system, and which differentiates that system from its environment. As an approach to viewing organisations, cognisance should then be taken not only of the whole system as such, but also of the activities associated with the components in the context of the whole entity. Put in another way, the subsystems that make up the system, contribute by their interactions to the common purposes of the organisation as a whole. The Management Information System is generally seen as such a subsystem.

Since this definition holds that there is some form of interaction between "man" and "technology" as sub-entities in the organisation, another related systems concept is postulated to describe the integration of technology in Human Services. This is the concept of synergism. The phenomenon of synergism occurs when the sum of the different subsystem activities produce a more effective organisational functioning. (Ahituv & Neumann, 1991:74). This implies that synergism or complementarity (Cnaan, 1989:191) is the end result of effective integration of technology into professional functioning. (Geiss & Viswanathan, 1986:45). Successful integration means that the
Information System of an organisation provides information in a quantified format and that professional staff have the need and skill to use this information purposefully.

Cnaan (1989:191) points out that the nature of HS Organisations, which can be differentiated from commercial organisations by its particular goals, purposes and methodologies, has led to concern about the successful integration of information technology in an organisation where most of its activities are performed skillfully by human beings themselves. This author reflects on this concern by stating that information technology can lead to job fragmentation and de-skilling of staff. The opinion is held that both professionals and computers have certain areas of excellence and that in the case of the HS organisation, professionals excel in empathy, discretion, sensitivity, the use of senses and the assessment of and intervention in complicated situations, while the computer excels in analysis and computational ability. It should even be kept in mind that, computers as components of Information Systems, have the ability to process information. Computers thus have a cognitive side. (Cnaan, 1989:198). Reinoehl & Hanna (1990:314) argue, that in the above context, the emphasis is gradually shifting from an emphasis on efficiency in performing routine tasks, to more complex cognitive applications in which manipulating information enhances practitioner effectiveness and adds to the work product. Therefore, without going into the underlying philosophies regarding this aspect, it can be concluded here that the computer, rather than replacing human functioning, can assist in reducing those areas and activities that are usually open to interpretation.

The application of the concept of synergism is not only limited to the specific interfaces between human and computer, but is also reflected in the process of design and implementation of Information Systems. Supported by various authors, the view is emphasised here that although technical designing is the field of the systems analyst, human service professionals as end users and performers of the elementary duties, have a role to play in providing knowledge and understanding which might otherwise have eluded uninformed analysts. (Cnaan, 1989:192). In this context, synergism then becomes a reflection of user friendliness. Slavin (1985:312) argues therefore that
many attempts at rational data use have failed, not because of poor design, but because of resistance by the staff who had to provide the data. Lack of involvement leads to lack of interest.

In conclusion, an operational and applied definition of the concept of system as it is used in this study is offered here. A system, in the HS Organisational sense can be defined as a set of interdependent components, consisting of professional staff and information technology, that dynamically interact and reciprocally influence each other towards a level of synergism that is conducive to the goals and purposes of that organisation, thereby differentiating that system from its environment. Differentiation in this respect means that the organisation becomes an entity separate from its environment, but also interacting with the environment.

2.1.2 The concept of Information System.

The concept of Information System is derived from a combination of the concepts of system as discussed above and the concept of information. The latter is defined as: "...data that has been processed and is meaningful to a user." (Ahituv & Neumann, 1991:2), (Caputo, 1988:24). Geiss & Viswanathan (1986:27) view data as the raw material produced by observation or measurement - that is, facts or that which the senses perceive - and that produced by thought - inferences, calculations and speculations. Information results from the processing of data into its relevant, useful and meaningful components. This means that data is processed by filtering (removal of errors and irrelevant data), aggregation, comparison, smoothing, estimation and correlation. Since information is then data that has been processed into a meaningful format, it can be deduced that some data has to be collected, transmitted, then processed and stored. To become meaningful to a user, the information must be retrieved and distributed to them. Another definition explaining in detail the variety of activities embodied in the concept is offered by Slavin (1985:312). He defines an Information System as: "... a series of processes, including systematic classification, indexing and coding, and data collection, storage, processing, retrieval and transmission." This definition is supported by that of Geiss & Viswanathan (1986:28), except that they add the dimension of
information that is needed by a person as evidence to reach a solution for some organisational problem. This aspect once again distinguishes information from data. Data that is used for a specific purpose, can be described as information. Information processed into a body of facts, theories or scientific laws (evidence), becomes knowledge. Knowledge may be viewed as a compact statement of information into its essence (Geiss & Viswanathan, 1986:28). Weirich (1985:333) adds that this evidence is made available to this person through "some mode of presentation" (reports, graphs, tables, figures). The Information System thus becomes a problem-solving tool. With this addition of a contextual interface between a human factor and the Information System, the aspect of complementarity as previously discussed, is once more emphasized. Caputo (1988:25) holds the opinion that implicit in the term is the notion of flow. Information moves from one person to another, creating a constant series of decisions, which causes work to be done.

Slavin (1985:312) distinguishes between manual and automated or electronic data processing and stresses that the choice of type of system is determined by the volume, complexity (number of variables required for classification and retrieval) and the costs involved. In this respect Gruber (1981:235) argues that Human Service Organisations have always had some form of Information System. He maintains that file cabinets with data on client dispositions, budgets, case conferences and case notes are examples thereof, but in line with the above definition, these can actually only be described as data banks or Information System hardware, since raw data is then stored in an unprocessed meaningless format. (Caputo, 1988:25). In some organisations this data is sometimes processed and retrieved manually for the use of annual reports or enquiries, in which case it becomes meaningful to a user. Only then it can be argued that an Information System exists. What is clear however, is the argument that modern complexities of both the environment that these organisations operate in, as well as the internal realities of organisational functioning, have rendered these manual data processing and retrieval systems inadequate. To achieve a higher level of sophistication and consistency of reporting, the drive now appears to be towards the full automation of Information Systems.
Derived from Information Theory the Information System concept is further divided into different types of subsystems. These are generally regarded as Administrative Data Processing Systems (ADPS), consisting of the Transactional Processing System (TPS), with its focus on data capturing of transactions and storage in files, and the Structured Decision System (SDS), which facilitates structuring of routine decision making. Another subsystem is the Decision Support System (DSS) which focuses on information that is supplied to management in support of less structured decision making. The decision making facilities, Structured Decision System (SDS) and Decision Support System (DSS) together are termed the Management Information System (MIS), while all the above named subsystems together form the Organisational Information System (OIS). (Ahituv & Neumann, 1991:130).

As part of a study on Computer applications in Human Services, Van Lieshout (1992:14) identified six subsystems in terms of areas of applicability in the HS Organisation:

1) **Applications aimed at support of Management functions:**
   Planning and budgeting systems, program development and monitoring, public relations, evaluation, cost analysis social and legislative action. This can be termed Management Information systems supporting management decision making.

2) **Applications for registration and administrative procedures:**
   Client- and personnel registration information systems, or course attendance registration.

3) **Applications for data retrieval:**
   Research orientated programmes facilitating access to a Database or Data bank.

4) **Applications for Client use:**
   Information gathering without the presence of professionals.

5) **Applications for decision support in direct practice:**
   Expert systems to facilitate Assessment and Clinical diagnosis, referral and follow-up, continuity of service, service integration, tracking clients, recording progress and staff evaluation. To this can be added various research applications such as
knowledge building, social problem analysis, program evaluation and practice testing.

6) **Applications for Direct Practice:**

Information distribution to clients with the active participation of the Practitioner, i.e. budgeting advice and therapeutic applications. (Supported by Slavin, 1985:311).

This description serves to explain subsystems in practice, but also informs us of the different end-users of Information Systems.

The components of Information Systems are described by Ahituv & Neumann (1991:2), Gruber (1981:236) and Caputo (1988:25) as people (users), hardware (data storage, processing, retrieval devices), software (data structure, organisation methods, computing language and programs), data and procedures. The information that is processed by this system is used to support the operational and management functions of the organisation.

Management functions can be defined to exist on different levels in the organisation. Derived from the model of organisational decision making as proposed by Anthony (1965) (Ahituv & Neumann, 1991:112), and applied to the HS Organisation, strategic decisions are made by the director, departmental head, or senior management of the organisation, planning and control of staff operations and case management by supervisors or case managers, while the actual operations are managed by professional staff and clients who decide on interventions. Anthony's model also suggests that decision making is less structured at the strategic level than at the operations level, therefore the various users require different types of information.

For the purposes of this study, an Information System in a HS Organisation can be defined as the collection, classification, coding and indexing of data for storage, as well as the processing, retrieval and transmission of information in different formats, to various end users in the organisation. The purpose of the system is to improve, rationalise and streamline management and operational functioning. An information system thus becomes an organisational tool to rationalise and quantify
the activities of the organisation, with the aim of installing a monitoring and control tool for management, which will facilitate more effective decision making, service delivery and improved organisational accountability. (Gruber, 1981:238).

2.2 CHARACTERISTICS OF THE HS ORGANISATION AS A SYSTEM.

Having defined the concepts of System and Information System, the next step is to determine the necessary conditions for an entity to be conceived as a system. In order to facilitate the operationalisation of the concept "system", the following section is devoted to a description of the HS Organisation in terms of its characteristics. With this description some of the non-rational but quantifiable areas of such a system can be explored more effectively. In systems analysis methodology, a description of the characteristics of a particular system is generally regarded as the first step of analysis. (Ahituv & Neumann, 1991:82).

The discussion follows the basic characteristics of the organisation as a man-made system as proposed by Ahituv & Neumann (1991:82) and supported by Katz (1992:47).

2.2.1 Goals and purposes.

Like any organisational system, the HS Organisation also has certain long term purposes and short term goals that can be explicit or implicit to the Organisation.

Gruber (1981:5) argues that the purposes of the HS Organisation often take on certain symbolic qualities which often mystify the position of the organisation in society, and mask the nature of actual operations. The same author also holds that objectives are often stated in such general terms that their effects could not be easily measured. Clarification of objectives in precise statements and the identification of quantitative measures is thus a prerequisite of proper systems analysis. Slavin (1985:155) notes in this regard: "They (Social Workers) should learn to talk about which of how many at what price, with what expected success, and why this is the way society should do it."
This can be considered of vital importance, since it determines the implementation of the characteristic of measurement. The purpose of a Management Information System would be to provide quantified information at all levels of management in the particular organisation. This often includes clients, who within the realm of modern practice are co-responsible for taking treatment decisions.

2.2.2 Measure of performance.

At the opposite end of purposes and goals and in direct relation to these, is the characteristic of a measurement tool for measuring the effectiveness - the extent to which goals were achieved, (the relation between the purpose and the entity's outputs), and efficiency measures - how well were the goals achieved (the relation between purposes, outputs and inputs).

2.2.3 Inputs.

Defined by Ahituv & Neumann (1991:82) as concerned with organisation resources such as capital, personnel, information, materials, inventories, machinery, inputs which are used and transformed into outputs. The technologies that are used by HS staff to change people's functioning on an individual and collective manner, can be considered the inputs that are applied to process people. It is interesting to note the view of Gruber (1981:9) and others that the HS Organisation was previously mostly focusing its policy and planning efforts towards measuring inputs, rather than output, effectiveness or impact. In this area, the uncertainties, unknowns and unpredictable events as phenomena occurring in the life of the HS Organisation, related to clients served and outcomes of therapy, as well as the high worker discretion in determining treatment decisions, which are often based on ideologies only, is believed to contaminate the determinacy and effectiveness of technological input. (Caputo, 1988:71). In a paper about the crisis of accountability Newman and Turem (1985:168) refer to Scott Briar's summary of the main problem regarding technological inputs: "...(The profession is) sliding from theory to theory, from technique to technique, but seldom grappling with the question of whether what was accomplished did the clients any good." Although characteristic of the HS Organisation, these factors ultimately contribute towards the
vagueness and disorganisation in the monitoring, controlling and structuring of performance. (Gruber, 1981:6).

2.2.4 Outputs.

Strongly associated with the foregoing characteristic, a system qualifies to be a system when certain outputs are produced in order to fulfil or achieve the stated purposes. Along the line of argument taken by Caputo (1988:71) the HS Organisation is frequently seen as a people processing system, meaning that the people who come to the agency, qualify to be the "raw material" that has to be processed or subjected to correctional technology, to be transformed into an output. In this respect the HS Organisation is characterized as a system, since it displays the production of outputs in terms of better client functioning or reduced pathology.

This characteristic is, however, the subject of much controversy and argumentation, because of numerous factors that influence the rational quantification of outputs. Some of these are:

* The impact of interventions are difficult to measure due to the absence of measuring instruments.
* Related to the above, change could be effected by other variables than the particular service that was rendered.
* There is an absence of an active market regulating mechanism that is guided by demand for service.

It can thus be stated here that due to the above, issues such as accountability and quantification of services become vague.

2.2.5 Clients.

With this characteristic the authors attempt to describe the aspect of service delivery to a client by the entity, as a way to defining the entity as a system. The client not only appears at the root of goals and purposes, but becomes a measure of performance. Thus, the higher the measure of performance, the better are the client's interests served.
Likewise, the Information System is also designed to serve the interests or value based needs of managers at different levels in the organisation. In the design of the system, the value system of the client should be recognized at all times.

2.2.6 External constraints.
A system is constantly affected by external constraints that are imposed on it by its particular environment. HS Organisations are influenced by environmental factors such as its dependency on resources provided by Government or outside organisations, the pressure from these providers to know how resources were spent and, the conflicting societal expectancies and system demands that lead to muddled goals and missions, place constraints on the HS Organisation that are difficult to overcome.

2.2.7 Boundaries and environment.
The particular features that define and delineate the system, form its boundaries. This definition then suggests that the system is on the inside of the boundaries, while the environment is on the outside.

Only when the system forms a self-contained entity which is controlled by the system itself, can it be truly considered to have boundaries. The different interactions, between the system and its environment, constitute the interfaces that occur at the boundaries. This takes the form of inputs and outputs. (Ahituv & Neumann, 1991:84). Applied to the HS organisation, it is found that the environment often consists of primarily the population group which forms the target for inputs and institutions that have to provide the funds to maintain that particular system.

In a certain sense then, the HS Organisation is not a fully self contained entity, since it is directly dependent on its environment for survival. The environment has to provide the raw material, as well as the means to obtain inputs in the form of funding and communication of legitimacy. In return the system produces the outputs. It can be argued then, that the interface at the boundaries
of the system are related to the issues of accountability, missions and impact of outputs.

2.2.8 Subsystems.

A system is composed of different subsystems which are purposeful in their own right, have their own measures of performance, but contribute towards the purposes and measurements of the whole system. Adjustments in subsystems lead to changes in the whole system, as well as in the measurement of activities. Common examples of subsystems found in the computerised Information System, mainly consist of Transaction Processing Systems (TPS) and Decision Support Systems (DSS). In the context of the HS Organisation, groups of Social workers, or project teams working on specific tasks can be described as subsystems.

2.2.9 Components and Interrelations.

It is generally regarded that the components of systems perform the processing (transformation) activities of inputs into outputs. Within the HS Organisation, this process is performed by the professional staff as components or elements to the system. In the process, staff make use of certain input resources which in the case under study refers to the technologies, skills and knowledge base which is applied in the interventions of the organisation.

Cognisance should be taken of the complexities that hinder the effective rational analysis of component activities. These are:

* The traditional focus of direct practice on the quality of the therapist-client relationship does not accommodate quantitative aspects such as work standards, and increase in client turnover. (Glastonbury, 1985:23).

* High therapist discretion in selection of appropriate technology. This represents high component control of the nature and type of inputs.

* In accordance with the characteristic of control and the role of decision maker who

---

3 See page 15 for a complete discussion of these terms.
can alter performance or measurement of the system, as posed by Katz (1992:47), it is clear that although such role exists, the HS Organisation is characterized by a lack of control over productivity and qualitative measurements by management.

- High level of dependency on worker’s ability to overcome client resistance to intervention.

2.2.10 Decision maker.

This is a vital condition for a system, since the decision maker can produce changes in the measures of performance of the system components, and hence in the measures of performance of the whole system. Thereby change in outputs can be effected. The role of decision maker is generally vested in the various managers in the organisation. Decision makers in the HS Organisation consist of the organisational director, the controlling board, case managers and supervisors, clinical staff and in some instances the clients themselves. It can be deduced that each type of decision maker requires a different aspect of the same available information that is usually relevant to the types of decisions they make.

2.2.11 Designer.

A designer is defined as the person who plans, designs or conceptualizes the nature of the system, by affecting the decision maker towards actions to change the component's measure of performance, and thereby the measure of performance of the whole system. The intention of the designer is to optimize the performance of the system in the best interest of the client served. It is for instance important to design the Information System to serve the needs of the users, otherwise the system may never be implemented.

It can be concluded then, that the HS Organisation can be characterized as a system. The various activities of the different components represent the activities commonly found in systems, although the measure of performance is often subject to vagueness and a low level of definition.
2.3 CLASSIFICATION OF THE HS ORGANISATION IN DIFFERENT TYPES OF SYSTEMS

It has been shown that the HS organisation displays the typical characteristics commonly found in systems. In fact, in terms of its characteristics, the HS Organisation can immediately be defined as a human-made system. Since natural systems are part of nature, and therefore not the focus of study, the implications of viewing the HS Organisation as a system created by man, provides the researcher with a whole range of implications to deal with in evaluation. An evaluative framework is provided by Ahituv & Neumann (1991:95) to facilitate the effective analysis and study of the HS Organisation. Throughout the discussion, appropriate definition of classes is followed by assuming interrelations with Social Work literature.

2.3.1 The HS Organisation as Abstract System.

The above authors define such a system as an orderly arrangement of components all of which are concepts. They distinguish between procedural systems, where the components consist of the procedures, regulations and laws, that are created through definition and assumptions, to solve problems or accomplish certain tasks, and a purely conceptual system where the body of concepts strives to explain aspects of reality. (So called abstracted systems). Within their view, organisational structure is classified as a product of an abstract procedural system.

The HS Organisation displays elements of the above definition. In their defining of organisational activities, Reinoehl & Hanna (1989:21) maintain that direct client services, defined as: "...the procedures which provide assessment, treatment or planned change for individuals, families, groups, organisations or communities."; policies, defined as the principles which gives expression to valued ends and directs Social Welfare actions; planning, defined as foresight, investigation and systematic thinking directed towards problem solving and control of future actions; and

---

4 Example: The legal System or the organisational structure of an organisation.
5 Example: Symbolic value such as Einstein's Relativity Theory.
administration, defined as the implementation of policies and procedures; all lend meaning to the organisational structure and thus to classifying the HS Organisation as an abstract procedural System.

Although the level of abstraction that is reached by the continuous definition of professional concepts, does not reach that of Einstein’s Relativity Theory. Social Work concepts attempt to explain certain aspects of reality with the aim to design methodologies to solve the problems in reality. Although this view is supported by Caputo (1988:71 - 73), he maintains that the mostly ideologically based nature of Human Service technologies, has certain ramifications for concretizing human services. In spite of these implications, it can be argued that the HS Organisation can be classified as having the elements of an abstract conceptual system.

The value of the MIS is seen especially in the abstract procedural area of the organisation. The drive towards accountability and efficiency through rationalizing of activities by means of control processes found in systems management, operations research and input-output analysis will lead towards better allocation of resources, monitoring and evaluation of social programmes. (Caputo, 1988:133). This author also argues that according to Weberian theory, accountability and legitimacy will be facilitated by further bureaucratization through structuring authority and decision making roles. The implementation of an MIS has a dual function. Not only does it structure decision making, but the increased level of abstraction that is reached in organisational functioning will facilitate information flow.

Specific applications of The MIS in the procedural area are: Decision Support Systems, data manipulation in research and evaluation, program budgeting and fiscal management. These applications appear to be in accordance to general applications as found in most organisations.

