Table 5-1: Internal vs. external information sources

	Internal information sources	External information sources
Definitions	Defined as "hard, focused and closely aligned to operational requirements"	Defined as information that is typically "contained in publications such as books, etc."
Examples	Sales and production statistics internal company reports	Books, reports (external to the organisation), conference proceedings, trade literature, legal and technical documents, external databases
Information management	The focus of managing internal information sources is on managing the life cycle of these sources (i.e. the management of the acquisition, storage and maintenance thereof)	Traditionally external information sources are more difficult to manage than internal information sources. The main reason for this is that analysis and interpretation is necessary to determine the value (i.e. relevance and usability) of these information sources. Only information that has potential strategic value to the operation of the organisation is acquired. Providing access to the right users is of critical importance.
Value and cost	Internal information sources are highly valued, but because the management thereof is often not visible the costs of managing these information sources are seldom closely scrutinised.	These information sources are often not regarded as valuable on a daily basis, but the strategic value thereof is increasingly being recognised. External information sources are often perceived as very costly because of calculable purchase prices. The researcher has however determined that the cost of information cannot be evaluated accurately, without taking into account the benefits derived from the use thereof.

(Swash, 1997:313)

Comments by the researcher

As is the case with Stanat's methodology, the methodology discussed by Swash is also quite comprehensive. The organisational environment is taken into account, information needs and information resources are identified and the cost and value of the latter are calculated and determined. The methodology concludes with the writing of a report with recommendations for corrective action – Swash (1997:314) stresses the fact that the recommendations resulting from the information audit are of vital importance. The researcher classifies this methodology as an example of an operational advisory audit for the following reasons:

- the audit is used establish whether the available information resources are used to satisfy information needs in congruence with the purpose and philosophy of the organisation;
- the audit is used to check on the efficiency and effectiveness with which the resources are used and accounted for.

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3.17 Webb

Webb (1994:9-11) describes the process of information auditing according to three clearly defined stages.

Phase 1: Initial audit (inventory)

An auditor needs sufficient information to work from. For this purpose an organisational profile must be compiled. Such a profile will typically include information on the organisation's main aims and objectives; the number of employees and departments/functions,; the number of sites (if geographically dispersed); and the size and make-up of the client population (Webb, 1994:9).

In addition to obtaining information about the organisation itself, the auditor will also need information on the organisational information environment. In order to get an overview of the current situation in an organisation the auditor needs to compile an inventory of existing (internal) information resources and systems (Webb, 1994:9).

The inventory needs to be followed by the collection of information on the users' information needs. This will enable the auditor to compare the available information resources to the identified information needs. An analysis of the information will indicate whether the available information resources support the organisational goals and whether the resources are relevant in satisfying the users' information needs (Webb, 1994:9).

The need for an information audit often evolves from the need for an organisational information systems review. Webb (1994:9) indicates that performing an information audit will be more beneficial to an organisation than an information systems review. This argument only seems to hold when an organisational information audit is performed, as compared to an information audit that focuses only on a specific organisational unit/units.

An information systems review can however still from part of information auditing. The results of an information systems review will provide the auditor with a "clear statement of services and sources", broken down according to a predetermined classification system. Factors that can be focused on can include: format, subject coverage, and even the quantification of each type of information source – the latter can be achieved by presenting results in percentage format. Additionally, the review can also focus on the information specialists and the typical tasks they perform, especially "non-information" (related) tasks (Webb, 1994:9-10).

Webb (1994:10) warns against examining organisational information systems and procedures in isolation from other organisational systems and procedures. In terms of the purpose of an organisational information audit it is important to compile a holistic picture. Webb (1994:10) therefore suggests following the compilation of an inventory of information systems with the compilation of an overall inventory of organisational systems and procedures. The purpose of this part of the information audit is to identify information-related equipment in the organisation in terms of characteristics such as range, type and location.

Tools/techniques that can be used during the initial stage of the audit to collect information include well structured checklists and questionnaires. Webb (1994:10) stresses the careful planning that should go into drawing up the checklists and questionnaires.

The initial stage represents the information audit in its simplest form. It proves an "up-to-date picture of information holdings and the related means of accessing it". The initial stage does not make provision for costing and/or valuing information resources, nor does it help in identifying users' information needs, or in identifying responsibility for managing information resources (Webb, 1994:10).[15]

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[15] The latter is emphasised in Burk & Horton's infomapping methodology.

Phase 2: Collecting the data

During the second phase of the audit contact is made with creators and users of information. It might be difficult to integrate all the information that will be collected as individuals might use a variety of approaches in creating and using information (Webb, 1994:10).

The researcher has determined that staff members' "information unawareness" can create problems for the auditor. Webb (1994:10) stresses the importance of the participants' positive attitudes towards participation in the auditing process as this influences the successful outcome of the information audit. Any investigation into the way that work is done can easily be regarded as threatening. The auditor should therefore stress the organisation-wide benefits to be derived from participation in the audit and furthermore should try and use questions that are formulated in neutral terms.

