CHAPTER 3: THE COMMUNICATION AUDIT, THE INFORMATION SYSTEMS AUDIT, INFORMATION MAPPING, THE INTELLIGENCE AUDIT AND THE KNOWLEDGE AUDIT

Chapter 3: Overview

The following part of this dissertation will focus on a number of terms and processes that have some connection to the process of information auditing, to a lesser or greater extent. These types of audits and processes are discussed with a view to indicating their applicability to designing an information audit methodology. Two terms that are often used as quasi synonyms for the term information audit, are the terms communication audit and information mapping. Not one of these two terms encompass the full meaning of an information audit, as will become clear from the following discussion.

The reasons for choosing the specific types of audits that will be discussed in this chapter are as follows:

- The communication audit because of its focus on organisational information flow patterns.
- Information mapping because of its focus on the identification and use of information resources;
- The information systems audit for its focus on the way in which technological tools are used to manage information resources (although implicitly);
- The knowledge audit: knowledge management (also referred to as strategic information management) is the "highest"/last level of information management (according to the evolution of information management functions) and therefore logically follows on information management and information auditing;
- The intelligence audit for its relationship with both information and knowledge management.

In the first section of this chapter the researcher will provide background information on the different types of audits (listed above) and the process of information mapping. In the second part of the chapter the researcher will discuss how the different types of audits are performed, i.e. the methodologies for these. The researcher will also classify the different types of audits according to the classification system of Ellis et al (cf. Chapter 2, paragraph 4), i.e. as either advisory or compliance audits.

1. Introduction

In the next section of this chapter, the researcher will provide background information on the different types of audits to be discussed and will also define key concepts that will be used during the discussion.

1.1   Communication audit

A related concept to that of the information audit is the communication audit. The two concepts are often regarded as identical (i.e. synonyms) or quasi synonyms. In the second part of this chapter the researcher will explain that the term communication audit does not encompass the full meaning of the information audit.

The term communication audit is a generic term that was used for the first time during the 1950s to describe a number of systems/strategies that were used to investigate the communication effectiveness in organisations. According to Downs (1987:43) communication audit methodologies were developed by following the examples of financial audit methodologies.

Attempting a definition of the concept communication audit is difficult because the concept has been used as an umbrella term for a variety of applications in different situations (Ellis et al, 1993:143). For example: Hamilton (1987:3) defines a communication audit as an objective report of the communication situation in an organisation. This audit report can be used by top management to implement improvements, e.g. to improve the flow of communication in the organisation. Ellis et al (1993:142,143) define a communication audit as a procedure whereby the state of communications in an organisation is investigated according to a set of criteria, or where the mutual understanding between the parties involved, is evaluated. Cortez & Bunge (1987:41) provide a more comprehensive definition of communication auditing. They describe a communication audit as a process whereby facts are collected, analysed and interpreted, resulting in the presentation of a report that reflects the communication philosophy, structure, practices and flow in an organisation. The researcher will use this definition as a working definition of a communication audit in this dissertation.

Different types of communication audits have different purposes. The "general" purpose of a communication audit is to compile a knowledge base on organisational communication in order to identify and neutralise communication problems (Ellis et al, 1993:142). The communication audit is also concerned with the organisational and sociological aspects of information flow (Buchanan & Gibb, 1998:34).

The different approaches to communication audits include a broad spectrum of activities that could include one or more of the following:

- assessing the effectiveness of the introduction of information technology into an organisation;
- assessing interpersonal communication;
- evaluating management/employee communications;
- evaluating the effectiveness of organisational communications;
- assessing public relations activity (Ellis et al, 1993:143).

Communication audits can be performed for a variety of reasons, e.g.:

- prior to organisational/departmental restructuring;
- when planning to acquire new telecommunications technology with a view to satisfying communication needs;
- for a functional purpose: it is a fact that effective communication serves as a motivating factor (Ellis et al, 1993:142).

1.2 Information mapping

In the literature, the researcher found different descriptions of the process of information mapping. This is because information mapping is currently being used in different environments for different purposes. In the next section of this chapter, the researcher will discuss the differences between the various applications.

1.2.1 Fields; Chance

Two authors, i.e. Fields (1981:155-161) and Chance (1993:237-239), discuss the method of information mapping as developed by Horn.

During the early 1970s Robert Horn developed the American programmed instructional system, also known as information mapping. It is described as a research-based method that is used for analysing, organising and visually presenting information (Chance, 1993:237).

Horn himself defines this form of information mapping is as "a set of rules and procedures for writing, organizing and displaying information about a subject". It involves the categorisation of information according to a classification scheme and then "assigning each chunk of information into labelled blocks. The order and format

in which these blocks are displayed is then geared towards making learning easier and information retrieval more efficient" (Fields, 1981:155).

The major application of this specific form of information mapping as a linear programmed instruction system; a secondary application is as a system for the classification of information; and in line with this, also as an information retrieval system (Fields, 1981:155).

As a programmed instructional system, information mapping can be applied in support of different student levels of knowledge and information needs, e.g.:

- For initial learning
- For the naive student.
- For the sophisticated student
- Relearning
- Review (a quick overview)
- Reference use (Fields, 1981:157).

Information mapping has a number of objectives. These objectives are mainly focused upon making specific processes easier and quicker. These processes include:

- Learning and reference work (e.g. For books).
- The preparation of learning and reference materials (e.g. Computer-aided instruction and hypertext).
- The development of cost-effective procedures for designing and maintaining (e.g. updating) training and reference materials (Fields, 1981:155).

Throughout the years the application of this form of information mapping has evolved and examples of other subject areas where information mapping has been applied range from accounting to arithmetic, cognitive development, educational programmes and media courses to nursing and history (Fields, 1981:159). Chance (1993:237-239) discusses the application of information mapping as a means of determining the usability of online information retrieval systems. This is done by focusing on the content of these systems.

There is however, another school of thought that ignores the application of information mapping as a teaching device related to programmed instruction, but who views it as an alternative method to conventional prose for the purpose of communicating information. According to this school of thought information mapping is defined as "...a set of rules and procedures for writing, organizing and displaying information on a subject" and "...the structured writing facility of information mapping may be of value in the classification and retrieval of information" (Fields, 1981:160).

According to the researcher, Horn's approach to information mapping cannot be classified as an audit.

1.2.2 Burk & Horton

Burk & Horton developed the method of Infomapping as a method for identifying tangible information resources in organisations (Underwood, 1994:59). The methodology of Infomapping as described by Burk & Horton (1988:24) focuses on the use of maps to illustrate the fundamental relationships between items, places, etc. The information map (infomap) can therefore be used to give a visual presentation of the information resource entities in an organisation, and the relationships between these entities[1].

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[1] An information resource entity is defined as a configuration of people, things, information, energy and other forms of input that have the ability to create, collect, store, provide, process and/or disseminate information (Burk & Horton, 1988:21).

1.2.3 Underwood

Underwood (1994:59-64) develops a soft-systems approach to Infomapping for which he uses Burk & Horton's method of Infomapping as foundation.

According to Underwood (1994:59) the method of Infomapping supports the information manager in compiling an inventory of organisational information resources and subsequently, a profile of each of these resources. This overview of the organisational information situation, helps in the identification of gaps in the information collection, areas where duplication take place, outdated information resources, to name just a few.

Underwood (1994:59) stresses that the effectiveness of Infomapping and the results thereof, depend on the accuracy with which the information users give their opinions of the organisational information situation. It should be noted, however, that the question as to *how* the information is used is not answered through the application of this technique. A lack of information about the context within which information is used, can hamper the information manager in analysing the results of Infomapping. The soft-systems method is proposed as an alternative (for a full discussion of this, refer to paragraph 2.2.3).