---

6 This idea is further discussed under Probabilistic and Concrete system.

7 Refer to page 15 for full explanation of terms.
2.3.2 The HS Organisation as Concrete System.

A concrete system necessitates the presence of at least two components which are objects. The two main classes associated with concrete systems are physical systems, which as a set of physical components operate together to accomplish an objective, and social systems, in which an organized and coordinated group of people operate together to achieve a common purpose. The Computerized Management Information System falls within the boundaries of physical systems, since it is comprised of definite physical components that have specific functions, while the Human Service Organisation is an example of the latter. Although professional staff (Social workers) and their clients, as an organized and coordinated group, can be seen as working towards a common purpose, it appears that due to indeterminate practice methods and highly individualized discretion in controlling interventions, the concretizing of Social system activities is highly problematic.

2.3.3 The HS Organisation as Open System.

An open system is one that has an environment and interacts with elements of that environment. There is also a process of exchange between the system and its environment, and the goods that are exchanged in the process are either inputs and outputs, or valuable resources. Both the HS organisation and the Information System qualifies for this class.

2.3.4 The HS Organisation as a Probabilistic System.

In this classification, the level of randomness inherent in the behaviour of the organisation determines its predictability. A high level of predictability is found in deterministic systems such as computer programmes since the relationship between inputs and outputs are predictable. Knowledge of component activities enables one to make predictions.

A very low level of predictability is found in random systems where uncertainty about rules of behaviour and the interrelations among components exists. The HS Organisation can be placed somewhere in between these extremes, and can be typified as a probabilistic or "loosely coupled" system since it operates in a relatively predictable manner.
There is however a level of uncertainty inherent in predicting outcomes of most of its inputs. This can be attributed to an inability to control extraneous factors and a lack of a clear relationship between a given set of intervention procedures and actual outcomes. This condition allows for the inclusion of many different variations and practices under the guise of the same method. (Caputo, 1988:73). In spite of these shortcomings the HS Organisation cannot be typified as a typical random system.

2.3.5 The HS Organisation as a Human/Machine System.

With this classification it is argued that the HS Organisation can be classified as a human/machine system, since both human and machine subsystems are used in its operations. Traditionally, Human Services might have been associated with being a human system only, but the use of some mechanical device in support of its functioning, altered this classification drastically. It is argued that for optimum goal realisation, an ideal combination of human and machine subsystems attempts to use the best characteristics of both.

The level of sophistication of this interrelationship is determined by the type of mechanisation that is achieved. For example, a computerized Information System can be used to enable full automation of office activities, or a computer program is designed to support professional staff in diagnosing clients, in which case the interrelationship becomes highly sophisticated. Gruber (1981:236) postulates however that in the HS Organisation, humans will never be replaced by a completely machine operated system.

2.3.6 The HS Organisation as a Purposeful System.

Central to the definition of a purposeful system is the characteristic of equi-finality, or the ability of the system to achieve the same final end by different means and from different states. Applied to the HS Organisation as system, it is clear that with its human element as component, it can deliver certain outputs under various conditions. Social workers can, for example, do their work of transforming a variety of client conditions from their offices, or at their client's home or
workplace. They can work with individuals, groups or communities, they use different input technology, all with the same purpose in mind, namely to create change. These purposes are embodied in the organisation's goal statements, policies and plans, and becomes the subject of organisational control and accountability.

As stated by Ahituv & Neumann (1991:97) and supported by Katz (1992:55) the Management Information System is a purposeful system in itself. Its purpose is to enhance and support the purpose of the organisation, by producing reports (outputs) of information in a variety of ways, or by reducing administrative decision making. The adoption of an Information System can in itself suggest adherence to the principle of equi-finality, since it suggests that traditional structuring of activities is not the only way to a successful system. (Geiss & Viswanathan, 1986:49).

2.3.7 The HS Organisation as an Adaptive System.
This classification refers to the ability of the system to adapt itself to the changes that may occur in the environment within which that system operates. Adaptability ensures that some of the efficiency that is lost during change is regained. Organisations, inclusive of the HS Organisation, generally can be classified as having such capacity. Literature shows that the HS Organisation was forced by environmental pressures to adapt its technology and accountability measures towards fulfilling its purposes and ensuring its survival.

Katz (1992:56) argues that HS Organisations can increase their adaptability, by moving away from a focus on organisational structure as approach, to adopting a strategic management approach. She further argues that Information Systems can play a vital role in this area by firstly reducing the administrative burden of professional staff, who are then enabled to fulfil their professional duties more efficiently, and secondly, by automating routine decision making. (see also: Geiss & Viswanathan, 1986:252).
2.3.8 The HS Organisation as Complex System.

According to this classification, complexity refers to the number of components and interrelations that can effectively be described. The HS Organisation can be classified as a complex system, since the complexity of their social, political, ethical and legal contexts has increased in recent years. (Katz, 1992:62).

2.3.9 The HS Organisation as a Closed-Loop System.

Within this classification, the aspect of a systems-control function by at least one component of that system, which constitutes a Feedback-Loop in its performance, is seen as the essential element of the definition. This implies that comparisons are done between inputs and outputs of the system with the aim of exerting control over its operations.

Control implies that there is a controlling subsystem and a controlled subsystem. The function of the controlling system is to compare achieved outcomes with desired outcomes. If deficiencies are identified, corrective signals are sent to the controlled system. The latter then has to change its behaviour to reduce the observed deficiencies. (Ahituv & Neumann, 1991:98). According to these authors, the essence of control is sensing the system’s outputs, comparing them to the stated objectives (standards) and generating corrective actions to either change the inputs, structure or objectives of the controlled system.

The role of the Information System is clear in that its Feedback-Loop links subsystems together, enabling the control subsystem to make rational and calculated decisions about future actions. Feedback-Loops can either be negative, - in which case actions of the controlled system are reversed away from the objectives, or positive, - in which case corrective signals reinforce the actions of the controlled subsystem. Without a Feedback-Loop it is questionable if the organisation will be able to adjust to the demands that are placed on it to provide services in accordance with environmental
needs. The importance of a Feedback-Loop in the entropy\(^8\) of the organisation as system, cannot be underestimated.

Katz (1992:56) maintains that control in the HS Organisation refers to all the mechanisms that contribute towards its accountability, and she includes here the Information System, units of service, techniques for programme evaluation, integrated service delivery or the various paradigms that can be adopted by the organisation, such as the mission, client and staff development paradigm. In the opinion of Caputo (1988:74) control is also dependent on the concept of authority and power in the organisation. He argues that these concepts are in turn not only dependent on the hierarchical structure of the organisation, but also on aspects such as professional status or area of expertise. The accurate exertion of power and authority is undermined by the indeterminate nature of the activities in the HS Organisation.

In the above sense, control is a largely problematic issue, since it appears to be vested in several subsystems at the same time at various levels. Control is therefore not only vested in organisational position, but also in knowledge, credibility and expertise. For instance, the amount of control over organizational activities is also directly dependent on the professional’s ability to control the clients. Thus, Caputo (1988:74) classifies the HS Organisation as a client control system, since the organisation should strive to minimize the client's ability to negate the assistance provided by the organisation. To overcome this inherent resistance to receive assistance, practitioners need to have information at hand to change and improve their practices to the point where clients actually demand service. These different control systems create a variety of information needs, which should be accommodated by the Organisational Information System.

With this classification of the organisation in different types of systems complete, the last section of this chapter deals with the relevance of the Systems perspective in the analysis of the organisation.

---

\(^8\)The ability of a System to survive.
2.4 THE RELEVANCE OF THE SYSTEMS PERSPECTIVE IN THE ANALYSIS OF
THE HS ORGANISATION - CONCLUDING REMARKS.

The Systems Perspective is not only valuable in describing the HS Organisation in terms of its
Systems properties, but it also provides the background for a framework to analyze the role of
Information Systems in the solving of accountability problems inherent in these organisations.

It needs to be noted here that Information Systems which originated from the Systemic Perspective,
act as a subsystem in a technical rational fashion in support of managerial functioning. Slavin
(1985:185) notes in this respect that the term Scientific Management refers to all managerial
ideologies that are based on terms such as systems management, systems analysis, operations
research and systems engineering. Included in these models are Planning, Programming, Budgeting
Systems (PPBS), Management by Objectives (MBO), Zero Based Budgeting (ZBB) and
Management Information Systems (MIS).

In this Chapter the organisation was studied from a Systemic Perspective as it is found in
Information Theory. The Systems Perspective thus is a helpful theoretical framework for
structuring activities in the HS Organisation. For instance, the Systems Perspective has facilitated
the classification of the HS Organisation as an abstract, concrete, open, probabilistic,
human/machine, purposeful, adaptive, complex and closed-loop system. The different
components of Information Systems have also been clarified in this Chapter. Another valuable
contribution made by this perspective is that of the importance of the Feedback-Loop in the
adjustment of organisation processes. In this study, the focus is ultimately on Information
processing in the organisation. Having clarified the role of the Information System in the HS
Organisation it is now possible to proceed to the next phase of this study, which is the identification
of elements of an Information model, using Living Systems Theory.
TOWARDS A MODEL OF ORGANISATIONAL INFORMATION ANALYSIS.

Introduction.
In Chapter 2 the HS Organisation, as unit of study, was defined and characterized as a typical system. It was also concluded that the Organisational Information System can be described as a subsystem to the organisation. From an Information Theory point of view, both the organisation as well as the Information system can also be classified as an abstract, concrete, probabilistic, human/machine, purposeful, adaptive, complex and a closed-loop system.

In this chapter the notion is introduced that there is an interrelationship between the effectiveness of the Information System elements and the functional effectiveness of organisational functioning. Thus, the way in which information is managed becomes a direct indicator of how effective the organisation as system is functioning. This view gives direction to the statement of Caputo (1988:133) that the Information System actually facilitates structuring of decision making roles and authority in the organisation. This author further stresses the point that improved bureaucratization leads to improved organisational functioning. It can be concluded then that the more effective information processes are carried out, the better structured, less complex and more effective the organisation can be.

3.1 THE LIVING SYSTEMS THEORY AS PERSPECTIVE FOR ANALYSIS.
This almost reciprocal relationship between effective Information management and effective organisational functioning can be examined from a Social Work perspective by means of the Living Systems Theory. In a study about the Living Systems Theory, Delport (1992:73) mentions that the General Living Systems Theory as conceptual framework has a wide range of application. It can be used to assess, inclusive of the HS Organisation, all social and biological systems. As framework, it moves away from strictly formal structural to structural and process orientated analysis. This lends a systematic character to subsystem analysis.
Miller (1978:597) holds the view that Living Systems Theory not only helps with definition to differentiate organisations from other living systems, but also provides a basis for understanding how organisations differ and how through the application of quantitative techniques organisations can be studied. In this study, the value of the theory is seen as providing a bridge between aspects regarding effective organisational functioning and elements of Information Theory.

In his major work on the Living Systems Theory, Miller (1978:603) has identified nineteen critical subsystems which are normally extensively developed in most organisations and which enables classification and description of organisational activities. Without the presence of these subsystems the organisation cannot function. It is also maintained by this author that nine of these subsystems are primarily responsible for managing information in the system. The other subsystems have either a combined information and matter-energy function, or solely a matter-energy function. By matter-energy is meant all physical equipment, components, people, objects that is used by the organisation in its production or information processes.

Since the nine critical information processing subsystems are identified as essential for organisational functioning, and they are at the core of what happens with information in the organisation, they provide an excellent basis for analysis of Organisational Information Management. The development of an Information Model can be facilitated by analysing these subsystems in terms of their definitions, structures and functions. Since this study focuses primarily on Information processing in the HS Organisation, the other eleven critical matter-energy related subsystems in the organisation are not examined here.

3.1.1 Comparing the nine critical Information Processing Subsystems with elements of an Information System.

As an initial step towards converging two theoretical perspectives and developing an Information Model, it is necessary to confirm whether the Information System, as defined in this study, displays elements of the nine critical Information processing subsystems.
This step in framework building can be achieved by comparing the nine critical subsystems with elements of Information Systems, as identified in the previous chapter and according to the work of Ahituv & Neumann, (1991). The comparison is provided in Table 3.1 where a detailed description of the particular subsystem is compared to the relevant Information component as found in Information Theory. The Information components were derived from Chapter 2 and intensive study of Ahituv & Neumann (1991) to identify all possible Information System components which could be applicable to the arrangement of subsystems as provided by the Living Systems Theory. These subsystems are as follows: Input Transducer, Internal Transducer, Channel and Network, Decoder, Associator, Memory, Decider, Encoder, Output Transducer. A brief description of methodology as used by the researcher is given here.

3.1.2 Research methodology used in comparing the nine critical Information processing subsystems with Information System components.

1) The definition of a subsystem as provided by Miller (1976) forms the basis upon which a description of the function of a subsystem can be formulated.

2) The researcher then uses descriptive knowledge of HS Organisations as obtained from Chapter 2, (see page 19 - 31), as well as practical experience of HS Organisations, to find practical examples of how a subsystem can possibly be identified in an Organisation.

3) A careful study of Information Theory then provides the structural and functional elements that will match with the practical examples of each subsystem.

4) Key elements of subsystem definitions are then used to provide the scope in the search for Information components.

5) One subsystem analysis is completed first, before a next one is dealt with. This step prevents eventual confusion and impaired accuracy of definition, due to possible fatigue.

The results of this analysis is given in Table 3.1 below:
### TABLE 3.1: COMPARISON OF THE NINE CRITICAL SUBSYSTEMS THAT PROCESS INFORMATION AND ELEMENTS OF AN INFORMATION SYSTEM

<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEMS IN PROCESSING OF INFORMATION: LIVING SYSTEMS THEORY.</th>
<th>ELEMENTS OF INFORMATION SYSTEMS: INFORMATION THEORY.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.1 INPUT-TRANSUDER</strong></td>
<td></td>
</tr>
<tr>
<td>Refers to the sensory subsystem responsible for bringing descriptive information in a matter-energy format into the organisation for internal transmission. Examples:</td>
<td>The Information System uses a specific range of variables that are determined during the design of the procedures and formats for external Information collection. Information from the environment, clients or other resources is collected and presented in a standardized format called a source record, which is then given to an operator who physically reads the data from the source record into the system. This input process is generally called the Transaction Processing System (TPS) which focuses on capturing and entering data into the Information System.</td>
</tr>
<tr>
<td>1) Market research departments reporting on environmental tendencies,</td>
<td></td>
</tr>
<tr>
<td>2) medical personnel taking down patient history,</td>
<td></td>
</tr>
<tr>
<td>3) magazines, books, test and assessment results,</td>
<td></td>
</tr>
<tr>
<td>4) answering to telephone calls,</td>
<td></td>
</tr>
<tr>
<td>5) incoming correspondence, financial payments and</td>
<td></td>
</tr>
<tr>
<td>6) environmental policies.</td>
<td></td>
</tr>
</tbody>
</table>
### CRITICAL SUBSYSTEMS IN PROCESSING OF INFORMATION: LIVING SYSTEMS THEORY.

<table>
<thead>
<tr>
<th>3.2 INTERNAL TRANSDUCER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refers to the sensory subsystem obtaining, reporting and receiving descriptive information about subsystem or component activities internal to the organisation. Examples:</td>
</tr>
<tr>
<td>1) a departmental head responsible for internal reporting,</td>
</tr>
<tr>
<td>2) staff meetings, newsletters, departmental reports, status reports, financial reports, caseload reports and internal requests,</td>
</tr>
<tr>
<td>3) needs assessments (internal).</td>
</tr>
</tbody>
</table>

### ELEMENTS OF INFORMATION SYSTEMS: INFORMATION THEORY.

Internal transducing of the data after reading in is performed by a specific arrangement of procedures included in the system's software. Software is composed of programs which have their own data structures and computing language for receiving and processing of information. Usually an edit program residing in the computer's memory validates the data that has been captured and sends it back to the originator if corrections are to be done. The type of software that is used by the organisation determines the reporting format that is used to capture internal transactions.
### CRITICAL SUBSYSTEMS IN PROCESSING OF INFORMATION: LIVING SYSTEMS THEORY.

#### 3.3 CHANNEL AND NETWORK

This subsystem consists of a single or multiple interrelated physical channel for sending and transmitting information to all components of the organisation without changing or interpretation of contents.

Examples:
1. A manager communicating with his staff.
2. Inter departmental postage.
3. Internal phone calls.
4. Client records and assessment results to different departments.

### ELEMENTS OF INFORMATION SYSTEMS: INFORMATION THEORY.

The Information system can either be part of a network of computers or it can operate individually as a subsystem by itself. As an information processing subsystem it is linked by channels with other subsystems in the organisation called peripherals.

Examples: keyboards, monitors and printers are all linked to the Central Processing Unit.

Channels are used to transfer data into and out of the memory. Computer based conference, messaging (storing and forwarding messages), word processing, document preparation and distribution, directories of names, locations, phone numbers, and departments are examples of two way communication networking.
### CRITICAL SUBSYSTEMS
**IN PROCESSING OF INFORMATION:**
**LIVING SYSTEMS THEORY.**

<table>
<thead>
<tr>
<th>3.4 <strong>DECODER</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This subsystem is responsible for coding, translating or explaining information provided by the input transducer or internal transducer into a private code for use in the organisation. Examples:</td>
</tr>
<tr>
<td>1) Translators who interpret data in an applicable format for the particular organisation.</td>
</tr>
<tr>
<td>2) Social work and psychiatric terminology or shorthand on case records,</td>
</tr>
<tr>
<td>3) Classification of signs and symptoms into different categories,</td>
</tr>
<tr>
<td>4) Business codes and intercom codes.</td>
</tr>
</tbody>
</table>

### ELEMENTS OF INFORMATION
**SYSTEMS:**
**INFORMATION THEORY.**

Previously collected human-readable data is decoded by the Information subsystem into a computer-readable format. This activity is performed by the Central Processing Unit which classifies and indexes, as well as decodes input information into a binary code (shorthand) that is private to the system itself. This data is then stored into various transaction files. This facility enables decoding of large volumes of data into a format that is compact and makes storage easy.
3.5 ASSOCIATOR

The subsystem promoting permanent associations between different information aspects during first phase of learning. This subsystem uses new information to change the way in which the organisation does things.

Examples:

1) Activities of individuals are changed as a result of an association that was made between pieces of information.

2) Orientation programs,

3) Implementing and using new procedures, interventions and technologies, not making use of programs that are not working.

4) Making and implementing new policies.

The Information System provides a Feedback-Loop which facilitates linkages between different subsystems. This is done by sensing the controlled system's outputs, comparing them to the stated objectives(standards) and generating corrective actions to either change the inputs/outputs, or structure the objectives of the controlled system. The Feedback-Loop enables the control subsystem to make rational and calculated decisions about new processes to change the nature of future actions. These actions are performed by the central processing unit, which monitors all computer operations, performs arithmetic computations and logical operations, before storing information in the system's memory.
### 3.6 MEMORY

The subsystem that is responsible for the second phase learning process by storing information for various time spans within the organisation, and retrieving information when needed.

**Examples:**

1. filing cabinets as maintained by specific staff delivering a library service,
2. bookshelves,
3. social records,
4. note books,
5. computers.

The memory of the Information system is the specific hardware that stores, updates and retrieves information and that is built into micro chips within the computer. It has a certain capacity and speed at which processed data can be retrieved. The memory can be accessed for purposes of entering, maintaining, updating or retrieving information. The memory consists of the hard disk which is a component of the central processing unit. It is managed by various programmes and has a certain capacity. It can make use of auxiliary storage devices called diskettes when extra capacity is needed.
### CRITICAL SUBSYSTEMS

#### IN PROCESSING OF

#### INFORMATION:

#### LIVING SYSTEMS THEORY.

<table>
<thead>
<tr>
<th>3.7 DECIDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refers to the executive subsystem responsible for receiving and using information inputs from subsystems for the purpose of controlling, altering and adjusting the organisation's activities. Examples:</td>
</tr>
<tr>
<td>1) The chief executive officer in an organisation who has final decision making powers,</td>
</tr>
<tr>
<td>2) a board of directors, decisions by departmental heads, planning departmental activities, administrative decisions,</td>
</tr>
<tr>
<td>3) different types of evaluations.</td>
</tr>
</tbody>
</table>

### ELEMENTS OF INFORMATION SYSTEMS:

#### INFORMATION THEORY.

The activities of this subsystem can either be the sole responsibility of the Information System, such as the Structured Decision System (SDS), which automatically makes certain routine and structured decisions; or can be the responsibility of the various levels of managerial staff who require different types of information to make certain levels of decisions. In this instance a Decision Support System (DSS) supplies specific information that is used by the deciders to make decisions. Activities of a DSS are: retrieving information for use in statistical or accounting models: applying estimations of proposed decisions and proposing solutions. Deciders are also defined as the different end users of information.
### 3.8 Encoder

The subsystem responsible for preparing information for outside use by converting information from internal private coding into general codes that can be interpreted by the environment.