Those who will be expected to participate in the auditing process should be informed, leaving them with enough time to prepare for the interview. A sample of staff members should be chosen to participate and care should be taken to choose staff members from different departments, managerial and operational levels, and who are responsible for performing different functions in the organisation. Appointments must be scheduled with individuals who will be interviewed. The auditor should use this opportunity to inform participants of the duration of the interview and the purpose thereof.

The interview should include questions that seek to determine the individual's main responsibilities in the organisation; the nature of information typically required and/or used; the frequency of requirement; and the preferred format for receiving information. The auditor should also try and determine whether individuals have any personal information management systems that they rely on for satisfying their information needs (Webb, 1994:11).

The geographical dispersion of the organisation will determine whether a postal survey will be conducted and/or one-on-one interviews. It might be necessary to adapt the questionnaire slightly for a postal survey. If questionnaires are sent out by mail, a return date and destination address must be clearly indicated (Webb, 1994:11).

Phase 3: Data analysis

The data that has been collected must be analysed with the purpose of finding answer to questions such as:

- What information does staff need to do their jobs properly?
- Is the needed information available internally or externally?
- Is information needs currently being met?
- What systems and procedures are currently used for disseminating information?

After answers have been found to the questions the auditor should investigate what information resources are currently available but are not in use and try and determine the reasons for this. In instances where information resources have become irrelevant, alternatives should be identified, investigated and tested with potential users (Webb, 1994:11).

Comments by the researcher

The researcher classifies Webb's information audit methodology as an example of an operational advisory audit. This is because the objectives of the audit include the following:

- To define the purpose of the audited system and to establish how effectively it is being accomplished.
- To establish whether the purpose is in congruence with the purpose and philosophy of the organisation.
- To check on the efficiency and effectiveness with which the resources are used, accounted for and safeguarded.

- To find out how useful and reliable the information system supporting the organisation is.

The inclusion of the information systems review adds an interesting aspect to the information audit methodology. Furthermore Webb places a lot of emphasis on the follow-up phase, in terms of the identification and testing of alternatives. This phase extends Webb's audit past the scope of the majority of information audit methodologies that have been discussed in this chapter.

3.18 Worlock

In a business environment where information technology providers promise improved quality (while reducing costs) or an increased competitive edge, information auditing (as a decision-making audit) is suggested. According to Worlock (1987:52) an "[a]udit suggests that those payoffs at the top [i.e. the expansion of business scope] and bottom line [i.e. the reduction of costs] are at least measurable in some way, with the added bonus that the idea of an 'audit trail' leaves a line of clearly-made decisions available for subsequent managers to examine and evaluate." The information audit is said to guarantee accurate results, but it should be taken into account that good judgement determines the success thereof. Worlock (1987:52) discusses a framework of headings for the auditing process – the judgement of these suggestions rests with the auditor.

The information auditing process and variations thereof as suggested by Worlock (1987:51-56) were tested in different environments, e.g. where the main role players ranged from being information professionals to commercial information providers. The different methodologies were tested in accordance with different expectations of the results rendered by the information audit. The information providers for example, were interested in using the information audit to determine whether the value of information could be increased through the application of information technology. In order to do this, the information audit had to be designed in such a way that it could be used to audit the value of information that was "in use in the marketplace" (Worlock, 1987:52).

The results of testing different variations of the information audit methodology were the identification of five sets of audit criteria. These should not be seen as mutually exclusive, nor that they should be used in a specific order or that all of these be used every time. The five sets of audit criteria were chosen because they best represent the criteria needed "in situations were both internal and external, local and remote information resources had to be evaluated within global information requirements" (Worlock, 1987:52).

The five sets of audit criteria are:

- Utility analysis
- Quality values
- Productivity factors
- Implementation criteria
- Strategic impact statements (Worlock, 1987:52).

o Utility Analysis

Worlock (1987:52) found through market research that clients valued information not because of the value added to the information through specific processes, nor for the sake of the information products themselves. Information products that were most highly valued were those that delivered the right information at the right time. It therefore became clear that it was of utmost importance to be able to examine a client's business activities and the information needs resulting from these activities. The utility analysis enables the information auditor to create a hierarchy of information needs. In practice the information needs can range from everyday information queries that can be answered by a colleague to those for which the answers can be found in personal filing systems, or even the corporate library (Worlock, 1987:52).

Subsequently the hierarchy of information needs can be structured in terms of corresponding information service(s) that will satisfy these needs. Practical examples include the positioning of current awareness services for frequent, rapid updating of the latest developments in a field; the use of the Reference Collection in the corporate library for answering ready-reference type queries (Worlock, 1987:52).

Worlock (1987:52-53) points out that it is important to note that value-adding is ignored during the Utility analysis. The basis of good auditing is the "recognition of values" (Worlock, 1987:54).

Phase 1: Review of quality values

As indicated in the discussion above, value-adding is ignored during the Utility analysis. Values are examined under the phases of Quality values, as well as Productivity factors.

The selection criteria examined during this phase include the following:

- Speed of access (this is determined by the type of information system used, e.g. real-time vs. manual).
- Comprehensiveness.
- Cost (this is the auditable cost-saving of answering a query in a specific way).
- Recency (this involves the supply of the most up to date information that is available).
- Currency (Worlock, 1987: 54).

Evaluation takes place by awarding points according to the criteria listed above while taking into account the hierarchy of perceived information needs.