1.2.4 Best

Best (1985:79) provides yet another description of the process of information mapping. According to this author, an information map is used to construct an overview (model) of the way in which an organisation functions and how it uses information. This model, i.e. the information map must take into account the aims of top management in terms of cost-saving, increasing profit, and improving organisational efficiency. The model should also make provision for indicating whether or not corporate policy and goals are being met.

Best's description of information mapping is that it is diagnostic and evaluative and therefore it can be classified as an advisory audit, with elements of a compliance audit (i.e. where it is determined whether corporate policy and goals are being met).

Best's (1985:78-94) approach differs from that of Burk & Horton in that Best regards information mapping as a technique/tool that can be used to support the implementation of information technology in organisations. In contrast, Burk & Horton's method of "Infomapping" concentrates on the identification and location of all corporate information resources – not only information technology.

1.2.5 Cousins

Cousins, as Best, suggest the use of information mapping when introducing new technology into an organisation. The introduction of technology into an organisation creates complex management and development problems and information mapping is suggested as a solution to these problems (Cousins, 1981:46).

1.2.6 Posch

A problem that is common to many organisations nowadays, is the lack of communication between information professionals, on the one hand, and staff and management, on the other. Posch (1992:56) regards information maps as tools to facilitate communication regarding the information environment in an organisation.

Posch (1992:56) defines information mapping as consisting of diagrams about an organisation's information resources. The information maps are used to describe the corporate information resources, i.e. "those assets used directly to manage an organization's resources". The information maps are also useful for illustrating the relationships between the information resources, their characteristics and their role in the organisation.

1.3 Information systems audit

From 1950 onward computers were introduced in many companies, including accounting firms. The technology replaced well-established paper-based systems. The most common type of data that were stored on Electronic Data Processing (EDP) systems, as they were originally known, was accounting data, such as ledgers and journals (Flesher, 1996:647).

In response to these developments the information systems audit was developed. The term information systems audit is defined as follows: any audit that is used to focus on all aspects (or selected parts) of automated information processing systems and to evaluate these. Information systems audits do not focus solely on automated systems – manual processes and systems and the interfaces between automated and manual systems are also investigated (EDP auditors, 1987:2). Flesher (1996:249) adds to this definition: "Information systems audits involve everything from the initial conversion to an electronic system to applications of specific software programs."

Information systems auditors investigate and evaluate the development, maintenance and functioning of components of automated systems (or of entire systems) as well as the interfaces between various types of systems in an organisation (EDP auditors, 1987:2).

Nowadays, EDP auditing is more commonly referred to as information systems auditing. This auditing speciality is changing rapidly – the result of the continual development of information technology and other technologies that result in little or no human intervention in some procedures (Flesher, 1996:648). It is important that internal auditors have some understanding of information systems. The term *information systems* as used in this context, can vaguely be defined as systems where accounting systems are embedded (Flesher, 1996: 648). A lack of generally-accepted definitions of concepts such as "systems, information and subsystems" are still regarded as a drawback within the field of information systems auditing, especially when looked at from an educational perspective and when developing information systems audit theory (Flesher, 1996:651).

Information systems auditing is very close in its definition to that of the information audit (as it is defined in Chapter 4, paragraph 2). In contrast to the information audit, information systems auditing is one-sided and limited to focusing mainly, though not exclusively, on automated information processing systems. This interpretation by the researcher is supported by the following quotation from Wysong (Information systems auditing, 1983:v): "Our challenge as auditors in the EDP environment is to control where technology is taking us and to see that systems are built to take advantage of the potential benefits of the technology…"

One can therefore conclude that information systems audits are usually performed in environments where the main focus is on electronic data processing and/or the systems used for these processes as well as specialised information systems – where accounting systems are embedded.. In Chapter 4 it will become clear that the term information audit is used to describe a much more encompassing process where the focus is firstly on information (and information content) and secondly on the role that information plays in the organisation as a whole.

1.4 Knowledge audit

Contrary to popular opinion, knowledge management is not a new concept. Ponelis & Fairer-Wessels (1998:1) quote Horton who indicated in 1979 already, in his evolution of resource management functions, that the management of knowledge originated during the 1980s in the form of expert systems and artificial intelligence.

The concepts *knowledge* and *knowledge management* will be defined, before the researcher defines the knowledge audit. The abstract nature of both these concepts make it extremely difficult to define.

Knowledge is that which is internalised within the human mind. It "is formulated in the minds of individuals through experience" and is subjective by nature. Knowledge is the product of adding value to information (which in turn is the product of adding value to data) (Ponelis & Fairer-Wessels, 1998:2-3).

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Knowledge management focuses firstly on the identification of knowledge needs and knowledge assets, as well as the identification of knowledge problems and opportunities; and secondly, on the implementation of knowledge management strategies and solutions (Ponelis & Fairer-Wessels, 1998:5).

According to Kirrane (1999) the scope of knowledge management activities include the creation, discovery, buying (or borrowing), distribution, capture, retrieval, measurement and updating of knowledge. One of the tools available to the manager responsible for organisational knowledge management, is the knowledge audit that is used to collect information on the state of knowledge in an organisation.

1.5   Intelligence audit

Another "level" of information auditing that has recently been under discussion is the so-called *intelligence audit*. The researcher will give a brief overview of two different interpretations of the intelligence audit.

According to Jurek (1997:42) the purpose of an intelligence audit is to identify corporate experts within an organisation, as well as other existing sources of knowledge. The ultimate goal of an intelligence audit is to compile a database of expertise available in the organisation, as compared to a database compiled according to departments. This database will serve as a one-stop source of information that will be very useful when, for example, having to identify members for a research project team.

When looking at Kirrane's description of the scope of the knowledge audit (paragraph 2.4) the researcher concludes that the intelligence audit as defined by Jurek could be regarded as a component of the knowledge audit, rather than as an audit in full right.

Another, different interpretation of the intelligence audit is provided by Fuld (1991) and will be discussed in more detail at the end of this chapter (paragraph 2.5).

2. The different types of audits: Methodologies

The different types of audits that were listed at the beginning of this chapter and defined in the first part of this chapter, will subsequently be discussed in more detail by focusing on specific methodologies that are used when performing these.

2.1   Communication audit

The process of communication cannot be separated from information. The purpose of communication is the dissemination of information. Few of the authors' works that have been studied refer to the information component when discussing communication auditing. Hunn & Meisel (1991:56), however, focus strongly on information as one of the focus areas of a communication audit by stating that a "[communication audit] records the flow of information through an entire organization or sub-unit."

From the above discussion it becomes clear that it is difficult to define the boundaries of the communication audit. Buchanan & Gibb (1998:34) describe the information audit as being subsumed by the communication audit. The researcher disagrees with this statement as a communication audit focuses only on information flows (as far as information is concerned) and not on identifying and evaluating information resources. Information flow is therefore only one component that should be investigated during an information audit. The researcher comes to the conclusion that an information audit is more encompassing than a communication audit when it comes to investigating the information environment.

In the next section of the discussion, the researcher will give an overview of three different communication audit methodologies.

2.1.1 Cortez & Bunge

The phases that Cortez & Bunge suggest be included in a communication audit are similar to those discussed by Stanat for inclusion in an information audit (refer to Chapter 5, paragraph 3.15 for a detailed discussion of information audit methodology as proposed by Stanat). The communication audit methodology as discussed by Cortez & Bunge (1987:45-59) consists of the following phases:

Phase 1: Planning

Determine the purpose and scope of the audit, formulate goals, identify focus areas and determine the general approach to be followed. Draw up a time schedule stating when each of the different phases must be completed.

Phase 2: Compile an inventory of communication items

Collect information about organisational communication items, communication programmes, communication channels, etc., as determined by the scope of the audit. One of the purposes of the communication audit is to give as complete a description as possible of the way in which communication takes place in an organisation. (When applying this phase to information auditing, one would have to provide a complete description of the information life cycle within an organisation.)