**Examples:**

1) The annual report written to inform resource providers (supra system) about organisational activities,

2) preparing presentations, assessment reports to referral agents,

3) case reports and other records, preparing talks, advertisements and bills.

---

The Information System provides information in various formats (on screen, reports, graphs, tables), for different purposes, such as decision making, but also to provide statistical information for external reporting purposes. In response to requests, information is withdrawn (retrieved) from the storage device (memory), and made available in a human-readable code that is usable by the organisation for reporting purposes.
### 3.9 OUTPUT TRANSDUCER

This subsystem transforms organisational information into a matter-energy format that is channelled to the organisational environment. Examples:

1. The use of communication media by various components of the organisation.
2. Mailing bills.
3. Use of telephones for business calls.
4. Talking to and meeting individuals outside the organisation, public relations, client reports.
5. Insurance information.

### 3.2 CONCLUDING DISCUSSION.

In the above discussion, the processes that are performed by the nine critical subsystems were clearly defined and explained. For each subsystem process, a particular unit or Information System component was described which will influence the effectiveness of the subsystem processes in some way. This was done by using the Living Systems Theory as basis for analysis. A careful study of
Information System components enabled the association of components with the different Subsystems as identified by Living Systems Theory. The Organisational Information System then, from an Information Theory Perspective, and in its most sophisticated format (using computer technology), displays characteristics which can be associated with the nine critical subsystems which process information as described by Miller (1978:623-665). It should be noted that Information can only become meaningful to the organisation, once data is used for some specific purpose. Thus, besides studying the process that each subsystem is responsible for, one should keep in mind that the particular process only becomes meaningful, when it is at least used for one of the different classes of primary processes as discussed in Table 3.2. (see next section).

3.3 TOWARDS AN HYPOTHESIS FOR FUTURE STUDY.

A specific hypothesis that can be derived from the above comparative analysis is that if the components of Information systems are effectively present in the organisation, then there is a high probability that the information in that organisation is managed effectively. The Information System then becomes a structural support to the organisation in that it plays a significant role in the processes associated with each of the information processing subsystems within the organisation. The reverse is also true, namely that if the nine critical information processing subsystems operate effectively, then it can be delineated that the components, activities or functions of the Information System are effectively in place. For a study of this nature, where the goal is to develop a model for managing Information in an organisation, so that a particular Human Service Organisation can take a decision as to which possible Information System can best be adopted by that organisation, the latter statement appears to be the most suitable for examination. The following hypothesis is therefore formulated: The effective functioning of the nine critical subsystems will be associated with an effective Information System.

In the previous section, the nine critical information processing subsystems within the organisation were defined and analysed to guide the development of an Information Model. In order to facilitate further analysis, this general description of subsystem processes is extended by focusing on the
interrelatedness of subsystems and explaining basic processes which are performed by these subsystems in the interest of organisational survival. These processes, called by Miller (1978) the Six Primary Systemic Processes, are used as basis in the following analysis. A brief summary of these Primary Systemic processes is provided as background to further analysis. This is followed by a table containing the Six Primary Processes compared with the Information System components as identified from Information Theory.

3.4 THE SIX PRIMARY SYSTEMIC PROCESSES.
It is postulated by Miller (1978:666) that according to Living Systems Theory, subsystem processes can be classified into the following six primary processes:

3.4.1 Process relationships between inputs and outputs:
These processes refer to what is going into the organisation as a 'black box' and what is going out of the organisation. He holds the belief that organisations are designed to perform specific processes in societies and that products refer to physical activities, such as towing vehicles and moving furniture, and should be distinguished from services which are certain types of communications to clients, such as advice, counselling or instruction (Miller, 1978:667). In the HS Organisation with its focus on service type products, relationships between inputs and outputs play as important a role as in other types of organisations. In this study, relational processes are examined with the aim to concretise areas of service measurement.

3.4.2 Adjustment processes to maintain a steady state of the organisation:
These processes examine the actions which are taken when certain imbalances occur in the organisation's matter-energy and information processes. Once again, the purpose of analysis is to identify the role of the Information System in managing adjustment processes and the effectiveness of the organisation in making
adjustments in its production processes.

3.4.3 Evolutionary Processes:
Miller (1978:687) has brought in these processes to compare organisational growth with that of a living organism, referring to changes in the information content of the genetic structure of the organisation. Evolution is a historical process. In the context of this study, evolution of the organisation can be indicated by the way in which organisational information processes have been refined over a period of time, and how the Information System changed and adjusted to organisational information needs.

3.4.4 Growth, cohesion and integration:
These three processes are very much related and become variables of change as the organisation expands and increases in complexity. The Information System is subjected to these same changes and has to accommodate increased complexity in its functioning. The effectiveness with which information is managed becomes an indicator of the cohesion and integration that exists in the organisation.

3.4.5 Pathological Processes:
Pathology is regarded by Miller (1978:702) as very difficult to diagnose in the organisational context. Partly due to the many variations of and often vague manifestations of pathology, he attempts to isolate certain pathologies which originate in matter-energy or information processes. The Information System is also sensitive to pathological conditions, (Ahituv & Neumann, 1991:510), and therefore certain preventative measures are discussed in the comparison.

3.4.6 Decay and termination Processes:
Termination due to various reasons has an effect on the Information System as well.
Redundancy of information, processes, components or equipment leads inevitably to termination. The growth in generations of computer systems for instance, is a clear example of existing systems which become redundant after time.

### 3.4.7 Comparing the six Primary processes with Information components.

With this basic background of the six primary organisational processes, a detailed analysis of these processes in relation to the processes performed by the Information System, can now be done. The basic rationale for doing this comparison should be kept in mind: knowledge of primary organisational processes will enable one to understand how the Information System assists the organisation in carrying out the primary processes. The relevant Information components are extracted from Information Theory, and compared to the applicable primary process as obtained from Living Systems Theory. In order to make the process more practical, the researcher has to apply logic in the deduction of primary process examples. After examples were formulated for each primary process, matching Information components were obtained from Information Theory, and compared with existing examples. The result of this intensive process is provided in Table 3.2 below.

The primary processes appear in the left hand column, whilst the complementary information components appear in the right column.

**TABLE 3.2: INFORMATION COMPONENTS DERIVED FROM THE SIX PRIMARY PROCESSES ACCORDING TO LIVING SYSTEM THEORY.**

<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relational processes between inputs and outputs:</td>
<td></td>
</tr>
<tr>
<td>Matter-energy inputs related to matter-energy outputs:</td>
<td>* The Transaction Processing System continuously captures data on the activities that occur in the organisation on a daily basis.</td>
</tr>
<tr>
<td>* Quality and quantity of products are influenced by types of employees.</td>
<td></td>
</tr>
</tbody>
</table>

48
<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matter-energy inputs related to matter-energy outputs: (continued).</td>
<td>This includes specific orders from the environment, the type of input required or given, when, where, intensity, time duration, purpose, number of items involved and money involved. These transactions are obtained from a source document and recorded into some system (mechanical, electronic or hand).</td>
</tr>
<tr>
<td>* Steady-state of inputs and outputs to be maintained. i.e. Inputs must be used to produce outputs for growth, maintenance and repair, or wastes to be extruded, otherwise accumulation occurs.</td>
<td>* The DSS function is the program which uses information on inputs and outputs to do calculations related to relations, efficiency standards, effectiveness, costs, productivity, quality and quantity of products.</td>
</tr>
<tr>
<td>* Costs of organisational processes are measured by the inputs that are required.</td>
<td>* Relational computations such as ‘value added’ calculations or input-output ratios measures effectiveness.</td>
</tr>
<tr>
<td>* Productivity is measured by outputs produced by processes.</td>
<td>* Effectiveness also measured by aspects such as strategic location close to inputs, free and un-distorted environmental information inputs, and special considerations from the supra-system.</td>
</tr>
<tr>
<td>PRIMARY SYSTEMIC PROCESSES.</td>
<td>INFORMATION COMPONENTS.</td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Matter-energy inputs in relation to information outputs:</td>
<td>* Before information outputs can be produced, certain components have to be installed, such as computers, printers, documents and forms for transactions, operators and programmes to enable data capture.</td>
</tr>
<tr>
<td>* Information outputs are directly related to the accessibility to matter-energy inputs as provided by human components.</td>
<td></td>
</tr>
<tr>
<td>Examples: Printer cartridges for operating a printer; computer electronic equipment to run a programme; files for clients.</td>
<td></td>
</tr>
<tr>
<td>Information inputs in relation to matter-energy outputs:</td>
<td>* The Decision Support System (DSS) uses data obtained by the TPS to be tested against a simulated model to assist deciders in making decisions.</td>
</tr>
<tr>
<td>* Information inputs obtained from environmental feedback such as product demand, service requests and orders determines rate and nature of service outputs.</td>
<td></td>
</tr>
<tr>
<td>* Such information may also determine the proportion of outputs, quantities.</td>
<td></td>
</tr>
<tr>
<td>* An important variable is the time it takes to process relevant information inputs before an output is elicited.</td>
<td></td>
</tr>
<tr>
<td>* The Structured Decision System (SDS) is programmed to make decisions automatically without human interaction relating to quantities, types or nature of outputs.</td>
<td></td>
</tr>
<tr>
<td>PRIMARY SYSTEMIC PROCESSES.</td>
<td>INFORMATION COMPONENTS.</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Information inputs related to information outputs:</td>
<td></td>
</tr>
<tr>
<td>* A communication-loop exists when the system responds to messages which were addressed to it by other systems outside the organisation.</td>
<td></td>
</tr>
<tr>
<td>* Inward and outward flow of information is dependent on variables such as complexity of processing, processing time and variations in processing times, complexity and number of channels that are used, human errors, variations in efficiency among departments, differences in personality and the number of deciders in the organisation.</td>
<td></td>
</tr>
<tr>
<td>* The characteristics of a Closed-Loop System are to be present. The following five elements have to be present, to ensure effective relational processes:</td>
<td></td>
</tr>
<tr>
<td>1) Conditions to be controlled with information have to be identified; i.e. outputs, measuring units and frequency.</td>
<td></td>
</tr>
<tr>
<td>2) A sensor for measuring conditions and sending messages to control unit.</td>
<td></td>
</tr>
<tr>
<td>3) A standard for conditions being measured.</td>
<td></td>
</tr>
<tr>
<td>4) A control unit that compares the measurements with the standards.</td>
<td></td>
</tr>
<tr>
<td>5) An action generator that sends a corrective signal to the controlled unit.</td>
<td></td>
</tr>
<tr>
<td>* Loop to have the attributes of timeliness of information, accuracy of information and significantly detailed.</td>
<td></td>
</tr>
</tbody>
</table>
## PRIMARY SYSTEMIC PROCESSES.

<table>
<thead>
<tr>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
</table>

### 2. Adjustment processes to maintain variables in a steady state:

<table>
<thead>
<tr>
<th>Matter-energy input adjustment processes.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* When lacks in matter-energy inputs are experienced, certain adjustment programmes come into action. Examples are: using stored products, rationing, own producing, admitting people who were previously excluded from services.</td>
<td>* This aspect is taken up by the organisation’s SDS which has the function to make structured or set decisions when shortages in needed supplies, processes or inputs occur. In automated format this function consists of a program that tests data against a programmed model and automatically decides to make specified adjustments.</td>
</tr>
</tbody>
</table>
**PRIMARY SYSTEMIC PROCESSES.**

**Matter-energy throughput adjustment processes.**

* Refers to measures taken when problems that occur in matter-energy flow between inputs and outputs cause stress, or when staff movements occur. Measures taken at this level aim to prevent waste, deterioration, bottlenecks or delay. Applied examples are: new procedures to facilitate better patient flow, rearrangement of office components to facilitate patient flow, automation, alterations in products and changes in information processing variables.

**Matter-energy output adjustment processes.**

* These processes are activated when excessive outputs from the organisation occur. Examples of excessive outputs are: high staff turnover when demands or needs are not met, low satisfaction leading to staff resignations. Corrective steps have to be implemented to correct the balance.

---

**INFORMATION COMPONENTS.**

**Information component senses differences in matter-energy flow between inputs and outputs.** This can be a DSS or a SDS function, depending on the nature of the organisation. Timeliness of services, client waiting times, duration of treatment are examples of information requests that can be made.

* This data can be compared with stated objectives or standards and enables the decider to send corrective signals.

**Information obtained from users of matter-energy outputs provides the feedback which is needed by the organisation to decide on areas or components that have to be improved.**

* Data can also be gathered on staff satisfaction through structured questionnaires.
<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information input adjustment processes.</td>
<td></td>
</tr>
<tr>
<td>* The organisation has standard procedures to process expected amounts of information inputs. In the event of changes in the amount of or meaning of information inputs, the organisation has to activate adjustment processes to cope. In either case, adjustments relate to reassigning staff to other jobs, new product innovations or speeding up production methods.</td>
<td></td>
</tr>
</tbody>
</table>

* When changes occur in the amounts or types of data that is to be collected, the System has to be able to adjust by being updated through introduction of new procedures of data collection, new simulation models or variables for measurement.  
* Alternative arrangements to deal with information overloads, such as batch processing, or increased number of terminals can be considered.
<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information throughput adjustment processes.</td>
<td>* Two options exist within the information component: A positive Feedback-Loop where fluctuations around standards are used to reinforce the direction in which employees are going, or a negative Feedback-Loop where fluctuations are used to reverse the direction in which employees are moving.</td>
</tr>
</tbody>
</table>

* These processes focus on the many social interactions among components in the organisation and includes the following:

1) Motivation of staff members and individual satisfaction enhancement.
2) Productivity: measuring staff outputs and implementing measures to improve productivity.
3) Satisfaction: Measuring satisfaction of owners, stakeholder and staff members and implementing processes to enhance satisfaction. This includes all personnel functions and strategies to prevent dissatisfaction and conflict, promote coordination through incentives and participation.

* Objectivity in conflict management is increased by the data verification option as provided by the information component.
### PRIMARY SYSTEMIC PROCESSES.

**Information output adjustment processes.**

* Excess information outputs in the form of leakage of information to the supra-system are dealt with by the following methods:

1) Denials and explanatory attempts to the supra-system.

2) Security measures and procedures to ensure control of information leakage.

3) Relieving strain from lack of outputs by relaxing censorship or installing alternative channels for distribution.

### INFORMATION COMPONENTS.

* Private access codes and data protection procedures are some examples of measures to protect information resident in the system’s memory from erasure or misuse.

* An Information System Security plan (See Appendix B for an example), including measures to secure data should be part of the system’s design.
**Feedback processes.**

* **External feedback:**
  * Incorporating user public reaction obtained through surveys, questionnaires, into future planning and computer simulations so that corrective actions can be taken. Included in this process is the measurement of perceptions following marketing and publicity actions.

* **Internal feedback:**
  * Information obtained from measuring component outputs in a variety of ways, usually against a standard of functioning. Included here is feedback regarding productivity, staff morale and attitudes.

* These aspects have been discussed under previous components. In summary, External feedback is accommodated in the System's Decision Support function where simulation models assist deciders in decision making, while Internal feedback is part of measuring staff satisfaction for adjusting processes.
<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. Evolutionary processes:</strong></td>
<td><strong>3. Evolutionary processes:</strong></td>
</tr>
<tr>
<td>* Organisational changes take place as a result of environmental pressures. Various factors influence the rate at which organisations develop. Some organisations develop faster than others. * Evolution depends upon changes in associated or learned information transmitted through successive generations of that organisation.</td>
<td>* The rate of organisational development can be enhanced by effective adjusting and updating the existing Information System as the demand arises. System design is generally seen as an evolutionary process.</td>
</tr>
</tbody>
</table>
### PRIMARY SYSTEMIC PROCESSES.

4. Growth, cohesion and integrative processes:

4.1 Growth.

Indicators of growth relate to:

- Increase in organisational size; expansion in spatial arrangements, more echelons or non-living components.
- Different units are used to measure the growth of an organisation, such as increases in number of components (i.e. employees), sales, higher client turnover and monetary value of outputs or services.
- More complex subsystems.

### INFORMATION COMPONENTS.

- Role of Information components in facilitating growth indicated by:
  - Increasing memory capacity.
  - Introduction of a network with several terminals as components.
  - Increase in number of variables for data capture by system.
  - Creation of information subsystems to provide own information processing facilities for each organisational subsystem.
**Primary Systemic Processes.**

<table>
<thead>
<tr>
<th>Growth processes. (continued)</th>
<th>Information Components.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Increase in matter-energy and information processing.</td>
<td>* Increase in volumes of data processing.</td>
</tr>
<tr>
<td>* More precise subsystem boundary definition.</td>
<td>* Increased definition of subsystem boundaries is enhanced by the structuring that occurs with Information system implementation.</td>
</tr>
<tr>
<td></td>
<td>* Differentiation and sophistication of DSS functions.</td>
</tr>
<tr>
<td>* Decentralisation of decision making structures.</td>
<td>* Enables implementation of more extensive adaptive processes.</td>
</tr>
<tr>
<td>* More extensive outputs.</td>
<td>* Use of system for input refinement. (i.e. use of computer in therapy)</td>
</tr>
<tr>
<td>* Higher level of sophistication of adaptive processes.</td>
<td></td>
</tr>
<tr>
<td>* More sensitive definition of inputs.</td>
<td></td>
</tr>
</tbody>
</table>
### PRIMARY SYSTEMIC PROCESSES.

4.2 Cohesion.
* Cohesion in the organisation as system is promoted in several ways:
  * Distribution of messages that will motivate subsystems and components to strive towards common goals, i.e. creation of more or less identical organisational units.
  * Using communication channels of varying lengths to send messages. The more direct and shorter the channels, the greater the cohesion.

### INFORMATION COMPONENTS.

* Information components can have a constructive role in promotion of cohesion.
* As measurement tool it provides feedback regarding level of mutual goal achievement.
* Involve all living components by accommodating their information needs in the system.
* Provides differentiated communication channels of various lengths to users.
### PRIMARY SYSTEMIC PROCESSES.

4.3 Integrative processes.

* Integration and coordination can be qualified when system processes are controlled by a centralized decider in relation to common goals and purposes.

* The level of integration is directly related to the level of decentralization that exists in the organisation.

* Another indicator is the level of managerial or decision making decentralization that exists.

* Regardless of decentralisation, processes should still be integrated. Information systems enable deciders at all levels to obtain data about all processes.

### INFORMATION COMPONENTS.

* The definition and identification of decision making levels during the design stage will facilitate integration.

* The Information system provides a centralized subsystem where all information is collected.

* Information from decentralized subsystems can also be obtained centrally through the system’s communication channels and links.
### PRIMARY SYSTEMIC PROCESSES.

5. Pathological Processes:

<table>
<thead>
<tr>
<th>Conditions for pathology:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Obvious conditions of pathology are evident when adaptive processes have failed. Examples are when an organisation fails to make a profit, or when facilities are destroyed, or overt conflict occurs among components. For this to happen, instability of one or more variables for a meaningful period has to be evident.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Instability of components occur when control measures in any of the Information System components are violated. For example, when incomplete source document data is allowed into the system.</td>
</tr>
<tr>
<td>* The information component constantly measures certain variables. Instability has to be reflected through its reporting function.</td>
</tr>
</tbody>
</table>

### Pathological Processes. (Continued)

* A source of pathology is found in inadequate decision making by the deciders of the organisation. This results from poor use of information to guide decision making. Insignificant adaptive processes are then activated.