Phase 2: Productivity factors

Once the quality values have been determined in view of the hierarchy of perceived information needs, productivity factors are taken into account. This phase evaluates the technological characteristics of information sources, e.g. the retrieval software or text retrieval engines. Examples of textual enhancement can include one or more of the following:

- document structure
- indexing, thesaurus development or full text searching capabilities
- rule-based guidance systems (providing access to 'predictable' answers)
- knowledge-based systems (Worlock, 1987:54).

Phase 3: Implementation factors

Worlock (1987:54) points out that all the phases described thus far (phases 1 to 3) can be used in the design and development of an information system. In view of this application of the audit phases, a phase for the investigation of Implementation factors follows logically. Three issues deserve attention during this phase:

- Ownership. Examples of questions: Whose is it? Should it be acquired? Is it affordable?
- Locations. Is information held locally? Is it accessed via networks? What are the cost implications?
- Interfaces. Can an existing interface be used? Must a new interface be developed? Will the interface be familiar to the users of the system?

Problems may be encountered under each of the headings listed above. The price involved in solving these problems may need to be justified in terms of the initial justification for the audit.

Phase 4: Strategic impact statements

Following on the justification of the price of solving implementation problems, the auditing process may need to be re-started. The new focus might be on the improvements or solutions to the problems in terms of:

- Reducing costs
- Increasing standards of performance
- Differentiating products from those available from competitors
- The creation of new business opportunities (Worlock, 1987:55-56).

o Concluding remarks

The audit priority should be taken into account throughout the auditing process. The aim of the audit is to create a record of the "decision-making chain" that was used to implement change in an information business. This will provide a next manager with information on the rationale of the process.

Comments by the researcher

Information auditing is discussed from the perspective of the financial audit and can therefore be classified as an example of the cost-benefit approach.

3.19 Booth & Haines

Booth & Haines (1993:224-232) discuss an information audit that was conducted for a Regional Health Authority in the UK. The situation that necessitated the information audit was major organizational change, as well as a request for the development of a new information policy. In view of the development of a new information policy the following strategy was suggested:

- Identify and review the corporate objectives.
- Decide what information is needed to meet the corporate requirements.
- Conduct an information audit to determine if the required information currently exists in the organisation and if so, to describe how it is currently utilized.
- Address the identified information "gaps" and problems – where possible.
- Develop an information management policy (Booth & Haines, 1993:225).

For the purpose of the information audit performed by Booth & Haines (1993:225) a project team was put together. This team was made up of a Project Director, a Project Leader, as well as staff who would be responsible for data entry and analysis.

Phase 1: Review corporate objectives

The first phase of the proposed strategy, was to review the recently revised corporate objectives.

Phase 2: Devising a questionnaire

A pool of questions was compiled for inclusion in a questionnaire. These questions were submitted to members of staff, as well as the Information Management Steering Committee for comment. Comments were made regarding the inclusion of questions that address all the stages of information handling/management, e.g. acquisition, collection, evaluation, dissemination, etc. Suggestions were made that there be a balance of statistically encodable questions and free-text questions. Furthermore the auditors had to ensure that the questions were "universal", i.e. applicable to all staff members. After amendments had been made the questionnaire was tested in a "test-run" (Booth & Haines, 1993:227).

Phase 3: Training and support

Ten staff members were elected to conduct the interviews for the information audit and were sent on a one-day training session where they were trained in conducting and the consistent recording of data – while keeping in mind the audit objectives. Each interviewer was given a list of interviewees. While the interviews were conducted the Project Leader had weekly meetings with each of the interviewers (Booth & Haines, 1993:227-228).

Phase 4: Interviews

It is advisable to involve as many staff members as possible in the review of corporate information requirements. This will ensure that the identified information requirements are representative of staff's needs. The interviews lasted between 45 minutes and 1 hour each. Project managers where asked additional questions relating to information flows in the organisation (Booth & Haines, 1993:228).

The major structural changes in the organisation and the accompanying job insecurity hampered the information collection process (Booth & Haines, 1993:230).

Phase 5: Analysis

The results of the questionnaires were a mixture of free-text and coded responses. The responses were analysed using a specialised statistical software package (Booth & Haines, 1993:228).

Phase 6: The report

The current information situation was defined using the Soft Systems Methodology (SSM). This analysis technique enabled the auditing team to "reflect the relative importance of the perceptions and attitudes of staff" within the organization. The information situation in the organisation was presented in a visual format. Graphics were used, e.g. a snail was used to depict an information facility that had slow response times; information that was irretrievable was depicted as a dustbin; an unfriendly system as a maze; information resources that had restricted access were depicted by means of a brick wall. This "rich" information picture was broken down into its main components. In turn each of the components were described in terms of its key elements based on the CATWOE formula:

- **C**lients/customers
- **A**ctors who carry out main activities
- **T**ransformation processes which occur, whereby inputs are modified and outputs produced
- **W**orld view – the framework or outlook adopted
- **O**wnership, in terms of prime concern for the power over it
- **E**nvironment with which the system operates (Booth & Haines, 1993:228-229).