Phase 3: Collect information from management

The scope of the audit, as determined during the planning phase, will determine which members of management will be involved in the communication audit to provide information on organisational communication processes, procedures and tools. The auditor can identify members of management who should participate by looking at management responsibility for specific functional areas in the organisation, as well as management responsibility for specific communication functions.

The main purpose of this phase is to collect information pertaining to management's beliefs and attitudes towards the organisational communication function; individual communication styles; key messages distributed by members of management; as well as problem areas identified by them. The researcher regards the identification of key messages that are distributed by management as crucial in terms of the information content of these.

Phase 4: Collect information from staff

It is also very important to collect information from staff, as they are the ones who are influenced by the way in which communication is managed in the organisation. During this specific phase the auditor should identify staff members who will be interviewed or who will be asked to fill out questionnaires. Determine the method that will be used for collecting information, e.g. questionnaires and/or interviews. The auditor should also decide whether all staff members will be involved in the collecting of information or whether only selected staff members will be involved, as determined by sampling. Once a first round of interviews has been conducted, or a number of questionnaires have been sent out, the auditor might obtain important new information. The auditor can then conduct a second round of interviews or send out more questionnaires, as a way of following up on this information and obtaining more detailed information.

Phase 5: Analyse the identified communication items

Analyse the inventory of communication items (as identified during phase 2) and add to these the additional items that were identified during phases 3 and 4. Evaluate these items according to the goals of the audit and the focus areas that were identified during phase 1.

Phase 6: Tabulate, summarise and interpret the data

This phase of the communication audit can be problematic, especially if staff from within the organisation performs the audit. In most instances, staff members do not have the qualifications that enable them to interpret statistical data accurately. Another problem that arises from organisational staff having to interpret the data, is their lack of objectivity. Confidentiality is another potential problem, especially if staff members' names are indicated in the data that has been collected.

It is important that the collected data be analysed and interpreted according to the goals and focus areas that had been identified during the Planning phase (1).

Phase 7: Write the report

The writing of the final report should not present any problems to the auditors, especially if phases 1 (Planning), 5 (Analysis) and 6 (Interpretation) have been performed properly. During the planning phase the expected results of the audit should have been spelt out and sufficient time should have been planned for so as to enable the audit team members to analyse the collected data, to have meetings, to compile preliminary reports, to circulate these for comment.

Phase 8: Inform the staff of the organisation

It is of the utmost importance that the staff members of the organisation are informed of the results of the audit. They were involved in the process by having to give of their working time to provide information. Cortez & Bunge (1987:58) stress the importance of focusing on positive results in the final report, as well as areas where positive improvement can take place. The full report need not be presented to the staff of the organisation. It has been found that the dissemination of the audit results have a bigger impact when it is presented in a summarised format, focusing only on the most important findings than when they are presented with the full report. Staff should also be informed about possible developments and plans for follow-up procedures.

Phase 9: Follow-up

The results and recommendations of the communication audit must be implemented, otherwise the exercise is useless and a waste of time and money. In order to ensure effective implementation, it is suggested that the implementation process be properly monitored.

The researcher comes to the conclusion that the phases that make up this methodology, as described by Cortez & Bunge, can be used successfully for performing an information audit – it is as simple as replacing the term *communication* with the term *information*. When this methodology is used for conducting an information audit the researcher also suggests that more emphasis be placed on information content.

This specific methodology is an example of an advisory audit because it has a strong diagnostic component: the appropriateness of communication systems and channels are evaluated and the staff members are informed of the findings of the audit.

2.1.2 Downs

The communication audit methodology that is proposed by Downs shows many similarities to the methodologies that will be discussed in this chapter. This supports the claim by Hamilton (1993:75) that the principles of an audit stay basically the same and that only the techniques and methods that are used are different for different types of audits.

The communication audit methodology as proposed by Downs (1988:11-49) consists of four phases. The researcher reckons that basic elements of this methodology can be used as a basis to designing an information audit methodology. Downs' methodology differs from some of the other methodologies that will be discussed in that Downs does not make provision for staff from within the organisation to perform the audit. His methodology only allows for auditors from an external auditing firm, to perform the organisational communication audit, the reason being that "[a]nyone can collect information about communication in the organization, but it takes persons with professional expertise and insights to make practical sense of that information – to identify strengths and weaknesses" (Downs, 1988:8).

Phase 1: Initiation

The need for an audit is verbalised. Permission needs to be obtained from management to perform a communication audit. The scope of the audit is determined. The auditors are informed about the way in which the organisation functions, and are provided with

information about the organisational culture, policies, etc. The auditors, in turn, inform management about the audit procedures that they are planning to use.

Phase 2: Planning

Provision is made for financial resources that might be needed; the nature of the final report is discussed and specified; the auditors determine and specify how they will be working in conjunction with the staff of the organisation. The auditors also identify focus areas and select their auditing instruments and tools. The staff members who will participate in the audit, are selected, they are informed of their involvement and appointments are made with them. The staff members are informed of the audit that will be performed and subsequently the auditors make the final preparations.

Phase 3: Identification of a focus area for the audit

According to Downs, an audit should focus on the most important elements in an organisation, e.g. staff involved in different positions, on different post levels; the structuring of the staff; the way in which the staff function as an integrated network; the communication channels that are used and the types of information that are shared. Downs discusses eleven broad guidelines that can be used to guide the auditing process. These include, amongst others: an investigation of the direction(s) of information flow; an investigation of the relationships between information (communication) and task performance; an investigation of the quality of communication relationships, etc.

Phase 4: Conduct interviews

Downs suggests the use of any appropriate instrument for gathering information. The two most basic auditing tools that are discussed by him, are the interview and the questionnaire.

As is the case with the method for Infomapping, as described by Burk & Horton, the communication audit methodology of Downs does not provide for the writing of a final report or for any follow-up procedures. The researcher identifies this as a limitation of the methodology. The methodology should not be dismissed because of its limitations. The basic elements that are included in this methodology can be used as guidelines when developing an information audit methodology. The researcher classifies this specific communication audit methodology as an example of an advisory audit. The reasons for this are that the methodology has a strong diagnostic component by focusing on different elements of organisational communication processes and systems.
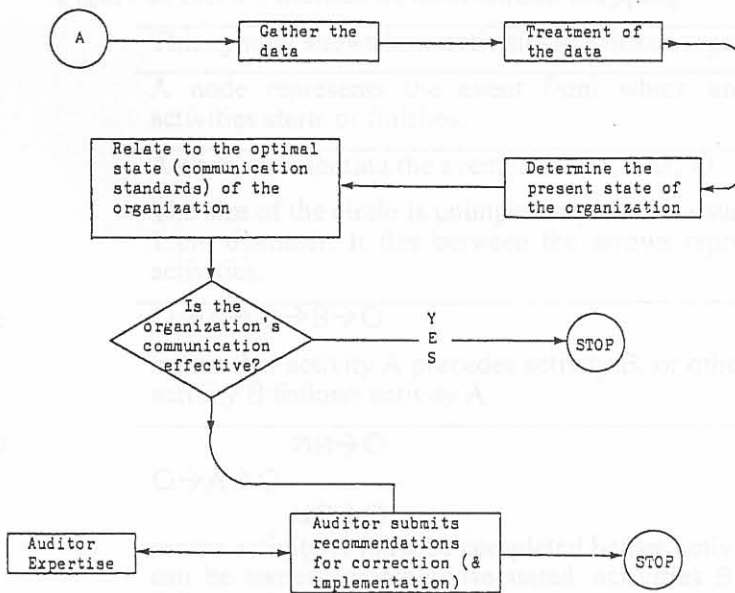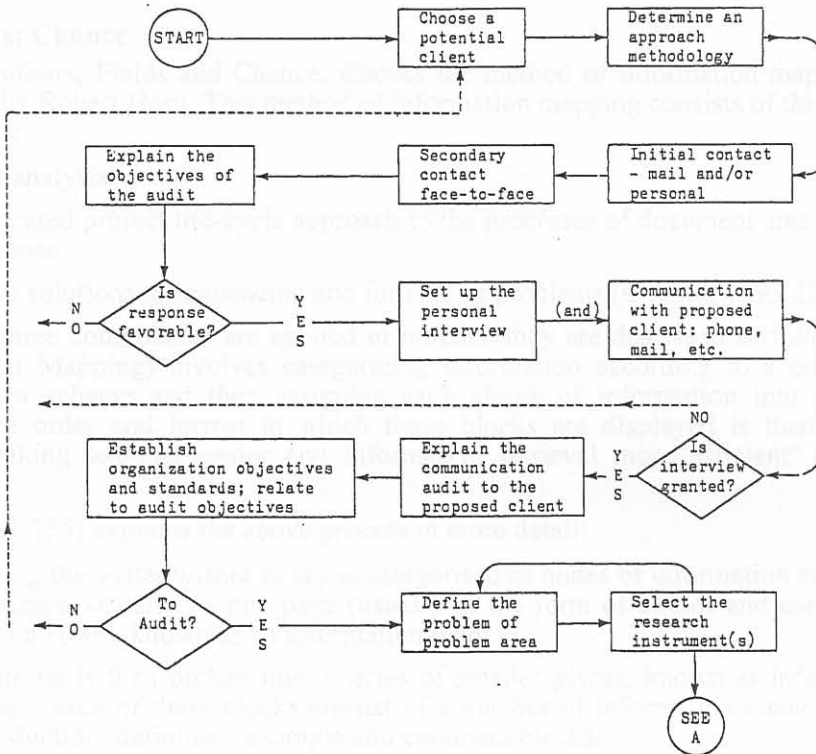
2.1.3 Ferguson & Ferguson