* In most Information Systems, built in control functions automatically alarm malfunctioning in components, however, control functions are to be included in the Information System plan.

* Security and Contingency plans for emergency situations are to be implemented to prevent pathological conditions from occurring.
### PRIMARY SYSTEMIC PROCESSES.

<table>
<thead>
<tr>
<th>5.1 Lacks of matter-energy inputs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* If lacks of resources or any matter-energy inputs such as personnel shortages continue long enough, the steady state is disturbed and a condition of depletion results, leading to destruction of the organisation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.2 Excesses of matter-energy inputs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Pathology results if an organisation is overloaded by matter-energy inputs from the environment. The quantities of these inputs are more than the organisation needs for its processes.</td>
</tr>
</tbody>
</table>

### INFORMATION COMPONENTS.

| * Lacks of matter-energy inputs are recorded by the SDS and either reported or automatically replenished. |
| * Checks on the system should be done regularly to prevent malfunctioning. |

| * If inputs into the Information system exceed the levels it is designed for, the timeliness of the system is jeopardized. In turn the accuracy level is influenced as reflected by outdated reporting. |
| * Built in time signals for regular operations serve to remind subsystems of outstanding activities. |
Pathological Processes (Continued)
Examples: Reaction times of welfare organisations are decreased when overpopulation of the city results in an overload of clients, or too many production processes occurring at the same time resulting in a lack of facilities.

5.3 Inappropriate matter-energy inputs.
* Unexpected and damaging inputs from the environment or from within the organisation can disrupt its processes i.e. the influence of employees who do not function acceptably, or environmental disasters can damage an organisation.

<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathological Processes (Continued)</td>
<td>* If security measures are violated and environmental or internal conditions such as employees are allowed to damage the system, pathology will result.</td>
</tr>
<tr>
<td>Examples: Reaction times of welfare organisations are decreased when overpopulation of the city results in an overload of clients, or too many production processes occurring at the same time resulting in a lack of facilities.</td>
<td>* Security plans and a tracing facility have to be built into the system. (See Appendix B)</td>
</tr>
</tbody>
</table>

(See Appendix B)
<table>
<thead>
<tr>
<th>PRIMARY SYSTEMIC PROCESSES.</th>
<th>INFORMATION COMPONENTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathological processes (Continued).</td>
<td></td>
</tr>
<tr>
<td><strong>5.4 Lacks of information inputs:</strong></td>
<td></td>
</tr>
<tr>
<td>* If the organisation does not receive adequate feedback from the environment, it is not able to shape its services or products to fulfil different needs. Inability to collect accounts can lead to the organisation seizing to show profits and jeopardise its existence.</td>
<td></td>
</tr>
<tr>
<td><strong>5.5 Excesses of information inputs:</strong></td>
<td></td>
</tr>
<tr>
<td>* If the organisation is unable to process a flood of requests, it will lose public goodwill and clientele.</td>
<td></td>
</tr>
<tr>
<td>* Inadequate or irregular information inputs, especially regarding environmental feedback can lead to faulty and inadequate reporting and subsequent decision making.</td>
<td></td>
</tr>
<tr>
<td>* If not all the system's abilities are used through neglect or lack of training, irrational and inadequate decision making will result.</td>
<td></td>
</tr>
<tr>
<td>* If Information System components are not able to process big volumes of information, pathological states are the result. Extra components such as increased memory capacity and data input facilities should be installed to cope with increased volumes.</td>
<td></td>
</tr>
<tr>
<td>PRIMARY SYSTEMIC PROCESSES.</td>
<td>INFORMATION COMPONENTS.</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>Pathological Processes (continued)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5.6 Inputs of maladaptive genetic information in the template:</strong></td>
<td></td>
</tr>
<tr>
<td>* When the organisational structuring or chart is defective or faulty, its outputs and processes are negatively influenced by it.</td>
<td></td>
</tr>
<tr>
<td><strong>5.7 Abnormalities in internal matter-energy processes:</strong></td>
<td></td>
</tr>
<tr>
<td>* Inappropriate or inefficient handling of energy, materials, human components or inclusions (clients), or products leads to wastes, delays and inefficiency. Abnormalities in internal information processes: (i.e., Pathological decision making structure or management style.)</td>
<td></td>
</tr>
</tbody>
</table>

* Sufficient 'factoring' or analysis of the organisation into several components during the design stage, is a prerequisite to successful structuring of the Information System.  
* Controls based on audit principles are once again emphasized as measures to ensure correct handling of components.
### PRIMARY SYSTEMIC PROCESSES.

Pathological processes (Continued)

5.8 Abnormalities in Internal Information processes:

* Often information flow in the organisation is hampered by the particular managerial structure and associated style that is enforced by the decider subsystem.

* Pathology can also occur when blockages or distortions in information flow within the organisation occur.

* A breakdown in communication between subsystems can be directly linked to occurrence of pathological conditions.

### INFORMATION COMPONENTS.

* During the design stage all key personnel should be included in analysing the organisational information needs. If all subsystems are not included, breakdowns in communication or faulty implementation will occur.
### PRIMARY SYSTEMIC PROCESSES.

<table>
<thead>
<tr>
<th>6. Termination and Decay Processes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Decay of an organisation occurs when goals and purposes have been met or are abandoned. If no new goals are sought, the organisation will terminate eventually. (Organisational Life cycle).</td>
</tr>
<tr>
<td>* Environmental circumstances can lead to termination i.e. state legislation or economic deterioration.</td>
</tr>
</tbody>
</table>

### INFORMATION COMPONENTS.

<table>
<thead>
<tr>
<th>6. Termination and Decay Processes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* If adaptive processes to adjust the existing system to new or altered organisational needs cannot ensure proper information inputs, then the system seizes to fulfil its purpose, and will subsequently stop operating.</td>
</tr>
</tbody>
</table>

### Termination and Decay: (Continued)

<table>
<thead>
<tr>
<th>6. Termination and Decay Processes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Excessive negative feedback from the environment may lead to termination.</td>
</tr>
<tr>
<td>* Termination can occur when all adaptive processes have failed to make an impact, and implies that control is lost.</td>
</tr>
<tr>
<td>* A result of termination implies that systems are reduced to lower levels of functioning, where components can still survive as entities by themselves within the environment.</td>
</tr>
<tr>
<td>* Control of components is then taken over by the environmental system.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Termination and Decay Processes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Limited capabilities or some components of the Information System can then still be used, providing for some form of survival. (i.e. simple word processing capabilities), but replacement will eventually be needed.</td>
</tr>
</tbody>
</table>
3.5 CONCLUDING DISCUSSION.

In the preceding section, elements and processes of the Organisational Information System that are comparable with the six primary organisational processes, were analyzed with the aim to determine the specific areas for practical comparison in a later stage of research. Having identified and analyzed the nine critical subsystems, as well as the primary Information System processes which contribute towards organisational survival, the next step would be to compare and integrate these two areas. Such comparison will facilitate the formulation of indicators for measuring the effectiveness of organisational information processes. But it can well be asked: What is meant by processing information effectively? This question leads to the identification and definition of specific variables or qualifications to measure effectiveness.

Before these variables can be described, it is necessary to clarify the model of information management as it has been developed so far. In Figure 3.1 a graphical representation is given of the processes as performed by the nine critical information processing subsystems.

![Diagram of the processes performed by the nine critical information processing subsystems](image)

FIGURE 3.1 THE PROCESSES PERFORMED BY THE NINE CRITICAL INFORMATION PROCESSING SUBSYSTEMS: LIVING SYSTEMS THEORY.
The figure represents the processes as performed by the nine critical information processing subsystems in the organisation. By closely studying Figure 3.1, and particularly the linear representations of the subsystem functions, it should be clear that between what goes into the organisation from the environment on the left, and what goes back to the environment on the right, quite a few alterations and variations can occur in the different processes. These variables indicate towards the effectiveness with which the organisation conducts its information management. Some of the most important variables observed in Figure 3.1, are discussed below.

- Processing of information occurs in three stages as: Information inputs to the organisation, information throughput while information is residing in the organisation, and information outputs from the organisation.
- To zoom in on the issue of inputs, throughput and outputs, Figure 3.2 displays three subsystems in amplified format to indicate that each individual subsystem has its own inputs, throughput and outputs. This micro perspective has important implications for research, as it indicates that all variables applicable to the organisation as a whole can also be made applicable to the evaluation of each subsystem.

![Figure 3.2 Subsystem Processes from a Micro Systems Perspective](image-url)
Information inputs can come from two different sources: from the environment in encoded format as external feedback as well as through analysis carried out by the input transducer, and secondly from the matter-energy (and information) producing subsystems, in decoded format through the internal transducer.

Organisational Information outputs go to two different receivers: the environment in encoded format as carried out by the encoder and output transducer, and to the different subsystems as internal feedback in decoded format.

Information processing can be described as the events which occur within the organisation. It describes what is done with the information after it has entered the organisation.

The extent to which processing contributes towards the health of the organisation is determined by the health state of its information processing subsystems or processes.

Information inputs, throughput and outputs have a steady state value - an apparent level of processing which by its maintenance, produces a steady state of the organisation in any specific point in time.

Inputs, throughput and outputs have a steady state range, i.e. parameters within which processing produces steady state values, such as a specific volume of information within a specific time range.

The variables applicable to steady state measurement are:
- The volume of information that is processed.
- The extent to which information gets distorted while being processed.
- The time spent on processing.
- Lags in processing.
- The costs of processing as measured against matter-energy and information outputs. Usually the time and effort spend on information processing.
- The extent to which information is lost during processing.

Information inputs and outputs should appear in the organisation channel and net.
subsystem.
- The importance of each subsystem process in relation to other subsystems.
- The importance of different messages.
- The performance of information processing i.e., usefulness, accuracy, timeliness, cost and volume.
- The degree to which the information is being used to alter matter-energy processes.
- How the process contributes to the organisational functioning, in other words the meaningfulness of the process.

3.6 INTEGRATION OF THE SIX PRIMARY SUBSYSTEM PROCESSES.

The variables as identified in the previous section facilitate research of subsystem processes. In order to identify more variables of measurement that are specific to subsystem functioning, it seems imperative that it is determined, which subsystems are specifically involved in which primary process. This integration will also clarify which Information System units associated with each subsystem are to be measured. Theoretically, it might be deduced that all subsystems are involved with all the primary processes as explained in Figure 3.3.

FIGURE 3.3 MATRIX OF INTEGRATION OF PROCESSES WITH SUBSYSTEMS.
As per definition, each subsystem has a different function, and this might influence the level in which a subsystem is involved in a specific process. Abbreviations of subsystems are given in order to facilitate communication and debate:

<table>
<thead>
<tr>
<th>SUBSYSTEM</th>
<th>FUNCTION</th>
<th>DESCRIPTIVE WORD</th>
<th>ABBREVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT</td>
<td>Obtain information from outside.</td>
<td>Input</td>
<td>IN</td>
</tr>
<tr>
<td>TRANSDUCER</td>
<td>Internal</td>
<td>Monitor</td>
<td>MN</td>
</tr>
<tr>
<td>INTERNAL TRANSDUCER</td>
<td>Obtain and report on organisational functioning.</td>
<td>Circulate</td>
<td>CR</td>
</tr>
<tr>
<td>CHANNEL AND NET</td>
<td>Relay information within organisation.</td>
<td>Decode</td>
<td>DE</td>
</tr>
<tr>
<td>DECODER</td>
<td>Makes information usable within organisation.</td>
<td>Relate</td>
<td>RL</td>
</tr>
<tr>
<td>ASSOCIATOR</td>
<td>Putting information pieces together.</td>
<td>Remember</td>
<td>RE</td>
</tr>
<tr>
<td>MEMORY</td>
<td>Storing and receiving information within organisation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Since primary processes were already analyzed before, a detailed description of each process already exists. In the opinion of the researcher the format in which these primary processes appear on page 48 is still highly abstract. This abstraction problem would lead to confusion and a lack of accuracy in identifying the role of each different subsystem in each primary process. Therefore, to reduce the level of abstraction, and simultaneously make the primary processes more accurately related to practical organisational functioning, another list of the primary processes was compiled by studying each element of the primary processes, relating that element to a practical logical example as found in the organisation, and re-writing the element in practical language. This method is a repeat of that followed in the previous section, and ensures that matching processes and Information Theory components with subsystems would facilitate analysis. Information components are similarly reformulated to make them more comparable to the Information processing subsystems. Each primary process is taken in turn and matched with the elementary subsystem definitions as provided above. Where necessary, reference is made to full discussion as provided in Table 3.1 (see page 36). Through analysis, it was found that a particular primary process is performed by all the subsystems. These instances are indicated by the description ALL. Since analysis was such a lengthy and careful process, the chances of errors being made due to fatigue, were reduced by limiting the time that was spend on analysing each primary process. The six primary processes as well as their constituent units of Information system components are given in Table 3.4 below, whilst the relevant subsystem
<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEM</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>Matter-energy inputs to matter-energy outputs:</td>
<td>* Transaction Processing</td>
</tr>
<tr>
<td></td>
<td>* The influence of employees on quality and quantity of products.</td>
<td>System responsible for continuous data capture on intra organisational transactions as well as extra organisation inputs.</td>
</tr>
<tr>
<td>ALL</td>
<td>* Steady state of inputs related to outputs.</td>
<td>* DSS function uses information inputs to do calculations, comparisons and simulations with data obtained.</td>
</tr>
<tr>
<td>ALL</td>
<td>* Costs of processes are measured by the required inputs.</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>* Efficiency of subsystem measured in input-output ratios.</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>* Effectiveness of subsystem measured by:</td>
<td></td>
</tr>
<tr>
<td>IN</td>
<td>- location close to inputs,</td>
<td></td>
</tr>
<tr>
<td>IN</td>
<td>- level of distortion of environmental inputs,</td>
<td></td>
</tr>
<tr>
<td>IN, DE, RL, DC</td>
<td>- ability to meet extraordinary environmental needs.</td>
<td></td>
</tr>
<tr>
<td>IN, OT, CR, RL, EN.</td>
<td>Matter-energy inputs in relation to information outputs:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Information outputs can only be made if specific equipment is provided.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Process relies heavily on physical components such as computers, programmes, printers, source document formats, operators.</td>
<td></td>
</tr>
<tr>
<td>CRITICAL SUBSYSTEM</td>
<td>PRIMARY PROCESS</td>
<td>INFORMATION UNIT</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
</tbody>
</table>
| CR, RL, RE, DC, EN | Information inputs in relation to matter- energy outputs:  
* Information regarding environmental needs and requests are used to determine nature of services provided.  
* The quantity, proportion, extent of services are determined by this process.  
* How long does it take before a response is given to a request. | * Mainly the function of the Structured Decision System (SDS) to make some decisions automatically.  
* The DSS is responsible for more advanced types of decisions. |
| IN, MN, CR, OT | Information inputs related to information outputs:  
* The presence of a communication loop exists when an information response follows a request from the environment.  
* Flow of information is influenced by the following variables:  
- complexity of processing,  
- processing time and variations,  
- number of channels,  
- human errors,  
- different efficiency levels of departments,  
- personality differences,  
- number of deciders. | * Five elements:  
- conditions for measurement to be identified.  
- A sensor for measuring and sending messages.  
- A standard for conditions to be measured.  
- a control unit that compares measurements with standards.  
- Action generator to send corrective signals to controlled unit. |
In summary, Table 3.4 examines all the different relations between matter-energy products and information products. This is of particular relevance, since the importance of the Feedback-loop is once again clear from this analysis. The Information System components of TPS, SDS and DSS in this respect, are also significant. In Table 3.5 the performance of adjustment processes by the different subsystems are examined. These adjustments all relate to what has to be done in the event of shortages, or excesses that may be experienced within the organisation, or adjustments to services to facilitate the effectiveness of service.

TABLE 3.5 INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: ADJUSTMENT PROCESSES.

<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEM</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN, MN,</td>
<td>Matter-energy input adjustment processes:</td>
<td>* Automated format tests data against a programmed model and then makes specified adjustments. (SDS)</td>
</tr>
<tr>
<td>CR, RE, DC, EN, OT.</td>
<td>Matter-energy throughput adjustment process:</td>
<td>* DSS or SDS function: measuring variables against standards such as timeliness of service, waiting times, duration of treatment.</td>
</tr>
<tr>
<td>ALL</td>
<td>* Making adjustments when shortages of inputs are experienced.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* using stored items, rationing, admitting people previously excluded.</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>* Measures taken to relieve stress caused by flow problems. Measures to prevent waste, delays or accumulation in flow.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Installing new procedures, rearranging office equipment, automation.</td>
<td></td>
</tr>
<tr>
<td>CRITICAL SUBSYSTEM</td>
<td>PRIMARY PROCESS</td>
<td>INFORMATION UNIT</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>Matter-energy output adjustment processes:</td>
<td>* Regular internal staff satisfaction ratings supported by production measurement and client satisfaction ratings obtained from the environment which as processed data is provided to deciders.</td>
</tr>
<tr>
<td>CR, DE, DC, EN, OT, RL</td>
<td>* Processes to prevent excessive outputs from organisation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Excessive staff or clients leaving organisation.</td>
<td></td>
</tr>
<tr>
<td>IN, MN, CR, DE, RE, RL, DC</td>
<td>Information input adjustments:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Measures taken to manage changes in the amount or meaning of information inputs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Examples: reassigning staff to other jobs, speeding up production, new innovations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Designing and introduction of new procedures or processes to cope with excessive loads of information inputs.</td>
<td></td>
</tr>
<tr>
<td>CRITICAL SUBSYSTEM</td>
<td>PRIMARY PROCESS</td>
<td>INFORMATION UNIT</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>MN, CR, DE, RL, RE, DC, OT</td>
<td>Information throughput adjustment processes: * Measures to improve social interactions: - promotion of staff motivation and satisfaction, - Measuring staff outputs and implementing measures to increase production, - Broad range measurement of owner, stakeholder, staff satisfaction and inclusion of strategies to improve these.</td>
<td>* Positive Feedback-Loop: use of fluctuations in performance standards to reinforce employee production methods: or negative Feedback-Loops which aims at reversing employee efforts. * Effective conflict management through data verification and objective information options.</td>
</tr>
<tr>
<td>CRITICAL SUBSYSTEM</td>
<td>PRIMARY PROCESS</td>
<td>INFORMATION UNIT</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>CR, RE, EN, OT.</td>
<td><strong>Information output adjustments:</strong></td>
<td>* Private access codes and data protection procedures to protect information in memory from distortion, erasure or abuse.</td>
</tr>
<tr>
<td></td>
<td>* Measures taken to prevent information leakage:</td>
<td>* Information system security plan to ensure protection of information during emergency conditions. (See Appendix B)</td>
</tr>
<tr>
<td></td>
<td>- denials or explanations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- security measures and procedures,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- relaxing censorship or new channels to change lack of outputs.</td>
<td></td>
</tr>
<tr>
<td>IN, DE, CR, ME, RL, DC.</td>
<td><strong>Feedback processes:</strong></td>
<td>* External feedback incorporated in the specifications for design of new products.</td>
</tr>
<tr>
<td></td>
<td>* What is done with environmental feedback?</td>
<td>* Internal feedback used to improve staff productivity.</td>
</tr>
<tr>
<td></td>
<td>- Implementing corrective actions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* The use of information to provide feedback to staff regarding productivity.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.5 explains the output side of the Feedback-Loop in that the results of relational measurements are interpreted to produce the feedback that is needed by the different Production Subsystems to make adjustments in production processes. For instance, both matter-energy as well as information inputs and outputs have to be kept in balance. This is the steady state condition which is referred to on page 72. Not only production processes have to be adjusted through the use
of a Feedback-Loop, but information processes are also involved. If a steady state of information inputs and outputs is not maintained, it will not be possible to have the right information available for making effective decisions on adjustments in matter-energy processes.