The performance of the specific system was evaluated and problems identified. Following on the systems review a balance sheet was compiled where the findings of the audit were integrated with information on the organisational culture. In conclusion, recommendations were made (Booth & Haines, 1993:230).

Comments by the researcher

Booth & Haines are the only authors besides Jurek who include the development of an information management plan as part of the information audit methodology. The description provided by Booth & Haines is a detailed discussion of the methodology that was used and tested in practice. The researcher classifies this as a hybrid approach since the methodology contains elements of the geographical approach as well as the operational advisory audit.

3.20 Orna

The methodology proposed by Orna (1990:17-72) for the execution of an information audit in an organisation was developed to be used as a basis for an investigation aimed at the formulation and implementation of an information policy in an organisation.

o Pre-audit procedure: The initial investigation

Orna (1990) discusses how one should go about developing an organizational information policy. A lot of groundwork has to be done before one can even attempt the formulation of such a policy. According to Orna the first phase (1990:27-32), is the Initial Investigation. The main purpose of this phase is to collect information, so as to enable the organisation to determine how close they are to having an information policy, or alternatively, to determine whether they really want/need one. Determine the role of information in the organisation and identify all the available information resources (Orna, 1990:28).

According to Orna (1990:28-29, 34, 44) as well as many other authors whose methodologies are discussed in this chapter a prerequisite for the execution of a information audit in an organisation is a sound knowledge and understanding of the philosophy/culture (i.e. mission, objectives and priorities) and functioning of the specific organisation. Orna regards information on the organisation itself as important in view of the consequent investigation relating to information policy: organisational "culture is a potent influence on how the enterprise values information, on the way information flows, and on how information is used" (Orna, 1990:38). The initial investigation should render information on the following:

- Organisational mission, objectives and priorities
- Organisational structure
- Management style in the organisation
- The relationship between the above and the environment in which the organisation functions (Orna, 1990:28).

This information that was collected during the initial investigation will prove invaluable when it comes to performing an organisational information audit (Orna, 1990:28-29).

The scope of an organisational information audit typically includes the following:

- Identifying all the organizational information resources
- Determining how information is used in the organization
- Determining the costs and values of the information function (Orna, 1990:29).

In view of the above Orna (1990:29) stresses that it is of the utmost importance to perform a proper initial investigation (to collect information on the organizational environment), because the auditor cannot interpret the audit results properly without sufficient background knowledge, i.e. the "findings about [the organisational] information resources and the way [the organisation] uses information."

The prerequisites for conducting a successful initial investigation are:

- Support from top management
- Skilled staff to conduct the investigation and the audit
- Sufficient time to complete the research
- Free access to relevant information and the right people
- Standardized methods for managing the investigation and reporting the results thereof (Orna, 1990:31).

- The information audit: methodology

It is interesting to note that Orna (1990:44) makes metaphorical use of financial audit terminology when discussing information auditing. This is because the information audit, as the financial audit is "... an authoritative examination of accounts with verification by reference to witnesses and documents – particularly since 'accounts' were originally oral, because the information audit depends greatly on face-to-face discussion."

The scope of the information audit as discussed by Orna (1990:44-61) includes the following:

Phase 1: Planning

The planning phase includes the following:

- Identify relevant findings from the initial investigation, i.e. everything that relates to information resources and how these are used by the organisation.
- Identify the departments and individuals who should be interviewed.
- Allocate responsibility to audit team members to interview specific individuals and departments.
- Identify the questions that should be asked during the interviews. Circulate these amongst the audit team members for comment. Set up the interview schedule. It is also advisable to provide management members who are responsible for the audit, with copies of the questions and the interview schedule. Furthermore, it may be of use to provide the interviewees with a copy of the questions prior to the interview.

Possible questions that could be asked, include:

- What information is acquired, created, processed and disseminated by the staff of a specific department?
- Who (people) and what (tools, technology) are involved in the above-mentioned activities?
- What is the size of the budget allocated to information sources and who manages it?
- Are any information resources only partially used or not used at all? (Orna, 1990:45).

There should also be questions focusing on the identification of the technical tools that are used to manage and/or handle information resources and furthermore, determining how the management of the technology relates to organisational information management.

Phase 2: An investigation of the information available in the organisation

The following question can be used as a guideline for identifying information resources: "Is this something that people need to know and apply in their work, to achieve their and the enterprise's objectives?" (Orna, 1990:46). It should also be noted that the information audit focuses on identifying information sources generated within the organisation as well as those generated outside.

Phase 3: Identify the resources that are available for making information accessible

This includes groups or individuals who are responsible for acquiring, processing, storing and disseminating information, as well as equipment used to acquire, process, store and disseminate information (Orna, 1990:47).

Phase 4: Determine how information is used to further the purposes of the organisation

Orna (1990:47-48) suggests that the picture of the information sources and activities be "superimposed" on the picture developed during the initial investigation of the organisational objectives and priorities.

At this stage Orna (1990:48-49) also suggests the compilation of rough diagrams that illustrate information flows in the organisation.

Phase 5: Identify those responsible for managing and processing information, respectively

This stage provides information on the lines of control in the organisation. The managers' backgrounds need to be investigated, i.e. their education and training, their function in the organisation and their previous work experience. This type of information is useful when trying to determine the value attached to information in the organisation.