The methodology for a communication audit as proposed by Ferguson & Ferguson (Organizational communication, 1989:578-579) is flexible in the sense that it allows for different scopes. The methodology is presented in the form of a flowchart which makes different implementation options possible – depending on the answers that are provided to the different questions. For example: if at the end of the audit, it is determined that the communication in the organisation is effective, a proposal can be made that the audit be completed at this point. In the instance where it is determined that organisational communication is ineffective, there is an automatic progression to the next step during which proposals are made for corrective action (cf. Figure 1).

The researcher identifies a limitation to this methodology. This limitation is similar to the one identified for Burk & Horton's Infomapping methodology, i.e. that no provision is made for the implementation of the proposals that were made during the last phase of the communication audit. The advantage of this methodology is the visual presentation thereof – this should facilitate the way in which the audit is performed.

The communication audit methodology as discussed by Ferguson & Ferguson is yet another example of an advisory audit because it is used to evaluate the effectiveness of organisational communication.

Figure 1 : Schematic of communication audit

START → Choose a potential client → Determine an approach methodology

Explain the objectives of the audit ← Secondary contact face-to-face ← Initial contact - mail and/or personal

Is response favorable? — N → ... | YES → Set up the personal interview (and) Communication with proposed client: phone, mail, etc.

Establish organization objectives and standards; relate to audit objectives ← Explain the communication audit to the proposed client ← YES — Is interview granted? — NO

To Audit? — N → ... | YES → Define the problem of problem area → Select the research instrument(s) → SEE A

A → Gather the data → Treatment of the data

Relate to the optimal state (communication standards) of the organization ← Determine the present state of the organization

Is the organization's communication effective? — YES → STOP

Auditor Expertise ← Auditor submits recommendations for correction (& implementation) → STOP

(Organizational communication, 1989:578-579)

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2.2 Information mapping

In the next section of the discussion the researcher will focus on different approaches to information mapping, as discussed in the literature.

2.2.1 Fields; Chance

Both the authors, Fields and Chance, discuss the method of information mapping as developed by Robert Horn. This method of information mapping consists of three main components:

- Content analysis.
- An integrated project life-cycle approach to the processes of document creation and maintenance.
- Effective solutions to sequencing and formatting problems (Chance, 1993:238).

When the three components are applied in practice they are described as follows: "It (Information Mapping) involves categorizing information according to a consistent classification scheme and then assigning each chunk of information into labelled blocks. The order and format in which these blocks are displayed is then geared towards making learning easier and information retrieval more efficient" (Fields, 1981:155).

Fields (1981:155) explains the above process in more detail:

- Everything the writer wishes to say is categorised as nodes of information and these are presented visually on one page (usually in the form of circles and connecting lines and arrows), known as an information map;
- The material is then broken into a series of smaller pieces, known as information blocks and each of these blocks consist of a number of information elements, e.g. the introduction, definition, example and comment blocks;
- The information blocks are arranged in a standardized sequence.

The process is visually illustrated in Figure 2.

Figure 2: Horn's method of information mapping

Introduction	This symbol shows how activities are linked together.
Definition	A node represents the event from which an activity or activities starts or finishes.
Notation	A node representing the event is shown thus: O
	The size of the circle is unimportant, but it is usually about ½-1 cm diameter. It lies between the arrows representing two activities.
Example one	$O \rightarrow A \rightarrow O \rightarrow B \rightarrow O$
	means that activity A precedes activity B, or otherwise stated, activity B follows activity A.
Example two	$\nearrow B \rightarrow O$ $O \rightarrow A \rightarrow O$ $\searrow C \rightarrow O$ means activity A must be completed before activities B and C can be started, or otherwise stated, activities B and C must follow activity A.

(Excerpted from Fields, 1981:156)

From the above description it becomes clear that information mapping aids writers in conducting a proper analysis of information content; and the management of complex and appropriate subject matter (Chance, 1993:238).

The key components of the information mapping method are:

- Seven information types: procedure, process, structure, concept, fact, classification, principle.
- Seven information principles: chunking, labelling, relevance, consistency, integrated graphics, hierarchy, accessible detail.
- Two units of information: map, block (Chance, 1993:238).[2]

The researcher comes to the conclusion that the methods of information mapping that were developed in analogy with the original method as developed by Horn, are aimed at making information content available on a micrographic level. An example of this is where the method is used to focus on content detail such as is the case with classifying information found in course material and the mapping of book indexes. The researcher regards this method as too focused to be applied to information auditing where information content is taken into account but not in terms of specific detail as is done with Horn's method of information mapping.

Horn's method of information mapping is not used to examine and/or verify any specific thing and therefore cannot be classified as either an advisory or compliance audit.

2.2.2 Burk & Horton

The process of Infomapping as described by Burk & Horton shows many similarities with the process of information auditing as described by Stanat (refer to Chapter 5, paragraph 3.15 for a detailed discussion of the methodology as described by Stanat). On the other hand, Burk & Horton's methodology differs from the information systems audit (where the main focus is on automated accounting systems) in that Burk & Horton use Infomapping as a method to identify corporate information resources, whether these are technological or not. The results of the infomap are used to promote the optimal use of information as an organisational resource. Once again therefore, there is not an exclusive focus on information technology, although the implementation of information technology can support the optimisation of the use of information as a resource. It is interesting to note that Burk & Horton are the only authors who stress that their method of Infomapping be performed from a proper understanding and grasp of the concept of information management (Burk & Horton, 1988:13). Conducting an organisational Infomapping exercise will therefore create and stimulate organisational awareness of the importance of information (resources) management (Buchanan & Gibb, 1998:38).

The researcher will consequently provide a summary of the process of Infomapping, as proposed by Burk & Horton (1988:32-175).

Phase 1: Compile a preliminary information resource inventory

During this phase, reference is made to the information resource inventory as a *preliminary* one, seeing as the real corporate information resources can only be identified upon completion of all four phases of the Infomapping process.