It will be noticed from Table 3.6 that evolutionary processes actually suggest measurement of long-term organisational functioning. Therefore, in the analysis it is found that all nine critical subsystems can be targeted for measurement of evolution.

**TABLE 3.6 INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: EVOLUTIONARY PROCESSES.**

<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEMS</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>* Organisational change takes place as a result of environmental pressures.</td>
<td>* Adjusting and updating the information system when the need arises. Seen as the stages of office computerization.</td>
</tr>
<tr>
<td>ALL</td>
<td>* Rate of change depends on accuracy and frequency of new information transmission.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.6 also points to the importance of updating the Computerised Information System when evolution is measured in the organisational Information processes. Reluctance to renew the Information System might actually have a negative impact on the evolution of the total organisation.

In Table 3.7 the subsystems which are involved in promoting cohesion and integration through growth are examined.

82
TABLE 3.7 INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: GROWTH, COHESION AND INTEGRATION.

<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEMS</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growth:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>* Organisational expansion, increased office space, more echelons, more physical components.</td>
<td>* Increasing memory capacity.</td>
</tr>
<tr>
<td></td>
<td>* Units of measurement: increase in number of components, sales, higher client turnover, monetary value of outputs.</td>
<td>* Networking where several computers are linked together.</td>
</tr>
<tr>
<td>DC</td>
<td>* Subsystem definition becomes more complex.</td>
<td>* Increase in number of variables for measurement.</td>
</tr>
<tr>
<td>ALL</td>
<td>* Reorganisation of units, components, processes</td>
<td>* Reorganisation of software, data structures.</td>
</tr>
<tr>
<td>ALL</td>
<td>* Increase in volumes of matter-energy /information processing.</td>
<td>* Increase in volumes of data to be processed.</td>
</tr>
<tr>
<td>CRITICAL SUBSYSTEMS</td>
<td>PRIMARY PROCESS</td>
<td>INFORMATION UNIT</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
</tbody>
</table>
| **ALL**             | * Decentralized decision making.  
* Adaptive processes become more sophisticated.  
* Inputs become more refined. | * Increased definition of subsystem boundaries.  
* Differentiation and sophistication of DSS functions.  
* Implementation of more extensive adjustment processes.  
* Use of system for input refinement. |
| **CR, DE, RL, DC, OT.** | **Cohesion:**  
* Messages are distributed that have a positive influence on staff motivation.  
* Using a variety of more direct channels to distribute messages. | * Positive/ negative feedback to employees about own functioning.  
* Accommodate user needs in systems design to improve motivation.  
* Differentiated communication channels of various lengths to users. |
In Table 3.7 it is found that growth in organisational information use is indicated by the level of refinement of with which information is applied in the organisation. For instance, an organisation would initially use information on a limited basis only. After some time, new needs for information develop, the Information System is then upgraded to include new needs. Expanding the Information System results in more complex technology or procedures being adopted. The extent to which the growth of the system is accepted by staff members will determine the level of cohesion that is achieved with expansion. If a new or adjusted system is accepted a high level of integration occurs.

In the next Table, the major types of pathology as well as the ways in which pathology will develop, are discussed. An Information System is especially vulnerable to pathology. For example, if information is not regularly collected, such system will provide faulty or incomplete information to deciders in the organisation, thereby disturbing the accuracy of decision making.
### TABLE 3.8 INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: PATHOLOGICAL PROCESSES.

<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEMS</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
</table>
| DC, ALL             | * When adaptive processes have failed.  
                     | * When subsystem process variables have been unstable for a long time.  
                     | * When deciders do not make use of information to make decisions. | * Violation of system control measures: allowance of incomplete source data into system.  
                     |                                                                 | * Validation programmes check validity of information.  
                     |                                                                 | * Deciders will not use information when the system is not designed with their needs in mind. |
| ALL                 | Lacks of matter-energy inputs:  
<pre><code>                 | * Continuous personnel or equipment shortages can disturb the steady state of the subsystem processes. | * SDS function to check matter-energy supplies. |
</code></pre>
<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEMS</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALL</strong></td>
<td><strong>Excesses of matter-energy inputs:</strong> * Inability of subsystems to process a flood of requests is reflected in environmental adverse reaction.**</td>
<td>* Timeliness of information processing is affected by overloads. Information then becomes outdated. * Parameters of functioning serve as a way to control functioning.</td>
</tr>
<tr>
<td><strong>RE, CR,</strong></td>
<td><strong>Inappropriate matter-energy processes:</strong> * Damage, distortion or unwarranted access to information by external/internal input.**</td>
<td>* Violations of access codes by employees can lead to distortion or loss of data.</td>
</tr>
<tr>
<td><strong>IN, DC, RL</strong></td>
<td><strong>Lacks of information inputs:</strong> * A lack of environmental feedback disables organisational service planning: i.e. inability to collect accounts jeopardizes profitability and future service delivery.**</td>
<td>* Irregular or inadequate information inputs results in inappropriate reports and decision making.</td>
</tr>
<tr>
<td>CRITICAL SUBSYSTEMS</td>
<td>PRIMARY PROCESS</td>
<td>INFORMATION UNIT</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>IN, MN, DE, CR, RE, EN, OT</td>
<td>Excessive information inputs: * Inability of subsystems to process large volumes of information will affect its ability to respond to environmental needs.</td>
<td>* If additional memory space, alternative channels, terminals or personnel are not available, large volumes of information cannot be accommodated.</td>
</tr>
<tr>
<td>IN, MN, CR, RL, DC, EN, OT</td>
<td>Inputs of maladaptive genetic information in the template: * Faults in the organisational structure negatively influences subsystem information processes.</td>
<td>* Faulty decision making levels and template is the result of inadequate factoring and analysis in the design stage of the Information system.</td>
</tr>
<tr>
<td>ALL</td>
<td>Abnormal internal matter-energy processes: * Inappropriate or inefficient handling of energy, materials, human components or clients is wasteful, leads to delays and inefficiency.</td>
<td>* Implementation of control by audit can prevent pathology in this case.</td>
</tr>
</tbody>
</table>
Abnormal internal information processes:
* Organisational structure and styles can often negatively influence internal information flow.
* Resultant conditions are often blockages or even breakdowns in communication channels between subsystems.

It should be noted that a few primary sources of pathology were discussed in Table 3.8. These can be classified as excesses, shortages or abnormal conditions in both matter-energy and information processes, and problems that are the result of faults in the organisational structure. In HS Organisational context, a common example of excesses and shortages is found in the number of clients who are serviced by the organisation at a particular time. If there are not enough clients served by the organisation, all processes will be halted. Excessive use of the organisation will result in long waiting lists and frustration on the part of the clients who cannot be served within a particular time. Likewise, if information is not provided by the environment to the organisation, the organisation will not know how to adjust programmes to suit environmental needs. Of significance is the observation that those subsystems which are particularly involved in obtaining, sending, transmission and using of information are most adversely affected by pathological conditions in the organisation.

In the last Table, processes of termination and decay are examined to explore the implications of certain environmental and internal conditions on the management of information in the organisation.
TABLE 3.9 INTEGRATION OF THE SIX PRIMARY PROCESSES WITH THE DIFFERENT CRITICAL INFORMATION PROCESSING SUBSYSTEMS: TERMINATION AND DECAY.

<table>
<thead>
<tr>
<th>CRITICAL SUBSYSTEMS</th>
<th>PRIMARY PROCESS</th>
<th>INFORMATION UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>* Decay occurs when subsystem processes are no longer purposeful and no attempts are made to find new goals for it. * Termination can also result due to environmental conditions. * Termination can also be the result of a failure of adaptive processes to make changes. * After termination, some components or subsystems are used by themselves on a smaller scale.</td>
<td>* Evidence of termination found in failure to renew or update existing components. * Further evidence found in return to limited use of system components while broader use is suspended.</td>
</tr>
</tbody>
</table>

3.7 CONCLUDING DISCUSSION.

In the foregoing analysis each primary process was associated with the respective critical subsystem. This was done to determine the role of each subsystem in the different primary processes. This particular analysis can be seen as an important step in the research process, since a detailed description is provided of the role of each subsystem in organisational processes. A comprehensive view of organisational survival through information management is also portrayed in this analysis. With this integrated information, it is now possible to construct indicators with which these organisational processes can be more practically described.

Since indicator formulation can be a lengthy and highly detailed process based on the logical translation of abstract processes into practical language, it was considered essential to have a quick
reference of all the items that were dealt with in the analysis. With this quick reference, two main objectives in analysis can be achieved. Firstly, the problem of research errors or omissions can be eliminated by regularly comparing analysis accuracy with items in the quick reference. Secondly, the reference provides an overview of the distribution of subsystems in the different organisational processes. The quick reference as compiled in Table 3.10 provides a list of the primary processes as described in the previous section, whilst the abbreviations of the nine subsystems are listed in each column. After scanning the integration tables in the previous section, subsystem involvement could be indicated with an X in each box. During indicator formulation, it is found that table 3.10 is far from complete, and has to be adjusted to include the allocation of subsystems which until this phase of analysis, were not thought to be applicable. This new information also had to be transferred to tables 3.4 - 3.9 for accuracy which as presented here appear in finalized format. (see page 76 - 90). The analytical process followed in this section thus becomes dynamic and systematic.

3.7.1 Research methodology in Indicator formulation.

To ensure further methodological analysis, the following steps are followed:

1) Careful study of the first critical subsystem definition and description to become familiar with its exact purpose and function. (Example: See table 3.1, page 35).

2) Using the allocation of subsystems as portrayed in tables 3.4 - 3.9 as guideline, each table with primary processes is studied to decide whether the subsystem played a role in that process.

3) Every time a process element matches the definition of the subsystem or its function, that element is reformulated into an indicator, using the definition of an indicator as described under section 3.9. (see page 95). Briefly this means the construction of a simple sentence where a process specific to the subsystem is formulated to point to the presence, frequency, extent, quantity or quality of that process in relation to the subsystem's function.

See table 3.11.
4) After completion of each indicator, the integration tables (tables 3.4 - 3.9), as well as the quick reference, (see page 92) are updated to contain new subsystem allocations.

5) Since this method of analysis is very time consuming, possible fatigue and confusion has to be limited by analysing one subsystem at a time. Once a subsystem analysis is complete, time for rest is allowed before the next subsystem is analyzed.

6) As a control mechanism, a previous analysis is evaluated for accuracy and technical correctness, before commencing with the next subsystem.

7) Whilst analysing primary processes, the relevant Information System constituents are identified by evaluating the role of the second column Information components in that process, and listing these separately. The Information System constituents are given at the end of each subsystem.

8) This method is applied to each subsystem in succession.

**TABLE 3.10 QUICK REFERENCE OF THE DISTRIBUTION OF PRIMARY PROCESSES AND SPECIFIC ORGANISATIONAL SUBSYSTEMS.**

<table>
<thead>
<tr>
<th>PRIMARY PROCESS</th>
<th>IN</th>
<th>MN</th>
<th>CR</th>
<th>DE</th>
<th>RL</th>
<th>RE</th>
<th>DC</th>
<th>EN</th>
<th>OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT/OUTPUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RELATIONSHIPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATTER-ENERGY INPUTS TO</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MATTER-ENERGY OUTPUTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFORMATION OUTPUTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>PRIMARY PROCESS</td>
<td>IN</td>
<td>MN</td>
<td>CR</td>
<td>DE</td>
<td>RL</td>
<td>RE</td>
<td>DC</td>
<td>EN</td>
<td>OT</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>INFORMATION INPUTS TO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATTER-ENERGY OUTPUTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFORMATION INPUTS TO INFORMATION</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>OUTPUTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATTER-ENERGY ADJUSTMENT PROCESSES</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>MATTER-ENERGY THROUGHPUT ADJUSTMENTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>MATTER-ENERGY OUTPUT ADJUSTMENTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>INFORMATION INPUT ADJUSTMENTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>INFORMATION THROUGHPUT ADJUSTMENTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>INFORMATION OUTPUT ADJUSTMENTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>FEEDBACK PROCESSES</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**STABLE STATE ADJUSTMENTS**

**EVOLUTIONARY PROCESSES**
<table>
<thead>
<tr>
<th>PRIMARY PROCESS</th>
<th>IN</th>
<th>MN</th>
<th>CR</th>
<th>DE</th>
<th>RL</th>
<th>RE</th>
<th>DC</th>
<th>EN</th>
<th>OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVOLUTION</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GROWTH, COHESION, INTEGRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROWTH</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>COHESION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>INTEGRATION</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PATHOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LACKS OF MATTER-ENERGY</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>EXCESSES OF MATTER-ENERGY INPUTS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>INAPPROPRIATE MATTER-ENERGY PROCESSES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LACKS OF INFORMATION INPUTS</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXCESSIVE INFORMATION INPUTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INPUTS OF MALADAPTIVE GENETIC INFORMATION</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABNORMAL INTERNAL MATTER-ENERGY PROCESSES</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It should be clear now which primary processes are performed by which subsystems. Therefore it is now possible to commence to the next section which is the formulation of Indicators.

3.8 INDICATORS.

The next step in operationalising theory consists of identifying significant practical indicators. The Shorter Oxford English Dictionary (1973) describes an indicator as: "That which serves as an indication of something." A more elaborate and scientifically related description from the same source holds that an indicator is "Anything used in a scientific experiment to indicate the presence of a substance or quality." Central to this definition is the aspect of indication or pointing which refers to describing the presence of a substance, quality, structure or process, which has a certain relevance to and meaning in a particular context. Thus far, several structural as well as process components have been identified which are to be transformed into indicators. The following indicators of subsystem Information processing are identified here as:

3.8.1 INPUT TRANSDUCER

INDICATORS OF MATTER-ENERGY INPUTS TO MATTER-ENERGY OUTPUTS

- Specific employees are responsible for collecting information.
- They have a specific level of training for the job.
- Information is collected continuously.
• Specifications exist for the types of information that is collected.
• The ratio of information collected to information that is send into the organisation is measured.
• Information collectors are close to the sources of information.
• The accuracy of information is controlled.

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO INFORMATION OUTPUTS
• Use of specific equipment to assist staff in their tasks.
• Staff now how to deal with too much information.
• Information has to be collected within a specific time.

INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS
• Some way to minimize or manage human errors.
• There are different ways to send information through.
• Staff know what to do if information is not flowing through to the organisation.

INDICATORS OF MATTER-ENERGY INPUT ADJUSTMENTS
• Other activities can be done when there is not enough specific work.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENTS
• Measures taken to prevent accumulation, delays or wastes of information.
• Staff should be able to adapt to new information requirements.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS
• Varying amounts of information with different meanings can be accommodated.
• Feedback from the environment is used to change the way in which information is collected.
• Information collectors are sensitive to the needs from the environment.

INDICATORS OF EVOLUTIONARY PROCESSES
• The extent to which the activities have become independent, complex, reorganised, sophisticated or expanded.

INDICATORS OF GROWTH
• Using more space or equipment.
- Processing bigger volumes of information.
- Tasks are reorganized.
- Unit can take own decisions.
- Sophisticated procedures and adjustments.

**INDICATORS OF INTEGRATION**
- The process is under control of a central decider.

**INDICATORS OF PATHOLOGY**
- Failure of adjust to new demands.
- Confusion as to what information has to be collected.
- No staff or equipment to do the job.
- Cannot process large volumes of information.
- Cannot accommodate large numbers of people.
- Negative reaction from the environment.
- Gets no environmental feedback.
- Organisational structure limits operations.
- Presence of wastes of energy, material, causing delays in process.

**INDICATORS OF TERMINATION AND DECAY**
- There is no purpose in collecting environmental information.
- The environment cannot give any information.
- In spite of attempts, process has not changed.
- Tendency to scale down operations of subsystem.

**INFORMATION SYSTEM THEORY CONSTITUENTS**
- Source document from which data is obtained.
- Source document has a standardized format.
- System has a transaction processing component.
- Specific equipment such as computers, programmes are used.
- There is a verification programme that rejects faulty source documents.
- There is a data protection facility to prevent distortion.
3.8.2 INTERNAL TRANSDUCER

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS

- Number and types of reports determined by staff.
- Reports are compiled and sent out regularly.
- Costs of internal reports determined by the effort that is required.

INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS

- Information flow indicators:
  - Is difficult information required to compile reports.
  - The length of time it takes to compile reports.
  - Occurrence of human errors
  - Personality differences regarding types of reporting.
  - Some departments delay reports.

INDICATORS OF MATTER-ENERGY INPUT ADJUSTMENTS

- Staff can use other means to report when equipment shortages occur.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENTS

- Measures which are taken when there are wastes, accumulation or delays in reporting.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS

- The content and meaning of reports are changed to meet new demands.

INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENTS

- Reporting on staff outputs after motivational measures were taken.

INDICATORS OF EVOLUTIONARY PROCESSES

- Report formats are regularly updated and refined to meet new demands.

INDICATORS OF GROWTH

- The way in which reports are created is refined.
- More information is used to compile reports.
- More staff is assigned to the task of reporting.
- Departmental heads decide on their own reporting formats.
- More refined procedures and adjustments.

**INDICATORS OF PATHOLOGY**
- Failure of adjustments to effect change.
- When reporting has been unstable for a long time.
- Personnel or equipment shortages.
- Inability to report on a number of events.
- Managerial structure negatively impact on reporting of activities.
- Inappropriate reporting, or formats which waste a lot of energy.

**INDICATORS OF TERMINATION AND DECAY**
- The types of reports are no longer useful, but are not replaced.
- Attempts to change reporting within subsystem have failed.
- Scaling down operations of the subsystem.

**INFORMATION SYSTEM CONSTITUENTS**
- Transaction Processing System responsible for capturing data.
- New procedures and variables for more efficient data capturing.
- Physical component such as a computer to do processing.
- Software components.
- Edit programs to validate data.
- Updating of system when required.
- Process subject to control according to audit principles.

**3.8.3 CHANNEL AND NET INDICATORS**

**INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS**
- A variety of communication channels are used by the staff of the organisation.
- Channels have a steady state of inputs related to outputs.
- The ratio of inputs to outputs is used to measure efficiency of channel and net.
Effectiveness of channel and net measured by its location close to inputs, is ability to prevent distortion of messages, and its ability to handle excessive volumes of messages.

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO INFORMATION OUTPUTS
- The use of specific communication media to carry messages internally.

INDICATORS OF INFORMATION INPUTS IN RELATION TO MATTER-ENERGY OUTPUTS
- Messages taking a certain amount of time to reach their destination.

INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS
- The channel and net enables the completion of communication loops.
- Flow of information influenced by accuracy of complex message transfer, the number of channels that are used to convey messages, number of error messages that occur, ability to use channels for communication.

INDICATORS OF MATTER-ENERGY INPUT ADJUSTMENT PROCESSES
- The ability to store or accumulate surplus information pieces for later transmission.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENT PROCESSES
- Measures that are taken to prevent information waste, unnecessary accumulation.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS
- Channel has the ability to transmit large volumes of information.

INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENT PROCESSES
- Is the channel and net used to keep staff updated with relevant information.

INDICATORS OF INFORMATION OUTPUT ADJUSTMENTS
- Measures taken to prevent information leakage to the environment.
- Censorship increase/decrease on channels to regulate speed of transmission.

INDICATORS OF EVOLUTIONARY PROCESSES
- If the established use of channels contributes to organisational change.
- When information conveyed by the channel and net is accurate and frequently carried out.
INDICATORS OF GROWTH PROCESSES

- Indicated by increase in number of channels used.
- Improved definition of channels and net.
- Creation of new and more sophisticated channels
- Increase in volumes of information transmitted by channels.
- Specific channels for specific messages.
- More direct channels are used.

INDICATORS OF COHESION

- The effectiveness of the channel has a perceived positive effect on the organisation.

INDICATORS OF INTEGRATION

- Indicated by minimum information losses by channel.

INDICATORS OF PATHOLOGY

- Messages that are transmitted through channels are not used.
- Channels are out of order.
- Channels cannot be used due to personnel or equipment shortages.
- Excessive volumes of messages leads to queuing in channels.
- Whilst in the channel, messages become distorted or damaged in some way.
- Due to faulty links, messages do not reach their proper destinations.
- Delays occur in message transmission due to wrong use of channels.
- Use of channels are blocked by organisational structure or style.