Determine what kinds of information are processed by whom and where; what type of processing takes place; what is the background (training) of the people responsible for information processing and what are their functions in the organisation? Do the people who perform information processing regard this function of their work as information-related?

Orna (1990:51) stresses the importance of obtaining this information in a way that does not threaten the staff members who have to supply it. Reassurances are important as well as informing them of the purpose of the audit, i.e. that the audit is performed with a view to possible positive changes.

Phase 6: Identify and evaluate the information technology that is used to manage information resources

From an information management perspective it is important to consider information technology only after information content has been fully considered. The aim of this stage of the information audit is to obtain enough information so that an information map can be compiled of the information technology that is used to manage information resources. Orna (1990:54) states that information technology should be investigated in the widest definition of the concept, i.e. not only automated technology.

This stage will provide information on:

- What the technology is used for (i.e. specific tasks and procedures).
- The appropriateness of the technology, i.e. ease of use; in-built help functions; reliability; compatibility with other organisational systems and equipment.
- Who is responsible for buying technology – are these the same people responsible for managing the information sources?
- Are the managers of the technology the same as the managers of the different information sources?

Upon obtaining all the needed information the map of technology can be related to the rough diagrams of the organisational information flows to determine where the technology contributes to or hampers information flow (Orna, 1990:56).

Phase 7: Calculate the costs and determine the value of organisational information resources

Orna (1990:57) describes this stage as "a difficult but *essential* part of an information audit" (own italicisation). In order to complete the basic information on the organisational information resources, it is necessary to determine what the information resources cost the organisation as well as what their value are in terms of meeting organisational objectives.

As has been pointed out in Chapter 4, it is difficult, but possible to calculate the monetary cost of information resources. Orna (1990:57) suggests the use of costing objectives and methods which are currently used/accepted by the organisation. If this is not possible, provisional costing objectives will have to be applied and the limitations will have to be highlighted in the final report.

Orna (1990:57) refers the reader to the Burk & Horton's discussion of how to value information resources (see the discussion in Chapter 3 of this dissertation).

In contrast to Burk & Horton and Lubbe & Boon, Orna (1990:57-58) does not regard the relating of costs to values as a possibility. The reason for this is that one has to quantify the values that have to be determined (cf. Burk & Horton, phase 2), before the comparison can be done and Orna cannot see this being done accurately.

Calculating the total cost of the organisational information resources, determining the value of these and relating the cost to the value.

This concludes the process of information auditing as discussed by Orna. The recommendations that follow from the result of the audit, i.e. the "balance sheet", are regarded as separate from the audit. This is explained by Orna's (1990:44) use of the term "inventory" as a synonym for "information audit".

Comments by the researcher

Orna provides the reader with a detailed discussion of information audit methodology. Buchanan & Gibb (1998:40) point to a limitation in Orna's methodology, i.e. a lack of practical tools and techniques. This may prove to be a problem when the audit has to be performed by an information professional, who according to Buchanan & Gibb (1998:40) "... who may lack one or more of these required skills."

In contrast to Burk & Horton's infomapping methodology that focuses on static information resource entities, Orna's methodology focuses on dynamic information flow (Buchanan & Gibb, 1998:39). Furthermore Orna is one of the few authors who include an investigation of information technology as part of the information audit methodology.

The researcher classifies Orna's methodology as an example of the hybrid approach to information auditing, since it contains elements of the cost-benefit approach (not the benefit component), the operational advisory audit and the geographical approach.

3.21 Haynes

BPR is one of the latest buzzwords in the commercial environment. It is offered as a solution to organisations trying to survive in an increasingly competitive environment. BPR is a holistic approach to organisational change. In other words, it focuses on the organisation as a whole – taking into account organisational objectives, strategies, priorities etc. A sound knowledge base of organisational functioning and culture is needed in order to determine the best way to achieve organisational goals. BPR usually suggests the achievement of organisational goals by processing inputs into value-added outputs (Haynes, 1995:30).

BPR can be defined as follows: "Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (Haynes, 1995:30).

In view of the above, it becomes clear that Haynes (1995:30) regards the information audit as a tool to support the development and design of organisational information systems. Radical changes brought about by BPR, often lead to new demands for information services and products. An information audit can provide the information necessary for improving and/or implementing information services and products to satisfy users' needs.

Haynes (1995:30) touches on the problem of a lack of information auditing standards by stating that information auditing has been performed in various different ways in different environments over the years. This phenomenon can only be attributed to a lack of standardisation.

The step-wise information audit methodology suggested by Haynes (1995:31-32) should not be misinterpreted. The steps are listed sequentially, but some of them may be performed in parallel with others.

Phase 1: Analysing users' information needs

The logic behind the first step suggested by Haynes (1995:31) becomes clear when one considers that he regards an information audit as an information system design instrument. The first and most important information needed when designing an information system is information on the information needs of the (potential) users of the system. Within the context of using an information audit as follow-up to or in parallel with BPR it is important to understand that users' information needs reflect organisational needs.