As is the case when wanting to perform any type of investigation (or audit) in an organisation, it is of the utmost importance to obtain the permission and support of top management before embarking on the exercise. After permission has been obtained, the purpose and scope of the audit (or infomap) can be determined. Factors that should be taken into account when making such a decision include, amongst other things, the current knowledge base regarding the information resources in the organisation; the size and structural complexity of the organisation (e.g. whether there are branch

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[2] Information Mapping as described here by Chance (1993:237-239) is a trademark of Information Mapping Inc.

offices); the way in which information is currently used for planning and management purposes.

The next step would be to develop an instrument that can be used to collect the needed information, e.g. a questionnaire. Burk & Horton suggest the use of a classification scheme during the process of collecting the information. According to their proposed classification scheme, the identified information resource entities (i.e. potential information resources) are classified as sources, systems or services, or a combination of these. (The categories are not exclusive.) Based on this classification scheme, sub-categories can be identified, if necessary, e.g. internal and external information resource entities; manual or automated information resource entities. The classification is done based on the information that is collected about each information resource entity and by focusing on the specific context within which the information resource entity is used as well as how the use and value of the entity is perceived by the users and managers thereof.

It is important the person responsible for identifying and discovering organisational information resources, be on the lookout for so-called "hidden" information resource entities, i.e. information resource entities with potential value that staff members are not using or not even aware of. Information that is collected about so-called "hidden" information resource entities should be handled with care as it may be of a confidential nature or sensitive information that is used to provide the organisation with a competitive edge, in which case there are reasons for the information resource entity being "hidden".

Phase 2: Determine the cost and value of the information resource entities

The process whereby the cost and value of information resources/products are determined has been and still is a very controversial subject. Burk & Horton suggest the determination of the "relative" value of the identified information resource entities, as well as the calculation of the cost of these. The information gained in this way is also used to determine whether the information resource entities are being used in a cost-effective manner within the organisation. The researcher will not discuss these formulas and methods in detail, nor will she evaluate these or their usefulness. This is a topic for further research as will also be discussed in Chapter 4.

Burk & Horton suggest that one starts by calculating the cost of the identified information entities. Three guidelines apply:

- Identify the elements of cost to be considered.
- Determine objective(s) for costing, e.g. operating costs, total investment to date, etc.
- Decide on a method for measuring cost, e.g. direct costing, standard costing, life-cycle costing, cost estimating, etc.

It is also important to identify unnecessary and excess costs.

Following on the phase during which the cost of the information entities is calculated, the value of the information entities needs to be determined. Firstly, the nature of values to be investigated must be identified. Thereafter the information entities must be compared with one another and must subsequently be ranked in terms of their overall value to the organisation. The following three ratings should be taken into account before doing the ranking:

- Rate effectiveness (i.e. the measure of effectiveness with which the information entity supports the activity/activities intended);
- Strategic role of the information entity (i.e. the strategic importance of the information entity in terms of the activity/activities it is supposed to support);
- Strategic role of the activity (i.e. the strategic importance of the activity supported by the information entity).

The value-added model as developed by Taylor (1986) can also be used to determine the value of information entities.

For the last component of this phase, Burk & Horton start from the principle of information (resources) management that states that it is very important to relate cost

to value. To do this with the identified information entities, the ranked information entities are taken and categorised according to value indexes, ranging from high, to medium, to low, to nil value levels.

Phase 3: Analysis

During this third phase the actual infomapping is done. The first step of this phase is to determine according to which goals the analysis should be performed.[3] The goals guide the process of analysis.

Burk & Horton suggest the use of three basic analytical processes. The first consists of the compilation of a matrix to indicate the location of the information resource entities within the organisation, in relation to the users, functionaries (handlers and/or suppliers) and managers of these entities. The information can be combined in one matrix, or alternatively, a matrix can be compiled for each of the groups, i.e. one for the users, another for the functionaries and a third one for the managers (see Addendum C for an example of a user matrix). The second analytical process involves the visual presentation (mapping) of all the identified information resource entities on one sheet of paper. The third analytical process involves the visual presentation of all the identified information resource entities in terms of their financial aspects, i.e. value and costs.

Following on the compilation of the different maps, the information needs to be analysed. Burk & Horton suggest different methods for analysis. For example: one can look at the way in which the information resource entities are distributed throughout the organisation, and compare this with the distribution of the users, functionaries and managers thereof. The purpose of this method of analysis is to evaluate whether, if at all, and how effectively the information resource entities are being used as corporate resources. The source by Burk & Horton (1988:123-137) can be consulted for more detailed guidelines as to what critical factors should be taken into account during the process of analysing the different matrixes.

The mapping process was briefly mentioned as part of the second analytical method. The identified information resource entities are plotted on an information map (preferably on one sheet of paper), according to their characteristics, as became clear during the analytical process. The axes of the information map represent function, conduit, content and holdings, respectively (see Addendum D for an example of an information map). When plotting the information resource entities, each one must be scrutinised and answers must be found in order to determine the location on the infomap, e.g. is the entity more function-oriented as compared to being content-oriented. The infomap can be used for various purposes, e.g. to give an overview of the information resource entities in the organisation and by giving an overview, allowing one to identify areas where duplication take place, areas where gaps exist as well as areas of potential co-operation.

Phase 4: Synthesis

During this phase, all the information that was collected during the first three phases, are synthesised and consolidated. The corporate information resources are also identified. The phase of synthesis concentrates on three aspects of the information resource entities, i.e. the nature of the entities, their value and cost as well as their various strong and weak points. The result of the synthesis is a complete knowledge basis of all the information resources in the organisation. Burk & Horton (1988:175) describe the result as follows: "... after all four Steps had been completed, the overall result was a reconnaissance map of previously uncharted terrain – the first of its kind – providing a bird's eye view of your corporate information resources, their identification, location, nature and strategic significance".

The researcher comes to the conclusion that there are limitations to Burk & Horton's methodology of Infomapping. One limitation is that the process as described by them, does not allow one to make pertinent proposals regarding the improvement of information practices in the organisation, nor does it allow for proposals for future action plans. In all the communication audits that were studied (of which the one of

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[3] In Stanat's methodology for performing an information audit, she suggests that these goals be determined during the first (planning) phase, in accordance with organisational policy and goals.

Cortez is regarded as being the most comprehensive of these), as well as the majority of information audit methodologies (as discussed in Chapter 5), one of the most important parts of the audit, if not the most important, is the proposals that are made in the final report, as well as a plan/schedule for the implementation of these proposals. (These characteristics are also integral to other types of audits, e.g. the financial audit.) To the researcher it seems like a futile exercise to build up a knowledge base of the information environment within an organisation and not to put the information to any use. The time, money and staff that were invested in an audit (or infomap, for that matter) should be used to the advantage of the organisation. As a fifth phase of Burk & Horton's methodology for infomapping the researcher would like to add a phase during which a final report is prepared with the results of the exercise and with a view to the future, i.e. proposals for improvement/development and the implementation of these.

Buchanan & Gibb (1998:38) identify Burk & Horton's method of infomapping as "...the most comprehensive method available for identifying and defining an organisation's information resources." Information management practices and policies are investigated and problems and opportunities are identified. A limitation to the methodology is the lack of investigation of the organisational environment (in terms of the policies and objectives). Although the cost and value of information resources are determined, the methods used are crude and only provide rough estimates. Furthermore it is a time-consuming and expensive process.

Burk & Horton's method of Infomapping cannot be classified as an audit because it is only an intensive discovery process. Some components of this methodology, i.e. elements of phases 2, 3 and 4 can be regarded as examples of elements of a typical advisory audit (according to the classification of Ellis et al). This is because elements of these phases focus on the valuing of the information resources – this is diagnostic, with the further aim of evaluating the effectiveness and value thereof.

o   Infomapper software
During the early 1990s, F.W. Horton Jr. was involved in the development of an expert system called InfoMapper®, to assist information managers in applying the technique of infomapping in their organisation (Expert system, 1992:81). It is a database-oriented system that allows for the identification and classification of organisational information resources by means of inventorying and also for the compilation of different types of reports. The software program met with varying degrees of enthusiasm. It was, for example, harshly criticised by Barclay & Oppenheim (1994:31-42). Horton himself reacted to this in an article published in 1994 wherein he defended the product and its application (Horton, 1994:117-120). For a full description of InfoMapper, the article by Hayes (1992:9-11) applies.