INDICATORS OF TERMINATION AND DECAY.

- Channels exist but serve no purpose.
- Attempts to activate use of channels have failed.
- Reduced use of network.

INFORMATION SYSTEM CONSTITUENTS.

- Presence of a network of computers which are linked together.
- Links serve as channels to transfer data into and out of the memory.
- Channels enable decision makers on various levels to use information purposefully.
• Network can be extended to include more users or computers.
• Whilst messages are conveyed in the channels, data is protected against erasure (loss), distortion or leakage.
• Growth of this part of the IS indicated by more sophisticated channels that can process bigger volumes of data.
• Overloading of channels creates delays.
• Channels have a certain capacity which determines the volumes of data that can be processed.

3.8.4 DECODER

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS:
• Presence of a common code known by all employees in the organisation.
• Internal code facilitates improved quality and quantity of products.
• Internal code is used to select specific inputs.
• Efficiency of input-output ratios measured by use of codes.
• Subsystem effective when
  - use of codes is directly linked to inputs,
  - use of codes limits distortion of environmental inputs (i.e. perception of a client's problem).
  - a wide variety of codes are used for different environmental problems.

INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS:
• Decoded messages influence variables of information flow in the following manner:
  - makes processing less complex,
  - decreases processing time,
  - is dependant on efficiency level of different departments,
  - reduces human errors.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENT PROCESSES:
• Introducing different codes to relieve stress caused by flow problems.

INDICATORS OF MATTER-ENERGY OUTPUT ADJUSTMENT PROCESSES:
• Clients are better helped by more accurate classification of needs through codes.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS:
• New codes are introduced when changes in information occur.

INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENT PROCESSES:
• Business codes are used to measure staff outputs.

INDICATORS OF FEEDBACK PROCESSES:
• Feedback from the environment is decoded for internal use.

INDICATORS OF EVOLUTIONARY PROCESSES:
• Decoded information is meaningfully used by the organisation over a long period.

INDICATORS OF COHESIVE PROCESSES:
• Extensive use of decoded information promotes unity amongst staff members.

INDICATORS OF GROWTH:
• Growth occurs when use of codes increases client turnover or monetary value of outputs.
• Growth indicated by introduction of a more sophisticated system of codes.
• Because of more accurate decoding, everybody becomes more aware of exactly what to do.
• Processes are rearranged because of more accurate decoding.
• Higher volumes of information or matter-energy can be processed with the use of decoding.
• As a result of decoding, adaptive processes become more sophisticated.
• Through use of codes, inputs become more refined.

INDICATORS OF PATHOLOGY:
• Decoding is not done consistently.
• When decoded information is not used.
• When information is not steadily decoded.
• The organisation is unable to respond to decoded information.
• Unwarranted change or distortion of coding system.
• Inability to decode large volumes of information.
• The results of wrong interpretation of decoded information are seen in faulty inputs, handling of clients.

TERMINATION AND DECAY:
• Decoding subsystem is outdated and not used any more.
• Existing codes become disused because they are not adapted to new needs.
• Some members continue to use some codes on a limited scale.

INFORMATION SYSTEM CONSTITUENTS:
• Decoding carried out within the Central processing unit.
• Decoded information presented in binary code.
• Decoding of information enables processing of large volumes of information.
• Decoding into a standard code enables expansion of subsystem when need arises.
• Information in computer-readable format can only be read by a system using a similar code.

3.8.5 ASSOCIATOR.

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS:
• Associations made by employees has a positive influence on quality and quantity of products.
• Minimal deviations from a steady state of input-output ratio.
• Inputs are made at a low cost.
• Input-output ratio indicates high efficiency.
• Subsystem is measuring inputs constantly.
• Feedback provided by subsystem has a low level of distortion.
• A wide range of environmental needs can be accommodated by subsystem.
INDICATORS OF MATTER-ENERGY INPUTS TO INFORMATION OUTPUTS

- In order to make associations, specific reports, graphs, statistics or comparative analytical studies have to be present to enable associations to be made.

INDICATORS OF INFORMATION INPUTS IN RELATION TO MATTER-ENERGY OUTPUTS

- Environmental needs and requests are reflected in associations.
- Areas that are affected by associations are the quantity, proportion and extent of future services.
- Associations have to be made frequently.

INDICATORS OF INFORMATION INPUTS IN RELATION TO INFORMATION OUTPUTS

- A communication loop exists when associations are used to alter products or services.
- Completion of a communication loop occurs when alterations reflect a response to environmental needs.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENT PROCESSES

- Evidence of alterations are found in new procedures or improved processes.
- Measures are taken to ensure that associations can be made at the right time.

INDICATORS OF MATTER-ENERGY OUTPUT ADJUSTMENT PROCESSES

- Associations should encourage, rather than discourage staff.
- Minimal numbers of staff or clients leaving organisation as a result of alterations.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS

- Changes in the volume or meaning of information can be accommodated in the associations made by subsystem.

INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENT PROCESSES

- Associations are also about staff outputs and productivity.
- The satisfaction of owner, stakeholder, staff are important areas of measurement.

INDICATORS OF FEEDBACK

- Associations are used to give feedback to staff and suggestions of corrective actions.
INDICATORS OF EVOLUTIONARY PROCESSES

- It is found that in time the organisation changes as a result of implementation of associations.
- Associations are accurate and frequently made.

INDICATORS OF GROWTH

- Growth occurs when as a result of associations, products become more valuable.
- There is a higher client turnover.
- Associations are more specific and refined.
- The functions of the subsystem are precisely outlined.
- Availability of a broad range of associations.
- Results of associations become more sophisticated.

INDICATORS OF COHESION

- Nature of associations promote staff motivation.

INDICATORS OF PATHOLOGICAL PROCESSES

- No associations are made for a certain period.
- Associations are not fed back to staff.
- Associations cannot be made due to personnel or equipment shortages.
- Increased volumes of associations overload staff.
- Incomplete information from which associations are drawn.
- Information is unavailable for associations to be made.
- No responses occur when the associations are too many and too diverse.
- Associations are made by the wrong people.
- Responses to associations creating unnecessary wastes of energy, clients.

INDICATORS OF TERMINATION AND DECAY

- The making of certain associations are no longer applicable.
- Attempts to make associations more applicable to processes has failed.
- Limited use of some associations.
INFORMATION SYSTEM CONSTITUENTS

• Associations are done by the DSS function of the Information System.
• Five critical elements have to be present before associations can be made:
  - Conditions for measurement.
  - Sensor which measures.
  - A standard against which measurements are made.
  - A control unit that compares measurements with standards.
  - A person to generate corrective signals.
• A diversity of variables that are measured.
• Positive messages to reinforce employee efforts.
• Negative feedback to change employee efforts.
• Data is used to verify statements and perceptions.
• Process aims succeed in improving staff productivity.
• Feedback processes are regularly updated.
• Increase in variables for measurement.
• DSS becomes more specific.
• Feedback should be applicable to the particular production process.
• SDS function keeps inventory of equipment and stores.

3.8.6 MEMORY

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS

• Effectiveness of storage contents influenced by staff effort.
• Certain set volume of information stored and retrieved.
• Memory maintains an information input to output ratio.
• Memory is effective when the cost of storing data is kept low.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENT PROCESSES
• Measures to ensure that the memory is maintained and does not cause wastes,
accumulation or delays in information storage and retrieval.

- The type of memory is adjusted to cope with new needs.

**INDICATORS OF INFORMATION INPUT ADJUSTMENTS**

- Measures are taken to enable memory to accommodate larger volumes or different information.

**INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENT PROCESSES**

- Fast and accurate information storage and retrieval has a positive effect on staff motivation.

**INDICATORS OF INFORMATION OUTPUT ADJUSTMENTS**

- Security or access measures exist to prevent information leakage from memory.

**INDICATORS OF EVOLUTIONARY PROCESSES**

- Reliability of memory having long term benefits for the future of the organisation.
- The frequency and accuracy of information storage and retrieval processes increases.

**INDICATORS OF GROWTH**

- Increase in number of memory components.
- Expansion of memory capacity.
- Higher or processing speed.
- More accurate storage and retrieval.
- The memory becomes a recognised unit on its own.
- Memory can process more information.
- Memory needs more complicated adjustment measures.

**INDICATORS OF PATHOLOGY**

- Attempts to rectify memory problems have failed.
- No information is stored or retrieved for a time.
- Memory functioning is hampered by shortages in equipment or staff.
- Memory does not have enough storage space to take a volume of information.
- Memory contents are lost due to interference.
• Other organisational processes cannot function if information cannot be retrieved.
• Wrong handling of memory leads to delays.

**INDICATORS OF TERMINATION AND DECAY**

• The memory subsystem is no longer used.
• Memory was not adapted to new needs.
• Memory is used only on a small scale.

**INFORMATION SYSTEM CONSTITUENTS**

• Specific hardware that serves as main storage mechanism.
• Auxiliary storage devices called diskettes.
• Use of a program to enter data into the memory.
• Memory capacity that is easily extended if needed.
• Memory is used to obtain objective information.
• Memory protection by private access codes.
• Presence of a security plan.
• Validation of data before it enters memory.
• Warning signals when memory capacity will be overloaded.
• Memory is controlled by auditing its usefulness.
• Decay indicated by replacement of outdated memory facilities.

**3.8.7 DECIDER**

**INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS**

• The decisions by the subsystem has a direct influence on organisation products.
• Takes decisions within a certain time.
• Cost of decision making calculated by the effort it requires.
• Efficiency of decisions found in the demand for decisions in relation to actual decisions made.
• Ability of the decider to be close to the situation that needs a decision. (Simulation
models)

- Capacity of decider to meet extraordinary demands from environment.

**INDICATORS OF INFORMATION INPUTS RELATED TO MATTER-ENERGY OUTPUTS**

- Decider needs information from the environment to decide on nature of services.
- Variables of decision relate to quantity, proportion or extent of service.
- Decisions are taken within a short time.

**INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS**

- Presence of a Feedback-Loop exists when decisions reach production units.
- Information flow determined by:
  - complexity of a decision.
  - how long it takes to take a decision.
  - possibility of human errors.
  - the number of deciders who have to take the decision.
  - Influence of personality conflicts.

**INDICATORS OF MATTER-ENERGY INPUT ADJUSTMENT PROCESSES**

- Decisions focused on acquiring additional staff or equipment.
- Controlling the use of stored items.

**INDICATORS OF MATTER-ENERGY THROUGHPUT PROCESSES**

- Controlling wastes, delays, accumulations or any production flow problems.
- Strategies such as new procedures, office arrangements and automation.

**INDICATORS OF MATTER-ENERGY OUTPUT ADJUSTMENT PROCESSES**

- Decisions to prevent staff or clients leaving the organisation.

**INDICATORS OF INFORMATION INPUT ADJUSTMENTS**

- Decides on what information to obtain.
- Decides on the amount of information required.

**INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENT PROCESSES**

- Decides on how to improve staff social interactions.
- Developing strategies to improve owner, stakeholder and staff satisfaction.
INDICATORS OF FEEDBACK PROCESSES
• Decides on corrective actions in response to environmental feedback.
• Provides feedback to staff regarding productivity.

INDICATORS OF EVOLUTIONARY PROCESSES
• Decider is sensitive to environmental pressures.
• Conducts organisational change as a result of these pressures.

INDICATORS OF GROWTH
• Decider uses more equipment to facilitate decision making.
• More precise outline of decider functions.
• Functions are more accurately defined.
• Decider is able to make more informed decisions.
• Decisions are more sophisticated and strategic.
• Decisions relate to reorganisation of processes and components.

INDICATORS OF COHESION
• Results of decisions have a positive effect on staff motivation.

INDICATORS OF INTEGRATION
• Decider has proper control over all processes.

INDICATORS OF PATHOLOGY
• Cannot adjust processes.
• When decisions are made without use of information.
• When information is used selectively.
• Absence of decider for a long time.
• Adverse reaction from environment.
• When no feedback from the environment is received.
• Decider is confused by excessive volumes of information.
• When organisational structure faults disables decider.
• Inappropriate or inefficient decisions seen in wastes of material, energy, human components or delays in processes.
• Breakdown in communication between decider and other subsystems.

INDICATORS OF TERMINATION AND DECAY
• Decider function has no purpose any more.
• No new functions are sought for the decider.
• Decider is involved in other minor activities.

INFORMATION SYSTEM CONSTITUENTS
• Presence of a Structured Decision System (SDS) to take care of routine decisions.
• Presence of a Decision Support System (DSS) to assist deciders with decision making.
• Use of statistical or accounting models by DSS.
• Giving forecasts of proposed alternatives.
• Recommending solutions.
• Five elements in system program:
  - conditions for measurement.
  - A sensor doing process measurements.
  - A standard for conditions to be measured.
  - A control unit that compares measurements to standards.
  - An action generator to send corrective signals to controlled unit.
• Employee actions are either encouraged (positive feedback) or discouraged and changed (negative feedback).
• Differentiation and sophistication of DSS function.
• DSS function designed for decider needs and is adjusted accordingly.

3.8.8 ENCODER

INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS
• Quality and Quantity of environmental reporting dependent on staff interpretation.
• Decoded data is always used as basis for external reports.
• The effort to compile reports determine the costs involved.
• The effort of reporting viz the number of reports produced, determines the efficiency of the subsystem.

INDICATORS OF MATTER-ENERGY INPUTS IN RELATION TO INFORMATION OUTPUTS
• Specific equipment is used to produce reports.

INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS
• Communication loop exists when information responses follow environmental requests.
• Information flow for encoding to occur, influenced by:
  - The ease with which report information can be obtained.
  - How long it takes to compile a report.
  - The extent to which human errors can occur in the report.
  - Delays caused by slow departments.
  - Delays caused by certain persons.
  - The number of people whose permission must be obtained before a report can be drafted.

INDICATORS OF MATTER-ENERGY INPUT ADJUSTMENT PROCESSES
• The extent to which shortages in reporting equipment can be resolved.
• The alternatives that are available if sudden shortages occur, (e.g. stored items, rationing)

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENT PROCESSES
• Ensuring that reports are accurate the first time.
• Limiting reports that serve no purpose.
• Making sure that reports are ready on time.
• Preventing accumulation of reports.
• Rearranging physical set up to facilitate reporting.

INDICATORS OF MATTER-ENERGY OUTPUT ADJUSTMENT PROCESSES
• Report contents should not be harmful to the employees of the organisation.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS
• Changing report formats to suit new and different types of information.

INDICATORS OF INFORMATION OUTPUT ADJUSTMENTS
• Information to be included in reports have to be verified before inclusion.

INDICATORS OF EVOLUTION
• Improvement of accuracy and frequency of reporting.

INDICATORS OF GROWTH
• More aspects to report on are identified.
• Reporting formats become more sophisticated.
• Reports become more standardised.
• Increase in volumes of reports that can be created.
• More detailed information is available for reports.

INDICATORS OF COHESION
• Reports represent the views of the whole organisation.

INDICATORS OF INTEGRATION
• The extent to which the process is controlled by a specific person.

INDICATORS OF PATHOLOGY
• Attempts to alter the way in which reports are created have failed.
• Some ways to ensure efficient reporting remain unchanged.
• Reports are not created on an information base.
• No reports can be created because no personnel or equipment is available.
• Inability to create a big volume of reports.
• Report creation obstructed by faulty organisational structure.
• Continuous faults in equipment delaying reports.
• Management style has a negative influence on reporting.

INDICATORS OF TERMINATION AND DECAY
• There is no longer a purpose for creating specific reports.
Attempts to get new purpose for reports have failed.

Limited reports are still created.

**INFORMATION SYSTEM CONSTITUENTS**

- A specific report programme to enable retrieval of information from memory.
- Different formats of reports: graphs, tables, various tabulations and statistical formats.
- Report formats to be in human readable code.
- Makes use of physical equipment to carry out process.
- Updating function to accommodate new formats.
- Accommodates user needs during design.
- Centralized availability of information.
- Sufficient terminals for obtaining information.
- Regular system audit to evaluate effectiveness and accuracy of reports.
- Updating system to meet advances in technology.

**3.8.9 OUTPUT TRANSDUCER**

**INDICATORS OF MATTER-ENERGY INPUTS RELATED TO MATTER-ENERGY OUTPUTS**

- Quality and quantity of environmental communications depend on efforts of employees.
- Communications occur routinely.
- The efforts put into communications determine the costs of the process.
- Preparing outside communications stands in direct relationship to delivering communications.
- Effectiveness of communications determined by:
  - whether communications are a true reflection of what is actually happening in the organisation.
  - whether communications are what the environment wants to know.
INDICATORS OF MATTER-ENERGY INPUTS IN RELATION TO INFORMATION OUTPUTS
- Communications depend on use of specific equipment such as reports, overhead transparencies.

INDICATORS OF INFORMATION INPUTS IN RELATION TO MATTER-ENERGY OUTPUTS
- The time it takes between a communication request and the actual communication taking place.

INDICATORS OF INFORMATION INPUTS RELATED TO INFORMATION OUTPUTS
- A communication always follows a request.
- Transmission of communications depend on:
  - Simplicity of designing a communication.
  - Making sure that erroneous messages are not transmitted.
  - Ensuring that organisational factors such as personality differences or departmental preferences do not restrict communications.

INDICATORS OF MATTER-ENERGY INPUT ADJUSTMENT PROCESSES
- Checking equipment to ensure that communications can take place.
- Using stored items for presentations.

INDICATORS OF MATTER-ENERGY THROUGHPUT ADJUSTMENT PROCESSES
- Attempts to ensure that all equipment is functioning properly in transmission of communications.
- Changing equipment to improve presentations.

INDICATORS OF MATTER-ENERGY OUTPUT ADJUSTMENT PROCESSES
- Measures to prevent faulty reports from leaving the organisation.

INDICATORS OF INFORMATION INPUT ADJUSTMENTS
- Changing communication formats as new types of information become available.

INDICATORS OF INFORMATION THROUGHPUT ADJUSTMENT PROCESSES
- Measures which are taken to improve the image of the organisation with staff.
INDICATORS OF INFORMATION OUTPUT ADJUSTMENTS
- Verifying that wrong information is not used for transmission.
- Ensuring that right information is transmitted.

INDICATORS OF EVOLUTIONARY PROCESSES
- Accurate and frequent transmission to the environment accelerates environmental pressure to further change.

INDICATORS OF GROWTH
- Increased focus on reporting to the environment.
- More equipment is used to do reporting.
- Presentations become more complex.
- The way in which communications are presented is more accurately defined.
- Increase in number of presentations.
- More detailed information is conveyed in communications.

INDICATORS OF COHESION
- Communications have the support of all staff members.

INDICATORS OF INTEGRATION
- Communications are under proper control.

INDICATORS OF PATHOLOGY
- Attempts to improve communications have failed.
- Transmission of communications is unstable.
- Communications do not contain pieces of information.
- Continuous equipment shortages.
- A flood of requests cannot be accommodated.
- Communications are damaged so that transmission cannot take place.
- No information can be obtained for communications.
- The organisational structure prevents accurate communication.
- Inappropriate communications creates wastes, delays and inefficiency.
Managerial styles preventing effective transmission of communications.

INDICATORS OF TERMINATION AND DECAY

- Certain communications are no longer purposeful.
- No communications are requested by the environment.
- Attempts to make communications meaningful, have failed.

INFORMATION SYSTEM CONSTITUENTS

- Provision of supportive facilities:
  - Mail-merging,
  - direct billing programmes,
  - reporting and word processing,
  - graphic representations,
  - electronic transmission of communications.
- Physical components that can be used to transmit communications such as:
  - computer,
  - printers,
  - reports,
  - graphics programmes,
  - visual presentations,
- Links with a network for transmission.
- Communications use information which is collected centrally.