Information needs determination is a difficult process and a hotly debated topic in the literature. The researcher will not discuss this process in detail. Haynes (1995:31) briefly discusses a number of techniques that can be used to assist in gathering information on information needs. These include reference interviews, telephone interviews and questionnaire surveys. The auditor needs the following information on organisational information needs:

- Responsibilities of the information user
- Current and/or required channels for information dissemination
- Specific types of information required (i.e. topic, format, speed at which it is required)
- Existing information sources used and/or available to the user
- Identification of information needs that are not currently being met, identification of redundant information, etc. (Haynes, 1995:31).

The purpose of the list above is not to limit information auditors in terms of the information to be collected on users' information needs. The list should only be used as a guideline and "there should be some leeway for unanticipated areas to be dealt with".

Phase 2: Information resource mapping

Haynes (1995:31) states that this phase may be conducted in parallel with step 1, as information users are also often generators/providers of information.[16] The purpose of this step is to get a (visual) overview of existing organisational information systems and products. The format of the mapping process may vary depending on the specific environment within which the information audit is conducted. One possible method of information mapping is suggested by Burk and Horton who map information resource entities in terms of their characteristics (refer to the discussion in Chapter 3).

Phase 3: Mapping of information flows

This phase is important because information and communication cannot be separated. During the execution of this phase it is important to focus on formal as well as informal channels for the distribution of information. (The latter may be difficult to identify.) (Haynes, 1995:31).

Phase 4: Matching/comparing information needs against/with existing information resources

Haynes (1995:32) identifies various factors that influence the information needs of users in an organization. Identifying the real information needs is therefore a complex process (as has been mentioned during the discussion of phase 1). At a very basic level an organisational information audit is performed in order to determine which information needs are not being met (i.e. information gaps or holes) as well as to identify areas where duplication of effort takes place.

Phase 5: Designing a solution

The information that has been collected up to this point must be used to find solutions to identified problems. There are different ways to go about designing a solution, depending on the purpose of the information audit. It is also possible that top management will have to be convinced of the advantages of implementing suggested solutions. One of the best ways to do this is to make use of the "no-change" scenario and to compare this with the advantages which would result from a changed scenario (Haynes, 1995:32).

Phase 6: Implementation plan

Once a proposed solution has been accepted it will be necessary to formulate an implementation schedule – taking into account factors such as costs as well as available time, staff, physical resources, etc. At this stage Haynes (1995:32) also suggests informing those who will be affected by the changes.

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[16] In the terminology of Burk and Horton: information users may also act as information functionaries.

- Conclusion

Business process reengineering can lead to organisational information systems and products being declared redundant, or it can provide an opportunity for the development of new information systems and products as well as the definition of the roles existing systems and products have to fulfil. The effect of BPR on organisational information systems and products as well as on information auditing, depend on the attitude of information scientists. They should regard and use BPR as an opportunity for increasing organisational information awareness and for the development of the information service function.

Comments by the researcher

This is another thorough discussion of information audit methodology. Unfortunately the cost and values of information resources are not included in any of the phases. Haynes' methodology can be classified as an example of the geographical approach as it contains various phases during which mapping is done.

3.22 Buchanan & Gibb

These two authors discuss a "universal" information audit "model" that they developed after studying a number of information audit case studies and more specifically, the infomapping methodology of Burk & Horton and the strategic information audit methodology of Orna. Buchanan & Gibb (1998:41) describe their "universal model" as "[a]n integrated strategic approach to information auditing". This specific methodology was developed with a view to it being used in different environments and for the purpose of developing an effective information strategy for organisations.

The comment is made that when organisations find that they already possess some information that will be discovered through the audit they can skip this particular phase of the methodology.

The audit methodology is designed to be performed by an information professional (external consultant or a staff member) and a working group (representative of senior members of the organisation who were chosen for their information-related backgrounds). Buchanan & Gibb's methodology consists of five phases.

Phase 1: Promote

During this phase the auditor and his team must obtain support and cooperation for the information audit. This phase consists of three steps, each of which should be performed by the working group or the auditor as will be indicated:

- The promotion of the benefits of the information audit by increasing awareness of the importance of information management and by reducing suspicion and hostility amongst staff members – performed by the working group.
- A so-called "passport" letter is used to introduce the auditor and to serve as a sign of top management support for the information audit. In this way co-operation is fostered – performed by the working group.
- Conduct a preliminary survey of the organisation. The purpose of this is to ascertain the level of information awareness and information appreciation in the organisation – performed by the auditor.

Phase 2: Identify

This phase follows the example of Orna's information audit methodology by starting with a top-down strategic analysis of the organisation. This phase consists of six steps – the first four are performed by the working group in a workshop and the last two are the responsibility of the auditor:

- Identify and define the mission of the organisation. This can be done by making use of Abell's business definition framework, Synnott's interpretation of Portfolio analysis and Pellow and Wilson's CSF approach[17]
- Identify and define the organisational environment in terms of PEST (political, economic, social and technological influences).
- Identify and define the structure of the organisation.
- Identify and describe the culture of the organisation.
- Identify information flows according to the approach described by Orna.
- Identify the organisational information resources, i.e. finalise the preliminary inventory that has been compiled during the preceding steps.

The result of this phase is a comprehensive database with information on organisational information resources – linked to the mission, goals, objectives and activities of the organisation (Buchanan & Gibb, 1998:44).