2.2.3 Underwood
Underwood (1994:61) points out that various techniques have been used in conducting information audits, one of which is the technique of information mapping. Probably the best-known discussion of this technique is the one by Burk and Horton (1988) and summarized by Horton in a series of articles (Horton, 1988:249-254; 1989a:19-24; 1989b:91-95).

It is suggested that the term *information mapping* "has arisen from the study of methods of managing information resources that place particular emphasis on linking the effectiveness of management with the acquisition and use of information." According to a number of authors, the main advantage resulting from this technique is that one is able to obtain a general/broad overview of the information environment in an organisation (Underwood, 1994:61).

Underwood (1994:61) points out that, contrary to popular belief, the graphical presentation of results is not an essential component of the technique of information mapping. The concept of "mapping" should be seen as locating an information resource in an organisation "by reference to a set of coordinates based upon some conceptual model." There is an obvious analogy to cartography, where a graphical map is drawn, using sets of coordinates. In terms of information mapping, the information can remain in the form of lists of descriptions, associated with coordinates. The

drawing of an information map need not be done, especially if the purpose of the exercise is only to compile a list of organisational resources and their locations. There are obvious advantages to using a graphical map, e.g. the reinforcement of textual information through graphical presentation, is said to "add another dimension of meaning". The eye and brain are encouraged to form new associations and/or interpretations (Underwood, 1994:61).

The success of a mapping exercise depends to a large extent, on the choice of a framework of coordinates, as this determines the focus with which the map will be studied (Underwood, 1994:61).

The technique of infomapping uses a two-dimensional coordinate structure. On the one axis information resources are presented which are valued primarily for content (on the one extreme) or medium/conduit, i.e. for information flow (on the other extreme). The second axis is used to present information resources, which are valued primarily for its information function, as opposed to being valued as information holdings. The coordinate of an information resource is determined, after carefully studying it in terms of its use in the organisation, as well as its management (i.e. who is responsible for its creation, maintenance and deletion) (Underwood, 1994:61).

o Case study

A very young company was chosen. The organisational environment was therefore unstable, e.g. the operating environment which was not clearly defined. The unstable organisational environment reflected in the organisational information environment where the information flow was still developing. These two levels of uncertainty, in turn, reflected in the poor decision making in the organisation (Underwood, 1994:62-63).

Different departments in this young organisation were still competing, with the result that each were trying to build up its own information collection - the danger being, the creation of small "information empires". Little, if any effort, was made to share or pool information resources (Underwood, 1994:63).

"To develop an information map when faced with this prevailing view was a thankless, and ultimately, impossible task: there was no common view, and little appreciation of information sources outside the functional perimeter of each division of the organization" (Underwood, 1994:63).

o Alternative approach

The soft-systems approach is identified as one of the best techniques for dealing with design in an environment where the problems are ill-defined. This approach is also defined as a "method of learning", where a shared view is built of the requirements of system design (Underwood, 1994:63-64).

In an environment where the role and value of information resources are unclear, focus group interviews are suggested as a means of collecting information. The advantages are that a cross-divisional debate can be held during which each division can explain the value of its own information resources, while at the same time, giving other divisions the opportunity to examine how these information resources can be used by them (Underwood, 1994:63).

o Findings

Traditionally the techniques of information auditing, e.g. information mapping, is based on the assumption that a stable information environment exists within an organisation and that there is a shared (common) view of the value and flow of information resources in the organisation. Underwood (1994:64) describes this as a "systemic" view.

In contrast to the above, the soft-systems techniques, are suitable for use in environments where a number of different (even contrasting) viewpoints exist. The soft-systems approach does not only emphasise these differences, but even encourages

debate about them. Underwood (1994:64) concludes that the soft-systems approach "has a particular value and role to play when dealing with organizations which are young or are undergoing rapid change."

Underwood's basic methodology is based on Burk & Horton's and because of this the methodology can be described as an example of an advisory audit.

2.2.4 Best

Best (1985:80-81) distinguishes between information mapping as a method and as a technique. He regards information mapping as a method, rather than as a technique. According to him the advantage of this point of view, is that a wide variety of techniques (e.g. input/output analysis, data analysis, etc.) can be used during the different phases of the information mapping methodology. The disadvantage of regarding information mapping as a method, rather than as a technique, is that there exists no one, specific, set pattern according to which one can apply the method. This also highlights, once again, the problem of a lack of information audit methodology.

Best's methodology for "information mapping" for introducing information technology into an organisation, consists of eight phases. The different phases of information mapping, as developed by Best (1985:78-94), will be discussed:

Phase 1: Definition and taking into account corporate policy

As is the case with the other audits that have been discussed thus far and the methodologies for information auditing that are discussed in Chapter 5, it is very important to identify corporate policies and goals and to take these into account when planning to perform an information audit. Best explains this by pointing out that an organisation is made up of a collection of interactive elements, of which information is one of the elements. This emphasises the importance of taking into account corporate policies and goals.

Phase 2: Investigate organisational structure

The organisational structure is investigated according to specific design principles, e.g. effective information flow, the number of information transactions that are conducted across departmental boundaries, the control measures that are needed for information that is used to increase profit margins, the time that is invested in the creation, dissemination and use of information, etc. This can help the auditor to determine whether for example, there exist any autonomies regarding the management and flow of information in the organisation. The investigation also provides the auditor with information as to whether or not information is recognised as a corporate resource and managed and used as such.

The result of this phase is an organisational map that indicates autonomous areas.

Phase 3: Define and analyse problem areas

The information that was collected during the previous phase is used to identify problem areas. Furthermore the information is analysed, taking into account organisational policies and goals (as identified during the first phase).

Phase 4: First "information map"

The first "information map" consists of a number of diagrams and documents that serve as a summary and compilation of the information that has been gathered thus far. Furthermore, this information map serves as a basis/foundation from which the auditor can conduct other investigations, e.g. as relates to the functions and areas of information flow.

Phase 5: Investigate technological options

This phase makes it clear that Best uses the method of information mapping as a tool to the introduction and implementation of information technology in the organisation.

Phase 6: Develop a creative information map

The result of phase 5 is a so-called "creative information map". This map consists of a specification of interfaces, mass storage media, and other technological tools that have been identified as of potential use to the organisation. During this phase, the cost implications of the new information technology must also be investigated. The second information map in Best's methodology therefore serves as guideline for the choice of technological options and the financial implications of these.

Phase 7: Make proposals

Write a report in which the guidelines identified during the previous phase, are "converted" to proposals for implementation.

Phase 8: Implement the proposals

This phase is similar to the implementation phases as discussed by Stanat (refer to Chapter 5) and Cortez & Bunge (discussed earlier in this chapter).

In summary, Best (1985:94) can be quoted on the methodology of information mapping: "... [it] is a structured method for matching management's requirements in controlling the organisation with the structure of that organisation, to arrive at a medium-term strategy for implementing a technological 'nervous system' binding together existing DP to new information technologies and the best existing professional management practices. Carried through with commitment, it can be an exciting process for those concerned and can open up new ways forward, not only in communication and efficiency but in general business success."

Despite the limitation of Best's methodology (i.e. its focused application on being used to implement technology in an organisation), one can look at the basic phases (e.g. the definition of the organisational environment, the identification of problem areas, etc.) for guidance when developing an information audit methodology. What the researcher prefers about this methodology is the strong emphasis on the visual presentation of findings (i.e. the various infomaps).

Strictly speaking, Best's tool of information mapping cannot be regarded as an audit of any type, since the main aim is to use it to guide the implementation of information technology in organizations. Diagnostic elements (cf. the advisory audit) are present in phase 2.