3.9 CONCLUDING DISCUSSION.

The list of indicators as presented above enables one to develop evaluative technology in order to determine the different subsystems, and it represents the model of information management on an operational level. The functions and use of Information System technology in the organisation can be scrutinized by means of the indicators that have been deducted. Following this analysis a few interesting observations can be made. Firstly, in all subsystem processes it appears that the effectiveness of the processes depends to a large extent on the type of effort as produced by human
components in the subsystem. As a variable, the influence of human beings have to be recognized as playing a significant role in organisational functioning. Hence, this variable has been considered in each subsystem process. Secondly, it was attempted to view each subsystem as having its own input, throughput and output processes\(^{10}\). Therefore the model not only contains a number of detailed items for measurement, but as will be noted in Table 3.11, (see page 92), all subsystem processes are described as input-throughput-output functions. The above mentioned focus remains the central basis of analysis, regardless of the process type in question, eg. the different input-output relationships, or adjustments to maintain a steady state in the processes; the effect of steady state functioning on the organisational 'climate', or pathological effects due to disrupted inputs or outputs. The third observation is that by studying the organisation in terms of subsystem inputs-throughput-outputs as described in this model, the value of information as a meaningful tool in understanding and managing the organisation becomes eminent.

Now that indicators for effective functioning of subsystems have been adequately described, a further section will deal with identifying norms for effective organisational functioning. This particular analysis is seen as necessary to provide guidelines measuring organisational functioning, in particular the functioning of so called production orientated subsystems. Production subsystems can be described as the matter-energy producing subsystems, which in the case of the HS Organisation are represented by the different professionals who are involved with providing services to clients.

3.10 EXTENDED LIST OF NORMS.

In Chapter 2 (see page 19) reference was made to the different characteristics of organisations as systems, which would promote definition and analysis of the organisation. In the area of production process definition, these characteristics appear to contain norms which can indicate the effectiveness of the organisation.

\(^{10}\) See fig 3.4 and page 72 for full discussion.
Through analysis of each organisational characteristic as presented in Chapter 2, it is possible to extract a normative indicator to that particular characteristic. This analysis also revealed that normative indicators can be grouped under seven types of measures which can be employed by the organisation in the measurement of processes. These types of measures are listed here for clarity:

- Qualitative measures.
- Quantitative measures.
- Performance measures.
- Accuracy measures.
- Timeliness measures.
- Comparative measures.
- Prioritizing measures.

Using this classification as guideline, the norms as gained from the characteristics of Organisations as systems, are given here.

3.9.1 Norms related to Goals and purposes.

a) The extent to which Long term purposes and short term goals are written in precise statements and not in broad general terms determines the efficiency of Information management. (Qualitative measures).

b) Inclusive with goals are accurate quantitative measures to state the intended scope of operations. (Quantitative measures).

3.9.2 Norms related to measures of performance.

a) Effectiveness measures relate to quantity of outputs, how much environmental and client impact is achieved in relation to goals. (Quantitative measures).

b) Efficiency measures relate to how well the specified goals were achieved. (Qualitative measures).

c) Performance criteria such as unit costs of inputs against outputs, impact per financial unit compared to optional services reflect some of the performance issues.
that have to be measured. (Performance measures).

3.9.3 **Norms related to inputs.**

a) Technological inputs from staff should be justifiable and manageable to effect tangible changes in the client's situation. (Performance - Accuracy measures).

3.9.4 **Norms related to outputs.**

a) Outputs should be a reflection of goals and purposes. (Accuracy measures).

b) Outputs have to produce measurable improvement in client functioning or reduced pathology in specific areas. (Qualitative measures).

c) Outputs are to be measured by quantifiable measurement instruments measuring how much impact was made in a specific area. (Quantitative measures).

d) A balance in time spend on interventions to produce outputs is of importance. (Timeliness measures).

e) In summary: The right intervention at the right time within the right time produces the right effect. This suggests that a combination of variables produces the greatest impact. (Comparative measures).

3.9.5 **Norms related to clients.**

a) Services to clients becomes a measure of performance. (Performance measures).

b) Performance becomes an indicator of how well clients were served. (Qualitative measures).

3.9.6 **Norms related to External constraints.**

a) The system has to be able to measure / assess environmental demands, needs and expectations in order to respond effectively to these. (Prioritizing measures)
3.9.7 Norms related to boundaries and environment.

a) Clear definition and delineation of organisational products and services as well as range of operation facilitates existence of boundaries. (Quantitative and prioritising measures).

3.9.8 Norms related to subsystems.

a) Subsystem activities should be purposeful in their own right. (Prioritising measures).

b) Subsystem processes can be measured in terms of their performance. (Performance measures).

c) Changes in subsystem activities should effect changes in the organisation. (Accuracy measures).

3.9.9 Norms related to components and interrelations.

a) Components of subsystems should be actively involved in processing activities of inputs into outputs. (Performance measures).

b) Component activities should maintain a balance between quality and quantity of activities. (Accuracy measures).

c) The system should provide a performance measurement tool to measure component activities. (Performance measures).

3.9.10 Norms related to decision maker.

a) The decision maker should be in the position to change measures of performance of system components. (Prioritising measures).

b) Decision makers should exist on all decision making levels of the organisation. (Accuracy measures).

c) Decision makers require different information inputs to effectively make decisions. (Accuracy measurement).
3.9.11 Norms related to the designer.

a) The designer is to be the person who plans, designs or conceptualises the nature of the system. (Accuracy measures).

b) The designer’s role should be to affect the decision maker to change actions in subsystem activities. (Prioritising measures).

c) Designer goals are to optimize the performance of the system in the best interest of the client. (Quality measures).

3.11 CONCLUDING DISCUSSION.

The value of the normative indicators is seen in the area of evaluating production processes and organisational functioning. Where the indicators specific to Information processing subsystems are useful for evaluating the effectiveness of these subsystems, normative indicators are useful for evaluating organisational functioning in terms of outputs. In other words, norms can be used within the feedback cycle of the organisation. This section concludes the analysis of the Information Model. The question that now needs to be answered is: how does the model answer to the hypothesis as stated at the beginning of this chapter?

3.12 THE INFORMATION MODEL IN RELATION TO THE STATED HYPOTHESIS.

The hypothesis as formulated on page 35 stated that the effective functioning of the nine critical subsystems will result in the effective functioning of the Information System. It can be stated here that subsystems will function well when the different primary processes operate effectively as described in the model. In the model the six primary processes as they occur within each individual subsystem are analyzed, therefore a sound indication of process effectiveness should be obtained. At the same time, the placement and presence of specific Information System components and processes for each subsystem can be evaluated. This means that if a specific subsystem measures high on effectiveness of functioning, then there is a good indication that the Information System components in that subsystem will be effectively placed. However, this statement remains hypothetical at present.
3.13 CONCLUSION

The main objective of this study was to develop an Information Model for the Management of an Employee Assistance Programme, whilst the testing of the model was not indicated as a goal of this research. The actual testing of the model may be the subject of other research. To conclude this chapter it seems imperative to present the resulting model in its final and complete format. For a graphic presentation see Figure 3.4.

![Figure 3.4: A Comprehensive View of the Information Model.](image)

It should be noted that the Information Model in Figure 3.4 also makes provision for Information System constituents, as was clearly indicated in the analysis. The role of an Information System in an Organisation is thus clearly indicated by this representation.

In the next chapter, existing concepts will be discussed at length, with the aim of incorporating the information as generated through the process of analysis as done in this chapter. In this way the study is meant to make a contribution towards developing and enriching Social Work Theory, as well as Information Theory. As was discussed in a previous chapter (see page 13), the need for
integration of Information Theory with Social Work Theory is of paramount importance. In a certain sense, successful integration might assist the profession of Social Work in surviving the intense questioning by resource providers and society.

Another aspect that will be dealt with in Chapter 4, is the making of recommendations to the Organisation which requested and authorized this research.
Chapter 4

INTEGRATING INFORMATION THEORY WITH SOCIAL WORK THEORY

Introduction

Mouton & Marais (1991:60) postulate that concepts are the most elementary linguistic constructs through which reality is classified. Concepts are symbols of reality. The heading of this chapter refers to the integration of Information Theory with Social Work Theory. This means that the conceptual body that already exists in relation to both Theoretical perspectives, can be enriched and expanded when new information becomes available. It is especially through the denotative expansion of concepts as used in this study, that the connotative sense of these concepts are enriched. In other words, through the addition of more dimensions, processes, functions or characteristics to concepts, our understanding of reality is increased and becomes enriched.

Resulting from the above view, the concepts as outlined in Chapters 1 and 2 will be discussed with the aim to integrate the new knowledge which has been gained in Chapter 3. It was argued in chapter 2 (see page 12) that the HS Organisation is fraud with a diversity of organisational complexities, that environmental pressures have forced these organisations to examine own internal functioning, and bring their internal processes under control. It was also proposed that the Organisational Information System as a rational, objective tool is used to assist the organisation in using information in the interest of bringing processes under control. This recommendation still holds, but it should be noted that the model as developed in Chapter 3 now provides a framework for analysis of Organisational processes.

The conceptualisation deals with the elementary concepts of System and Information System. Thereafter, two concepts that play a central role in this study, are examined, namely those of accountability and Human Service Organisation. In a concluding discussion the value of new knowledge for both Theoretical perspectives is clarified. In the final section, recommendations are made regarding the implementation and use of the Information Model.
4.1 CONCEPTUALISATION

4.1.1 The concept of System

During conceptualization in Chapter 2, several different definitions of systems were given. The key elements of those definitions are given below:

- A set of interdependent components,
- This set comprises a whole entity,
- Dynamic links are focused towards goal attainment. (Caputo, 1988:24)

Another concept used in relation to that of a system is the concept of synergism:

- The sum of different component activities produces a more effective organisation. (Ahituv & Neumann, 1991:74)
- Technology is used by human beings in the interest of the system's goals. (Cnaan, 1989:191)

From the Information model that was developed in this study, a few conceptual conclusions can be drawn:

- Both matter-energy and information processes play a significant role in the system.
- Both these types of processes can be related to the ability of the system to survive.
- Some of these subsystems interact with the environment and are constantly either bringing information into the system or transmitting information to the environment.
- Subsystems are characterized as having structural elements as well as process elements.
- Effective placement of structural elements contributes towards the effectiveness of the processes performed by the subsystems.
- A system is characterized by having input-throughput-output processes.

If the above conclusions are written in conceptual terms, it is clear that a system consists of subsystems, each of which has either a matter-energy or a specific information process function, and
is composed of structural elements or components. The interaction between the different subsystems is responsible for the production of products of matter-energy or information, which are distributed to the environment. The effectiveness with which the sum of these processes contribute towards the attainment of organisational goals, determines the level of synergism or organisational health.

From this information, it is now possible to build an adapted concept of a system which provides a more precise character to the term. A System can be defined as a set of interacting critical subsystems with structural and processing characteristics, which use inputs from the environment to produce matter-energy products which as outputs, are distributed in fulfilment of environmental needs, and/or information products which are used to change internal processes or transmitted to the environment as feedback. This renewed concept incorporates results of the analysis as carried out in this study.

The question arises now: what is the value of the new information which is incorporated in this concept of a system? First of all, this definition lends more contextual body and definition to the dynamics of interaction between components, illustrating to the reader that the subsystems of a system, individually as well as collectively, play a critical role in the survival of the system. Secondly, the functions of subsystems are more accurately defined as matter-energy or information processes, once again defining what happens within the dynamic interactions between subsystems.

Thirdly, it is now also clear that information processing is an important function of any system. This means that all systems collect, process and produce information, and cannot survive without information. Viewed in this way, information becomes a key element towards reaching organisational goals, which inevitably means the survival of the system. It also means that if subsystems are not interacting, no information is produced, although zero information can in itself be information.

In conclusion, the organisation can be seen as a generator, with its critical components developing
matter-energy products as well as information products, the latter which is used to ensure continuous production of matter-energy products and feeding back performance information to the environment. It should be clear now, that Information Processing is an integral part of systemic functioning. Therefore, since information is such a critical component of a system, its conceptual characteristics are examined in the following section in relation to the concept of Information System.

4.1.2 The concept of Information System

Key elements of the concept of information as defined in Chapter 2 (see page 15) are provided here:

- Data that has been processed.
- Through processing, data becomes meaningful to a user. (Ahituv & Neumann, 1991:2) (Caputo, 1988:24)
- Data is collected, transmitted, processed and stored.

Elements of the definition of an Information System are as follows:

- A series of processes,
- systematic classification, indexing, coding, collection, storage, processing, retrieval and transmission of data. (Slavin, 1985:312)
- Data that is needed by a person,
- presented in some mode of presentation, i.e. reports, graphs, tables, figures,
- information flowing from one person to the next, decision making and production carried out,
- manual, or automated process,
- Information processing of a specific volume, certain complexity and cost,
- by components such as: people, hardware, software, data and procedures.
- Levels of decision making in the organisation.

From the analysis as presented in this study, Information System constituents were identified for
each critical information processing subsystem in the organisation. Constituents refer to components and functions of an Information system which collectively becomes the Organisational Information System. Examples of components are: hardware (computers, networks and printers), software consisting of programmes and specified subsystems such as TPS and DSS, and people who use these components for the purpose of collecting and using information.

The analysis also focused on the nine critical subsystems which are directly responsible for processing information in the organisation as system. It was found that for each subsystem process there was an equivalent information component either supporting or facilitating the particular process. The conclusion drawn from the analysis is that the presence of Information System constituents in each subsystem is related to the effectiveness of the processes by the subsystem. The role of the nine critical subsystems in defining the concept of Information system, is then of significant importance.

The implication of the above conclusion is seen in the concept of information. Information can now be defined as data obtained from the environment and from matter-energy producing subsystems, that is decoded into an internal code and used for the purpose of understanding environmental needs and requests, as well as organisational processes, and planning adjustments in these processes with the goal to improve the quality and quantity of the organisation's matter-energy outputs to the environment. Information is also seen as the messages that are transmitted through the organisation's channel and net to the environment in encoded format to report on organisational processes. This conceptualisation offers a more descriptive character to the concept of information.

If the concept of information is connected to the concept of system as defined in the above section, the following elements can be extracted for defining an Information System:

- Information is data obtained from mainly two sources: the environment and the...
internal matter-energy/information producing subsystems.

- Data is decoded into an internal code for internal use.
- Information is stored in the memory of the system.
- Decoded information is retrieved for use in understanding environmental needs and internal processes.
- With the associations made through the process of understanding, decisions are made regarding alterations in internal processes.
- Messages carrying information are transmitted through the organisational channel and net.
- Information can be messages directed in encoded format to the environment.

Elements in the definition of a system are the following:

- Critical subsystems with a specific structure and process.
- Obtaining and using environmental inputs to produce certain matter-energy or information outputs.
- Outputs are used to fulfill environmental needs, adjust internal processes and provide feedback to the environment.

With these elements it is now possible to define an Information System as follows:

An Information System is a set of nine critical subsystems, which can be identified by their specific structural and processing characteristics, and which are sometimes supported by specific electronic components to help carry out specific processes. These processes are the collection, decoding, storing, retrieving, encoding, transmitting, association of pieces of data to and from external and internal resources, with the goal of improving organisational processes and products in the interest of environmental need fulfilment.

The implications of this definition for conceptualisation are the following: Firstly, the definition offers a more specific description of the processes that are supported by the Information System. Secondly, the purpose of the Information System has also been clarified in this definition. Thirdly,
the integration of Theories is represented in this conceptualisation, since both Living Systems Theory and Information Theory terminology is used to describe the concept of Information System. Closely related to the concept and the purpose of Information System, is the concept of Accountability, this concept is discussed in the next section.

4.1.3 The concept of Accountability

The third concept that needs closer examination is that of accountability. Now that the concepts of system and Information System have been structured with new information as gained from this study, it should be clear that even the concept of accountability will have new meaning in the HS Organisation.

Elements of the definition as presented in Chapter 1, are given here as follows:

- Contractual or value based agreement between a resource provider and the HS Organisation,
- to provide certain services in exchange for certain resources (usually financial),
- Activation of controlling processes by the organisation,
- to report on effectiveness and efficiency of services,
- and how resources were utilized.

The conceptualisation in the previous sections extensively dealt with issues of inputs, throughput and outputs of an organisation. In this context, these processes describe the particular relationship between the organisation and its environment in more specific terms. Information on environmental needs and requests as well as internal processes is collected by the organisation and then transformed to shape standards and decisions as to how internal processes can be optimised or designed to ensure the fulfilment of these needs. Information is once again collected on the standard of the internal processes after adjustment and presented in a format that makes it understandable for the environment to receive it as feedback. In a sense this description offers a process definition of accountability in the organisation. So far, the discussion is much along the lines of discussion as
presented in chapter 1. A viewpoint that has been presented before in this study, relating to the
notion that each critical subsystem in the organisation has its own inputs-throughput-outputs is
reiterated here. The relevance of this view is seen in the concept of accountability. Each subsystem,
no matter how small its contribution, can be held accountable for its own inputs, throughput and
outputs. The implications of this are quite far reaching, since all organisational activities can be
linked to specific subsystems.

From the analysis as performed in chapter 3, it was also concluded that if the critical information
processing subsystems are effective in their processes, the organisation is managing its information
effectively. If information is managed effectively, it might suggest that reporting to the environment
is effective and accurate, in turn improving accountability. Effectiveness of information
management then becomes an indicator of the effectiveness of organisational accountability.

The above stated arguments suggest that although the measurement of HS programme effectiveness
can be a complicated issue as was suggested in Chapter 1, this process can now be improved by
means of the Information Model and its Information System constituents. The accuracy of
measurement that is achieved when organisational activities are analyzed as subsystems with own
inputs, throughput and outputs, as well as the use of the Information model to improve information
management, should enhance the accountability of the organisation.

Incorporating the new information as acquired here, accountability can now be defined as: the
extent to which an organisation is able to manage and use information about environmental
resources and needs to control its own production processes in the interest of maximum resource
utilization and goal achievement, and the ability of the organisation to accurately report on its
activities to the environment.

4.1.5 The concept of HS Organisation

It might well be asked if the new information gained through analysis has any influence on the
concept of Human Service Organisation.

In order to explore this question, some key elements of the definition as given in Chapter 1 (see page 7) are given here:

- These organisations process or change people individually or collectively.
- Organisational activities and interventions have a strong ideological base.
- The technologies applied by these organisations to process people are often not concrete, quantifiable and qualifiable.
- The missions of these organisations are often very diverse.
- Environmental needs and requests are often equally diverse and conflicting.
- Organisations are often totally dependent on environmental resources.

The analysis as presented in this study offers the following new information.

- Processing or changing people can be described as the organisation's matter-energy processes. Since these processes consist of inputs (people, resources) from the environment which are transformed into matter-energy outputs, which are in turn fed back to the environment; accurate measurement of these processes, whether performed on individuals or groups, is made possible by the Organisation's Information processing subsystems.

- Since matter-energy processes are ideologically based, rational measurement of processes will contribute towards determining the success of different interventions. There is an indication now, that even measurement of vague Social Work activities is possible with the help of the model as it is developed here. This indication is based on the conclusion that as long as the different Information processing subsystems are structurally determined, then measurement of organisational activities is possible. Even if the activities themselves are difficult to describe in

---

12 This argument was fully discussed in Chapter 1, page 8.
concrete terms, careful study of these activities will reveal quantifiable and qualifiable parameters.

- Rational measurement offers various analysis options to the decider. These and other statistically based measurement options assist the organisation in more accurate determination of environmental needs and their responses to these. The external and internal measurement options offered by the Information model enables the organisation to evaluate their internal processes as well as environmental factors, thereby reducing the areas of uncertainty which are responsible for the muddled missions which are often characteristic of HS Organisations.

- Since HS Organisations usually operate from a resource dependency basis, they need to be accountable to the environment for what is done with these resources. Proper use of Information through activation of Information processing subsystems, enables the organisation to obtain that objective. As per the stated hypothesis, effective development of Information can be facilitated by the implementation of Computerised Information System components.