Phase 3: Analyse

The purpose of this phase is "to analyse and evaluate the organisation's information resources and to formulate action plans to improve problematic situations and achieve objectives identified during [phase 2]". Phase 3 consists of four steps – the first three are completed by the auditor in cooperation with staff members and the fourth step is completed during the workshop by the working group.

- Evaluate the information resources in terms of their strategic importance, utility and management problems.
- Produce the detailed information flow diagram for the purpose of illustrating "who is using what, where and why" (Buchanan & Gibb, 1998:44-45).
- Write the preliminary report.
- Formulate action plans.

Phase 4: Account

The purpose of this phase is to calculate the cost of the organisational information resources and to relate these to values/benefits. Buchanan & Gibb (1998:45) recognise the problems associated with costing and valuing information resources and therefore they list three approaches that can be used for calculating costs. These are ABC (activity-based costing), OBS (output based specification) and Glazier's model.

"Given the potential complexity of the exercise this stage is not represented by a rigid methodology" (Buchanan & Gibb, 1998:45).

Phase 5: Synthesise

During this phase the report is presented on the complete information auditing process Furthermore the purpose is "to provide integrated strategic direction for the organisation's future management of information" (Buchanan & Gibb, 1998:46). The first step of this phase is the responsibility of the auditor (the compilation of a detailed information audit report), while the second is to be completed by the working group (the preparation of an integrated information strategy for the organisation).

[17] These frameworks were chosen because of their acceptance and use in business analysis.

- Evaluation

Buchanan & Gibb (1998:46-47) evaluate their "universal model" for information auditing as follows:

- Benefits
  - ➢ It is a complete "pragmatic solution to information auditing".
  - ➢ It serves as a management toolkit that can be customized according to individual needs.
  - ➢ The relationship between the business and information strategies of the organisation is identified and evaluated.
  - ➢ It provides a new approach to costing information resources.
  - ➢ It allows for the creation of a detailed information resource database inventory.
  - ➢ It provides strategic direction and management guidelines for the future management of information within the organisation.
- Potential barriers
  - ➢ The scale of the audit and the resources that are required may make it impractical for some, especially smaller organisations;
  - ➢ "Synthesis between stages may not always be clear and unambiguous due to the multi-disciplinary nature of the exercise";
  - ➢ The methodology is predominantly task-oriented and functional in nature.

Comments by the researcher

The researcher regards Buchanan & Gibb's methodology as a very good attempt towards developing a "standardized" information audit methodology. Very practical suggestions are made in terms of specific frameworks that can be used. This will prove important when wanting to standardize information auditing. The researcher classifies this approach as an example of the hybrid approach since it contains elements of the operational advisory and geographical approaches.

4. Other information audit applications

4.1 O'Flaherty: Information user audit

The information audit that is described by O'Flaherty (1997) is very limited. The term "information audit" is not defined. It is also used interchangeably with the term user audit.

The aim of the audit as performed in this project was to determine whether there were any changes in information seeking prior to the development and implementation of the new system (EURILIA) as compared to the information seeking behaviour exhibited after using the new system. The post-project information audit was aimed at obtaining additional, evaluative information and the results were used to make recommendations to improve aerospace access.

EURILIA was a three-year, ECU project aimed at enhancing "the Libraries R&D and education process which underpins the aerospace sector." For this purpose information needs were researched and a new service was developed (O'Flaherty, 1997:1).

The three initial phases of the project were as follows:

- The information needs of aerospace workers were identified.
- Subsequently a literature review of aerospace information was performed.
- The commercial viability of the newly developed aerospace information system was researched (O'Flaherty, 1997:2-4).

o Project user audits

Two types of user audits, pre-project and post-project audits, were performed. Both of these involved a number of interviews with aerospace users. The main aim of the interviews was to determine what the users' *attitudes* were towards information and to obtain *feedback* on the utility of the newly developed system (O'Flaherty, 1997:4).

The interviews were conducted at the beginning of the project (pre-project audit) and again at the end of the project (post-project audit). The same questionnaires were used for both audits in order to obtain comparable answers. For the post-project audit, a number of additional questions were added. The purpose of these was to *evaluate* the EURILIA system in terms of its effectiveness of retrieval, content, document delivery, and screen layouts (O'Flaherty, 1997:4-5).

4.2 EARL: Information needs assessment

The researcher regards the EARL information audit (Earl, 1995) as an information needs analysis. The "audit" was conducted to determine how the various libraries in the consortium could be assisted in creating WWW pages. The results gained from a questionnaire that was sent out to participating libraries, are discussed, as well as how these were analysed and what the findings were. The audit is evaluated in terms of problems that were experienced. The information audit is concluded by making suggestions in terms of possible solutions to the problems identified.

Phase 1: Questionnaires

EARL is a public library consortium in the United Kingdom. This consortium was created with the purpose of helping public libraries (through support and advice) in harnessing the full potential offered by the Internet. In order to customize these services to the public libraries, it was decided to conduct an information audit.

A questionnaire was sent out to the participating libraries. The purpose was to gather different types of information:

- Library information, i.e. the scope of library materials that libraries had on themselves.
- Non-library material – to ascertain the scope of material that libraries had access to and that they wished to make available through their web pages.
- Networking – to determine the extent to which libraries were already networked (this included the Internet as well as library management systems).