2.2.5 Cousins

Information mapping is suggested as a tool for managing the introduction of information technology into an organisation, because the information map can help the organisation understand the nature of the problems that it faces (Cousins, 1981:48,52).

Cousins (1981:48) uses an information map to present "the geography of the 'Information Business'". It is a two-dimensional map. On the one axis the *products* and *services* that are currently used, are indicated. On the second axis the *content* activities that the organisation is engaged in, are reflected, as well as the *conduit* systems that are in place. This information map included in the article by Cousins (1981:50) is in the same format as the one used by Burk & Horton.
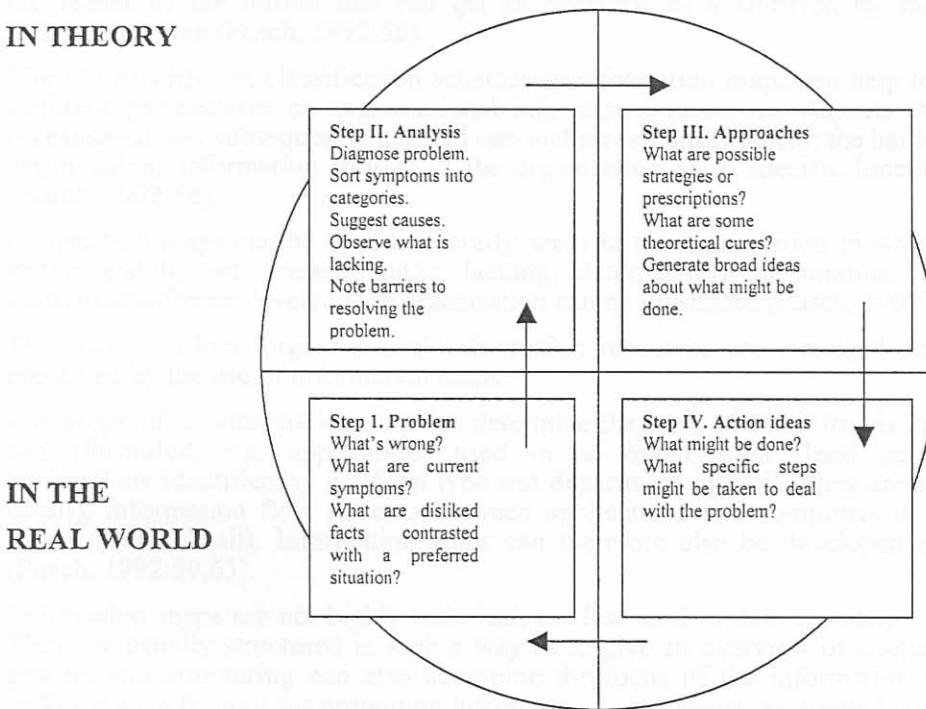
In analysing the results of the information map, gaps might be identified, e.g. problems relating to human resource management in the organisation. Questions that might be asked, include, amongst others, the following:

- Where does the human resource function stand in relation to the technologies that are presented?
- Where does the expertise of the staff lie?
- How many of the systems that are described, are staff members familiar with?
- What are the (potential) influences of the identified technologies on the organisation?
- What resources are needed in support of the identified technologies? (Cousins, 1981:48,50).

In conjunction with the information map, Cousins (1981:52) suggests the use of a Circle Chart to guide the auditor in finding solutions to the problems identified. The Circle Chart guides the user in inventing options. The Circle Chart (illustrated in Figure 3) guides the user thereof through four steps:

- Step 1: Problem – Identify the scope of the problem.

- Step 2: Analysis – Analyse the "technology 'gap' facing our particular situation in terms of causes and potential barriers to resolving the problem."

- Step 3: Approaches – This is an attempt to find solutions to the identified problems, e.g. possible strategies and/or approaches.

- Step 4: Action ideas – What must be done (in terms of specific steps) to solve the identified problems? Cousins (1981:52) states that expertise and insight, based on experience, usually lead to the best suggestions.

Figure 3: Circle Chart: The four basic steps in inventing options

IN THEORY

Step II. Analysis
Diagnose problem.
Sort symptoms into categories.
Suggest causes.
Observe what is lacking.
Note barriers to resolving the problem.

Step III. Approaches
What are possible strategies or prescriptions?
What are some theoretical cures?
Generate broad ideas about what might be done.

Step 1. Problem
What's wrong?
What are current symptoms?
What are disliked facts contrasted with a preferred situation?

Step IV. Action ideas
What might be done?
What specific steps might be taken to deal with the problem?

IN THE REAL WORLD

(Source: Cousins, 1981:52)

The researcher finds the approach to information mapping as described by Cousins, very useful. The information map can be developed as part of an information audit methodology, while the Circle Chart for inventing options (i.e. finding solutions to identified problems) may prove useful in finding solutions to problems that have been identified.

In terms of the classification of this methodology as an example of either an advisory or compliance audit, the same comments that were made about the Best's information mapping not being an audit, apply to information mapping as described by Cousins – elements of the methodology can be used when developing an information audit methodology.

2.2.6 Posch

Posch (1992:56-65) describes information maps as visual communication tools that can be used to disseminate information on organisational information resources to members of management and staff. This is because information maps describe information resources according to their business functions as well as what their roles are in the organisation. According to Posch, information maps are used to support strategic information planning and as a tool during information auditing.

Posch's description and application of information mapping as a diagramming (i.e. visual) technique is in strong contrast with that of Underwood, who states that information mapping need not include graphical representations. Diagrams are used to present information in visual format, while matrices are useful when classifying information. Horizontal and vertical axes define categories. Research has furthermore shown that the visual presentation of information often makes it easier for readers to interpret the information. Furthermore, in technical writing, diagrams and matrices (tables) are often used to present information/concepts (Posch, 1992:56).

Information maps make use of matrices and diagrams "to provide a powerful and flexible means of communicating technical information to a nontechnical audience". The diagrams and matrices used also offer a means of summarising information, i.e. the reader of the information can get an overview of a situation by studying the information map (Posch, 1992:56).

The use of different classification schemes in information maps can help to illustrate different perspectives on organisational information resources. Aspects that can be investigated and subsequently mapped can include, amongst others: the hardware in an organisation; information flow(s) in the organisation or in specific functional areas (Posch, 1992:56).

Information maps can be used to identify areas in the organisation in which specific expertise/skills are present and/or lacking. Alternatively information distribution patterns at different levels in the organisation can be illustrated (Posch, 1992:59).

The way in which organisational information resources are managed can also be presented by the use of information maps.

The scope of an information map can determine the level of detail that is investigated and illustrated, e.g. applications used in an organisation (least detail); these applications identified by platform type and department in which they are used (more detail); information flow patterns between applications and computers in a specific region (most detail). Information maps can therefore also be developed as a series (Posch, 1992:59,63).

Information maps are not highly technical, i.e. less so than data or enterprise models. They are usually structured in such a way as to give an overview of a situation (at a glance) and structuring can also determine the focus of the information map. This makes it a useful tool for presenting information to managers, as pointed out earlier in the discussion (Posch, 1992:59).

It is relatively easy to illustrate relationships between items on an information map, e.g. the relationships between information resources, between information resources and organisational functions, or even between information users and information resources. Clearer illustration of relationships also contributes to more effective descriptions of the resources involved. Information maps are especially useful in helping to identify strengths and weaknesses, as well as areas of duplication and obvious gaps, e.g. regarding information resources of information skills (Posch, 1992:59).

Posch (1992:63) identifies the first of the two most popular uses of information maps as follows: to support strategic information planning and/or to be used as a tool during information auditing. Information maps have proved especially useful as tools to reflect the results of strategic information planning, as well as to support ongoing planning and to communicate all of this to management. When strategic information planning is being done, information maps can be used to illustrate the value of an organisation's information resources.