An adapted and perhaps idealistic conceptual definition of the Human Service Organisation incorporates the above conclusions. A Human Service Organisation can be defined as: A not-for-profit organisation which has as its mission to change people’s attitudes, behaviour and social conditions with the qualifications that: effects of interventions can be measured; definite technologies are used in this process which are measurable, quantifiable and qualifiable; that services reflect measured environmental needs; that information is collected and used to make decisions on the quantity, nature and extent of services; and that an effective system exists which is used to report to the environment on the organisation’s progress.

---

In some instances Human Service Organisations today are profit-making or self-supportive financially. These vendors usually have contractual agreements with businesses to deliver services in exchange for resources. In the author’s opinion, the environmental appreciation or ‘valuation’ of such services determines the level of profitability.
The value of this renewed concept for organisations which can be classified as resorting under the Human Services is that the focus of activities is no longer only on providing a particular type of service to clients, but that these services are becoming quantifiable, qualifiable and measurable, and that these organisations are providing services according to certain standards and norms. These organisations can possess technology which will facilitate control of internal processes and become accountable for own activities.

4.1.6 Concluding Remarks.
The goal which was achieved in the above section relates to building concepts as used in both Living Systems Theory and Information Theory. A careful study of the concepts as discussed reveals that the central focus is on organisational functioning. In all of the concepts, this link is clearly portrayed. As such, it can be concluded that the expanded conceptual framework will influence both the above named theoretical perspectives. In the next section these implications for theory are discussed at length.

4.2 IMPLICATIONS FOR LIVING SYSTEMS THEORY AND INFORMATION THEORY.
It was mentioned in Chapter 1 (See page 10) that Information Theory is but one of the theoretical perspectives contributing to the study of Information Systems. According to Ahituv & Neumann (1991:4) Information Theory is classified as one of the technological sciences. Other contributing sciences are the social and behavioural sciences, and the exact sciences such as statistics, systems theory and control theory. As such, the study of Information Systems is seen to be multidisciplinary, since various perspectives are combined in studying the subject. These authors also describe information flow as fundamental to the study of Information Systems. From an Information Theory approach, Information flow begins with events, continues with conversion of these events into a code, goes on to processing of coded events, and pauses with a perception made by a human being. The decision taken by the human being on the basis of information, then produces new events. This process is termed feedback and begins and ends with events.
If the above process is related to the Information Model as composed in this study, then it becomes clear that there is a significant similarity in the perspectives of Information Theory and Living Systems Theory. The former perspective tends to see Information flow in isolation and only related to the alteration of production processes, whilst the latter provides a far more detailed and broader perspective of Information flow in an organisational context, where interaction with the environment is taken into consideration. Living Systems Theory thus incorporates two phases, namely internal information flow, and information flow from and to the environment.

It was found in Chapter 2 that definitions provided by Information Theory were a lot more practical than the descriptions given by Living Systems Theory. In a certain sense the impression was gained that due to more exposure to practical testing and operationalisation, Information Theory is more user-friendly than Living Systems Theory. This study has attempted to operationalize the latter theory to the point where it can be practically used by organisations to study and assess Information flow and related processes. In this respect, Living Systems Theory has seen development.

In conclusion it can be said that both Theoretical perspectives have gained through the examination of existing concepts. Information Theory is expanded by the broader view of organisational processes as provided by the Living Systems Theory, whilst the latter Theory has gained by the incorporation of knowledge about Feedback-Loops, which has helped in more accurately describing organisational Information processes, an area which was relatively vaguely described by this theory.

In the last section of this study, practical recommendations are made as to the use of the Information Model by the Organisation.

4.3 RECOMMENDATIONS AND GUIDELINES.

The purpose of this section is to make recommendations regarding the use of the Information Model in the interest of the organisation. Certain guidelines are also provided to assist in the practical interpretation of theory as discussed in this study. The researcher realises that from a Living Systems point of view, the information that has been generated so far, has to be encoded in order
to make it usable for the environment! This means that practical use of the model should be facilitated. To facilitate this orientation, the model as constructed can also be used to clarify information processes. (see Appendix A for photographs of the Model as constructed). The discussion here will be conducted in a systematic way, so as to facilitate practical use of this research.

4.3.1 Rationale of the model.

The Model should enable one to achieve the following goals:

a) To identify and measure the relative effectiveness of the critical Information processing subsystems in the organisation.

b) To analyze the functions of the Information System constituents from the Living Systems Theory perspective.

c) To delineate how the effectiveness of Living Systems Theory processes relate to the measures of unit effectiveness as used by the Information Systems Theory.

d) To identify from a Living Systems Theory point of view, the pathologies which impair the effectiveness of Information processing.

e) To suggest possible approaches to remedy these problems.

The following list of recommendations provides guidelines for these objectives to be met.

4.3.2 Practical Implementation of the Model.

The following recommendations can be made:

a) That an audit is done of the organisation to determine and describe the nine critical information processing subsystems, inclusive of the primary organisational processes as they present in the organisation. The objective with this audit would be to obtain a broad overview of organisational Information processing, whilst obvious problems with these processes can be identified. A next step would be to evaluate the effectiveness of these subsystems with the use of the indicators and definitions as provided in this study as a guideline or checklist. These indicators
have to be developed into proper questionnaires before being used as an evaluative tool. The questionnaires are then completed by staff members and then interpreted to obtain information regarding the effectiveness of organisational Information processes. Further information can then be obtained by interviewing staff and searching for practical examples within the organisation.

The results of this audit should be contained in a comprehensive report. This Organisational Information appraisal provides information on Information processes in the organisation as a system, thus ensuring that future Information System analysis can be done using the appraisal as background. To facilitate practical use of the model, a general description of subsystems as they appear in the Employee Assistance Centre, is given in Table 4.1.

### Table 4.1. Examples of the Different Information Processing Subsystems as Found in the Employee Assistance Centre.

<table>
<thead>
<tr>
<th>Subsystem Definition</th>
<th>Examples in Organisational Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Transducer</strong></td>
<td>Market research questionnaires; Mental Health appraisals of business units; Chemical dependency distribution; Aids distribution figures; Patient history; Magazines, Books; Client assessments; Incoming correspondence; EAP action committee minutes; Environmental policies; Answering telephone calls from outside.</td>
</tr>
</tbody>
</table>

*This table provides examples of Subsystems as they might appear in the organisation under study. For a complete description, the reader is referred to the analysis as done on page 36.*
<table>
<thead>
<tr>
<th>SUBSYSTEM DEFINITION</th>
<th>EXAMPLES IN ORGANISATIONAL CONTEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERNAL TRANSUDER</td>
<td>EXAMPLES</td>
</tr>
<tr>
<td>Staff and equipment applied to report on internal activities on an individual basis.</td>
<td>Departmental head - internal reports; Social worker quarterly reports; financial reports; status reports; caseload reports; internal requests; personnel needs assessments; community work project reports; output measurement.</td>
</tr>
<tr>
<td>CHANNEL AND NET</td>
<td>EXAMPLES</td>
</tr>
<tr>
<td>Refers to the network of physical channels which are used to send and transmit information to all individuals or subsystems in the organisation without changing or interpreting the contents.</td>
<td>Managerial communications to staff; internal communications; memorandums and circulars; written case studies; inter departmental postage; internal phone calls; internal client reports (to psychiatrist, Hostel Social worker, referral notes, exchange of material); sending staff meeting agendas; distributing course material; transferring files.</td>
</tr>
<tr>
<td>DECODER</td>
<td>EXAMPLES</td>
</tr>
<tr>
<td>Refers to the translation, explaining and altering of information to make it usable for the staff in the organisation.</td>
<td>Translating raw data in a format that is understood by the organisation; Social work, Psychology terminology; classification of client problems into categories; diagnostic systems; business codes; intercommunication codes.</td>
</tr>
<tr>
<td>SUBSYSTEM DEFINITION</td>
<td>EXAMPLES IN ORGANISATIONAL CONTEXT</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>ASSOCIATOR</strong></td>
<td><strong>EXAMPLES</strong></td>
</tr>
<tr>
<td>Refers to the subsystem which uses new information to change the way in which things are done in the organisation.</td>
<td>Measuring client satisfaction at termination of therapy; measuring and evaluating staff performance; implementing new strategies, procedures, technologies and interventions; eliminating redundant programmes; new policy implementation; identifying staff training needs; strategic planning using information.</td>
</tr>
<tr>
<td><strong>MEMORY</strong></td>
<td><strong>EXAMPLES</strong></td>
</tr>
<tr>
<td>Refers to the subsystem responsible for storing information for various periods of time, and retrieving that information when needed.</td>
<td>Filing cabinets and files in cabinet; maintaining filing system; computer disks and memory space; books in library; social records; conference reports; written case studies; research reports; topical discussions; training manuals; pamphlets.</td>
</tr>
<tr>
<td><strong>DECIDER</strong></td>
<td><strong>EXAMPLES</strong></td>
</tr>
<tr>
<td>Refers to specific staff who use information to make decisions to change alter, and adjust organisational activities.</td>
<td>Managerial functions; administrative decisions; strategic decisions; therapist decisions on future interventions; community worker planing activities; decisions at staff meetings; training schedules; annual plan; assigning tasks; financial planning and budgeting.</td>
</tr>
<tr>
<td><strong>SUBSYSTEM</strong></td>
<td><strong>DEFINITION</strong></td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>ENCODER</strong></td>
<td>Refers to preparing information for outside use by converting information from internal private codes into codes that can be understood by the environment.</td>
</tr>
<tr>
<td><strong>OUTPUT TRANSDUCER</strong></td>
<td>Refers to all communications to the environment.</td>
</tr>
</tbody>
</table>

b) That production processes of the organisation are clearly described and defined to determine how these processes are to be controlled and altered with the use of Information. Classification is facilitated by listing production processes in input-throughput-output relationships, in such a way that a Feedback-Loop is clearly identifiable. An example of a Feedback-Loop is given in Figure 4.1.
Table 4.2 provides an example of a specific class of service in terms of a Feedback-Loop.

**TABLE 4.2 EXAMPLE OF A FEEDBACK-LOOP AS APPLIED TO A SPECIFIC CLASS OF SERVICE.**

<table>
<thead>
<tr>
<th>THERAPEUTIC SERVICES</th>
<th>INPUTS</th>
<th>THROUGHPUT</th>
<th>OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapeutic approach.</td>
<td>•</td>
<td>Individual Therapy.</td>
<td>Outcome measures.</td>
</tr>
<tr>
<td>Treatment model.</td>
<td>•</td>
<td>Marital Therapy.</td>
<td>Impact vs. goals.</td>
</tr>
<tr>
<td>Initial diagnosis.</td>
<td>•</td>
<td>Family Therapy.</td>
<td>Reduction in pathology.</td>
</tr>
<tr>
<td>Intended scope of</td>
<td>•</td>
<td>Group Therapy.</td>
<td>Time measuring.</td>
</tr>
<tr>
<td>operations.</td>
<td>•</td>
<td>Child Therapy.</td>
<td>Performance measuring.</td>
</tr>
<tr>
<td>Treatment plan.</td>
<td>•</td>
<td>Chemical Dependency.</td>
<td></td>
</tr>
<tr>
<td>Time allocation.</td>
<td>•</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This type of classification can be repeated for all the different types of
organisational services. From the above example, it should be clear that output measures can be used to change or improve the inputs that are required in future.

c) That specific measurement instruments are obtained or designed to measure environmental needs on a regular basis. This function, which is included in the functions of the Input Transducer, is an important aspect which is in the researcher's opinion, often neglected by many HS Organisations. For example: environmental attitude questionnaires, corporate mental health appraisals, stress levels in specific business units and organisational climate studies. In the evaluation of existing Computerised Information Systems, the presence of such a facility can be of significant importance.

d) That with the above information at hand, a detailed Organisational Information Template should be drawn, where all subsystem descriptions, inclusive of primary processes, are accurately placed. This template should be based on the Information Model as presented in this study. (see Figure 3.4, page 124). The template will assist staff members in familiarizing themselves with the total concept of an Information System in the organisation, and provide a clear picture of how Information is managed in the organisation.

e) That the different levels of deciders in the organisation have to determine how feedback cycles are to be implemented to control production processes. For this process, the normative indicators as outlined on page 119 can be used. It is suggested that measurable objectives are kept simple and to the point, so as to maintain broad range user interest in the Information system. As an example of

---

15 An Organisational Information Template is defined as a detailed description or chart of all subsystems using the Information Model as format. (see page 124) The (OIT) should be distinguished from an Organisational structure or template as it is used on page 67, and which refers to positions and functions of staff members.
how normative indicators may appear in practice, special reference is made of an article by Wenzel (1990), where four measurable characteristics are presented to facilitate the measurement of counselling services.

1. Does the client's world view correspond with that of the Therapist.
2. The extent to which the client perceives the helper to be genuine, warm and empathic.
3. The extent to which the client thinks the helper to be credible.
4. The extent to which the client feels an emerging sense of mastery over the problem through the encouragement of the helper.

The measurement of client perceptions is seen by this author as a probable alternative to measuring Therapist perceptions, documentation and adherence to clinical standards.

This author also suggests that these characteristics are evaluated in other areas of service, such as Training and consultation. Example:

1. The extent to which managers perceive that EAP staff understand their world and talks their language.
2. Is the practitioner respected by management?
3. Does the practitioner have appreciation for their personal and organisational complexities?
4. Do managers experience a sense of hope in coping with workplace problems?

These practical examples closely correspond with the normative indicators as presented in this study, and illustrate how these could be interpreted for various service areas.

Typical examples of Decision Support System functions would be the following:

**Client utilisation of services**: Total number of families eligible for using of the service divided by the actual number of families using the service.

**Descriptive information**: Utilisation of services by population group, such as percentage of clients who are miners. These types of descriptive measurements are
seen to be significant only when they are compared to the total population existing in the environment.

**Service characteristics:**
- Average time lapsed between initial service request and start of service.
- How much service is provided whilst employees are not at work.
- How much service was provided over the phone rather than face to face.
  - How thorough were follow-up services.
- Are therapists assured that clients received the necessary services.
- Were confidentiality, legal, safety and reporting requirements observed.

**Performance measures:**
- Time between initial request and when services began.
- Time between first call and first appointment.

**Workplace integration:**
- Number of referrals with appropriate documentation and coordination from referral source.

**Referrals:**
- Number of referrals and distribution by type of problem categories.

Several other measures could be adapted using the normative indicators of this study. (see page 119).

When feasibility studies are done on existing Computerised Information Systems, special notice should be taken of the ability of such systems to fulfil the need for a Feedback-Loop, and the ability to provide reports of the above nature.

A decision should then be taken whether Information as managed at present, is effectively done to fulfil organisational as well as environmental needs and match the measurement objectives as outlined above. It should be remembered that an effective Information System does not necessarily contain a computerized system,
and that it is possible to manage Information effectively without the use of such system. However, a Computerised System has definite advantages if it is compatible with organisational needs. Using the same measurement criteria as contained in the list of indicators of this study, an appraisal can be done of other Organisational Information Systems. On the basis of these results, a decision can then be taken on future Computerised Information System implementation.

g) Should the need for a Computerised Information System clearly exist, then the section on Information System constituents of the Information model should be used to familiarize management as to the placement and role of different System components which are required by such system. This familiarisation is only preliminary and intended to give a broad overview of Computerised Information Systems. With the organisational Information needs already established, the help of Systems analysts and professional Computer experts can be called in to provide direction for further planning.

4.7 CONCLUSION.

The research aims as postulated at the beginning of this study, have been met. Through theoretical description and analysis, a platform is created from which Information processes can be analyzed in the organisation. An Information Model was also developed which can assist Social Workers to study Information management in their own Human Service Organisations. Through a process of extensive analysis Information Theory was linked with Social Work Theory in such a manner that Social Workers now have access to a field that has hitherto been neglected by the profession. Research on this topic is far from being exhausted, further studies need to be conducted to continue building the existing theoretical body.

The Information Model warrants further investigation and expansion. This can be achieved through ongoing research and practical testing. But, if this research has contributed towards a
realisation by the profession of the value of Information in the survival of Human Service Organisations at large, a fundamental objective of research has been achieved.

In the spirit of the Living Systems Theory, it is stated that HS Organisations have to take cognisance of new technology, since ignorance of change leads to inevitable decay and termination.
4.8 BIBLIOGRAPHY


7. DOZ werkgroep; Méér dan Computers! Een leerplan Sociale Informatiekunde voor het HSAO, PHAEDON - uitgave, Culemborg, 1992


4.9 SOURCES CONSULTED BUT NOT REFERRED TO IN THIS STUDY.

4. Bulmer, M.; Social Science and Social Policy, Allen & Unwin, Boston, 1986
18. Keys, P.R. & Ginsberg, L.H.; New Management in Human Services, NASW, Silver Spring, 1988
20. LaMendola, W; Glastonbury, B. & Toole, S (editors); A Casebook of Computer Applications in the Social and Human Services, The Haworth Press, New York, 1989
<table>
<thead>
<tr>
<th>No.</th>
<th>Author</th>
<th>Title</th>
<th>Publisher</th>
<th>Location</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Suchman, E.A.</td>
<td>Evaluative Research - Principles and Practice in Public Service &amp; Social Action Programs,</td>
<td>Russell Sage Foundation, New York</td>
<td></td>
<td>1967</td>
</tr>
</tbody>
</table>
INDEX

A

Abstract System 25
abstracted system 25
accountability 9, 21
accountability, and efficiency 26
accountability, and the Information Model 133
Accountability, definition 9, 132, 133
accountability, subsystems of 133
Accuracy measures 120
Adaptive System 29
Adjustment processes 52
Adjustment processes to maintain a steady state 46
administration, definition 26
Administrative Data Processing Systems 17
administrative procedures 17
Ahituv & Neumann 10-13, 15, 18, 25, 29, 30, 35, 127
Aids 139
Alcohol and Drug Rehabilitation Centres 9
Anglo American Corporation 3
Anthony (1965) 18
Assessment 17
Assessor 104
Assessor, definition 40
automation 16
auxiliary storage devices 41
B

batch processing 54
black box 46
boundaries 122
Boundaries and environment 22

C

Caputo 13, 15, 26, 28, 31, 33, 127
censorship 56
Central Processing Unit 38
Chamber of Mines Social Services Department 2
Chamber of Mines, Social Services Department 2
Channel and Net 99
Channel and Network, definition 38
characteristics, of a system 13
characteristics, of the organisation 19
Chemical dependency 139
Classification, of the HS Organisation 25
Client assessments 139
client control system 31
Clients 21, 121
Clinical diagnosis 17
Closed-Loop System 30, 51
Cnaan 13, 14
coding, of data 15
cognitive, applications 14
cohesion 59
cohesion, processes 47
communication-loop, see feedback-loop 51
Comparative measures 120
complementarity 13
Complex System 30
component, norms 122
Components and Interrelations 23
components, interdependent 13
computer 14
computer electronic equipment 50
computer technology 2
computer, and HS Service 2
computer, and HS Services 2
computer, applications 45
computer, applications 38, 40, 60, 99
computer, components 41, 50, 76, 97, 118, 130
computer, disks 141
computer, edit program 37
computer, experts 147
computer, Information System 28
computer, language 39, 104
computer, network 38, 83, 101
computer, programmes 27
computer, simulation models 57
computer, System redundancy 48
Computerized Information System 2, 3
computer 50
concept, Information System 15
conceptual system 25
Concrete Oxford Dictionary 95
Concrete System 27
Contractual agreement 132
Costs, of processes 49
costs, of processing 72
critical subsystems 34

data collection 15
Decay and termination Processes 47
decentralization 62
Decider 109
Decider, definition 42
Decision maker 24, 122
Decision Support System 17, 23, 26, 42, 49
Decoder 102
Decoder, definition 39
Delport 33
Designer 24, 123
Differentiation 15, 60
direct, decision support 17
direct, services 25
diskettes 41
distortion 72
Dynamic links 127

edit program 37
effectiveness 3
effectiveness, measures 49
Einstein 26
Employee Assistance Centre 3, 139