From the perspective of management, information maps can also prove useful. Before management can start a strategic planning session they need to know what the role and value of information resources are in the organisation and to what extent and how these contribute to organisational goals and objectives. This information can be obtained by performing an organisational information (resource) audit, as this "describes an organization's information resource assets and liabilities." Posch (1992:63) states that information maps can be used to illustrate the results of such an information audit, clearly depicting the relationships between resources and allowing management to pinpoint areas where resources/expertise are lacking and/or present.

Another area where information maps are often used is in the area of systems development. The evolvement of an information system over a period of time can be illustrated in a series of information maps (Posch, 1992:63).

It is very important to note that information maps are rarely used in isolation. Despite all the advantages in presenting information, this information on its own, is often insufficient and all too frequently additional explanations or definitions are required for purposes of clarification.

For information maps to be used effectively as communication tools, it is important that an information map is simple (for the sake of clarity) and not too complex, i.e. as "clear and easy to comprehend as possible". According to Posch (1992:63,65) this is "the most fundamental rule in information mapping." In the instance of an information map becoming too complex, the creation of a second information map should be considered, resulting in a series of information maps, each focusing on a different level of detail. The use of multiple and/or layered maps should also be considered.

Another technique that is used to simplify information maps and the interpretation thereof, is the use of multiple colours in one map. Colours can be used effectively to illustrate relationships more clearly or to highlight specific aspects of the map (Posch, 1992:65).

In conclusion it can be said that information maps are useful tools for information specialists to be used for any type of presentation that relates to the field of information management (Posch, 1992:65).

Posch (1992:65) indicates that information maps can be compiled on an ongoing basis to reflect the information environment in an organisation. A full set of information maps can then be used to make of an "enterprise information atlas".

"Information maps can be self-explanatory and very descriptive [despite being relatively simple in their presentation] and can often answer specific management questions... [I]nformation maps can be used creatively and for purposes ranging from purely technical documentation to clarifying aspects of a strategic business plan" (Posch, 1992:65).

Once again, the strong emphasis on the visual presentation of information by means of information maps, stand out as a useful element of Posch's methodology. Furthermore, information mapping as described by Posch contains elements of the advisory audit in that diagnostic and evaluative components are present.

2.3   Information systems audit

The rapid development of information technology results in changes in the auditing process (not the technique), specifically the technological audit tools that are used. Flesher (1996:651) foresees that, in future, "all audits will be considered systems audits because organizations are placing greater reliance on information systems." This change in definition will have a direct impact on the role of the information systems auditor. It is foreseen that in future, all auditors, despite their specialisation will need skills in information systems auditing.

The discipline of information systems auditing has developed to such an extent that it is now possible for auditors to specialise. Specialisation areas include security, privacy, data processing, information systems, quality assurance, and internal and external EDP auditing (Flesher, 1996:651).

Information systems auditors investigate and evaluate the development, maintenance and functioning of components of automated systems (or of entire systems) as well as the interfaces between various types of systems in an organisation (EDP auditors, 1987:2). Information systems audits are usually conducted as part of internal audits. Information systems audits are sometimes performed by special information systems departments responsible for performing the EDP assignment in an internal audit (Flesher, 1996:249).

Due to the technical nature of information systems auditing and the limited focus on mainly automated, accounting information systems, the researcher will not discuss the information systems audit methodology in detail.

A number of problems/challenges that face information systems auditors have been highlighted in the discussion thus far, e.g. rapid technological development. Uncertainty pertaining to the auditing of computer applications resulted in the Institute of Internal Auditors (IIA) publishing a document with the title *Systems Auditability and Control* (SAC). This three-volume publication contained all known information on computer auditing up to 1977. The SAC was and still is regarded as a valuable resource for internal auditors, management, systems experts and users of information systems. An important aspect that was highlighted in SAC '77 was the risks associated with the auditing of computer applications. SAC '77 was followed up by another research project on auditing. This project resulted in the publication of SAC '91. SAC '91 focuses strongly on audit risk and controls as becomes clear from three of the objectives of the publication (quoted below):

- "To provide senior management with guidelines that would assist in establishing priorities for the implementation of controls to mitigate risks associated with information technology.

- To provide internal audit and information systems professionals with specific guidelines and technical reference material to facilitate the implementation and verification of appropriate controls.

- To extend the document's useful life by emphasizing control principles and technologies rather than specific implementation methods, and by providing a modular format to make updates easier and more timely." (Flesher, 1996:655).

The scope of information systems audits is flexible as one or more aspects of the information systems environment can be audited. These include:

- Data integrity and system security: The auditing of data integrity and system security is one of the most important and common assignments of the information systems auditor. The best way to ensure data integrity and system security is for the auditor to be involved during the systems development process in order to address these issues at an early enough stage.

- Controls: The auditing of controls is also an important assignment, but of even greater importance is the task of the auditor to ensure that the controls suit the needs of the specific organisation.

- Contingency plans: A contingency plan is a plan providing back-up in the case of a disaster, in other words a plan that ensures that no operations are interrupted in case of a disaster. The information systems auditor is also responsible for auditing the effectiveness of the contingency plans of an organisation (Flesher, 1996:250).

Information systems audits can be classified as both advisory audits and compliance audits, depending on the specific aspects of the information systems environment that are audited. For example: the auditing of data integrity and security is an example of an advisory audit; the auditing of controls are evaluative (ensuring that the controls suit the needs of the specific organization) – this being an element of an advisory audit but at the same time there is also an element of a typical compliance audit (i.e. the monitoring of the controls themselves); the auditing component that focuses on contingency plans can be regarded as an example of an advisory audit.

2.4 Knowledge audit

The researcher will give a short overview of what knowledge auditing is but will not go into detail, as the main focus of this dissertation is the information audit. According to the evolution of information management, knowledge management is an expansion of information management. The same applies to the knowledge audit.

The purpose of the knowledge audit is "… to survey the data, information and knowledge that your association has or takes in and then processes and distributes for use by members and staff" (Kirrane, 1999).

When performing a knowledge audit, answers have to be found to specific critical questions, e.g.:

- What do we know and how do we know it?
- How useful is it and to whom?
- How often is this knowledge used?
- How critical is it to have this knowledge? For how long? At what cost? With what updating?

Many organisations assign monetary values to their (intangible) knowledge resources. In the USA, this balance sheet is bound by "laws and generally accepted accounting standards" (Kirrane, 1999).

The result of a knowledge audit is a knowledge map which is used to record, track and monitor the knowledge created in an organisation. The knowledge map therefore gives an overview of:

- Where the organisational knowledge resources are situated
- How it is screened, verified, organized and distributed
- Who is responsible for these knowledge activities and for disposing of unnecessary and outdated information (Kirrane, 1999).

As is the case with communication audits and the majority of information audits (cf. Chapter 5), knowledge audits can be classified as examples of advisory audits because of their investigative and evaluative characteristics.

2.5 Intelligence audit

Fuld (1991) focuses his discussion on the management of organisational intelligence programmes. As a part of such a program, it is necessary to perform an organisational needs assessment, i.e. an "intelligence snapshot". During this three-part phase the true information needs within the organisation are determined, the resources that are used to satisfy these needs and the communication channels through which information is sent and received. Another part of the organisational intelligence programme, is the intelligence audit. The main aim of the audit is to discover so-called "hidden" information resources, such as those that can be found in unused filing cabinets or the desk drawers of individual staff members. "An intelligence audit goes beyond an inventory of the physical resources; it attempts to capture the company's existing expertise. The successful intelligence program catalogues its information assets, much as a company library catalogues its books and magazines" (Fuld, 1991).

The intelligence audit can be classified as an advisory audit based on the classification of Ellis et al.

3. Conclusion

The researcher concludes that none of the processes or audit types described in this chapter can be regarded as the same as an information audit. Elements of some of the processes and audits can be taken into account when designing an information audit methodology, as has been pointed out.