Phase 2: Analysis of questionnaire results

The questionnaires rendered the following types of information:

- Library information: The information results from this part of the questionnaire were also an indirect measure of the availability/existence of marketing material within the various libraries.
- Non-library information: This part of the questionnaire focused on the material held by the various libraries. The results indicated that the majority of libraries wished to place community-related information on their Web pages or provide access thereto from these Web pages, e.g. information on museums and galleries, district councils, social services, education, leisure services and tourism.
- Networking and automation information: The final aim of the information audit was to ascertain the current state of information technology in libraries who were members of the consortium. The results were analysed in terms of different types of library systems that were in use as well as the percentage of stock handled through information technology. The existing types of Internet connections held by the EARL members were also determined.

The results were analysed and presented in the form of comparative graphs. The article concludes with a discussion and interpretation of the results of the questionnaire.

Comments by the researcher

According to the researcher the Earl audit is not an information audit in the proper sense of the word, as this was a very limited exercise that only determined what information existed in the various libraries (i.e. an information inventory), and to a limited extent, where (i.e. which library). Aspects that were not addressed were by whom the information is used, at what cost and to what effect [cf. the purpose of the information audit according to Swash (1997:314)].

4.3 Lewington: Information needs assessment

A survey of information needs and currently available health information sources on the channel island of Guernsey were performed. The purpose of the research was to determine the current state of health information provision: whether or not it is sufficient and to determine in which direction health information provision on Guernsey should develop. This was done against the background of the UK Patient's Charter according to which consumers of health information services should have access to health information they require. Also: on the channel island of Guernsey developments in the health information services highlighted the need for better access to health information (Lewington & Farmer, 1995:8).

A study was subsequently undertaken to:

- Identify the sources of health information that was currently being used.
- Determine the extent to which users of this information was satisfied with these sources.
- Determine the attitudes of health information service professionals towards health information provision.
- Audit existing outlets of health information.
- Identify gaps in health information provision;.
- Make suggestions for the improvement of health information provision on Guernsey (Lewington & Farmer, 1995:8).

Phase 1: Questionnaires

A questionnaire was distributed to the three main groups involved in health information provision on Guernsey. These groups were identified as the public, health care professionals and recent public hospital in-patients. The aims of the questionnaire were to:

- determine the current levels of satisfaction with health information provision;
- obtain recommendations for the improvement of health information provision (Lewington & Farmer, 1995:9).

Lewington & Farmer (1995:9-11) discuss the nature of Guernsey and the views of the three focus groups on health information provision.

Phase 2: Analysis of the questionnaires

From the analysis of the questionnaires it became clear that health care professionals were in favour of the development of a health information policy for Guernsey. There was however, no organised infrastructure in place for the provision of health information, nor was there any formal plan for health information provision (Lewington & Farmer, 1995:12).

The health information sources that were available include:

- health information professionals;
- libraries;
- self-help and support groups (Lewington & Farmer, 1995:12-13).

These health information sources (see list above) are briefly and informally evaluated in terms of their advantages/disadvantages (Lewington & Farmer, 1995:13).

The study enabled the researchers to identify gaps in health information provision, specifically in terms of the types of health information that was needed. The audit results indicated that though health information was available it was insufficient in the sense that the sources were either minor sources or extremely specialized. No recommendations were made as to the improvement/development of health information provision on Guernsey (Lewington & Farmer, 1995:13-14).

Comments by the researcher

The auditing process itself is not described in any detail in the article by Lewington & Farmer. The researcher therefore concludes that the audit as it was performed cannot be regarded as a "proper" information audit. The authors described the compilation of an inventory of existing health information sources. No mention is made of the monetary value of these information sources. The value of the information sources is determined in a non-monetary sense by identifying users' attitudes towards and opinion of the information sources. Another feature that is missing from the study of Lewington & Farmer, is the lack of concrete recommendations for the improvement of weak points that were identified.

4.4 Evan-Wong: Practical case study

The author describes the various components that were included in the study to determine the viability of developing existing information networks into commercial information services (Evan-Wong, 1997:1).

A business strategy was developed. It was made up of the following components:

- An analysis of both the internal and external environments of the system
- Information needs assessment
- Information audit
- Market/product opportunity analysis
- Marketing plan
- Evaluation (Evan-Wong, 1997:2).

The information audit was used as a tool to assess the resources that were available and that could be used to develop information products and services. For this purpose the SWOT technique was used to determine the Strengths and Weaknesses of the internal resources, as well as the Threats and Opportunities that may impact on these resources (Evan-Wong, 1997:2).

After the development of the business strategy selected existing regional information networks were evaluated against the business strategy; possible areas for commercialisation were identified; as well as the constraints to commercialisation (Evan-Wong, 1997:2-4).

Some of the organisations that were investigated did not form part of the public sector. In order to accommodate these organisations it was necessary to make some adjustments to the policy that was developed (Evan-Wong, 1997:4).

Another opportunity for commercialisation was identified, i.e. the establishment of a regional information company that would serve as a broker for the information products and services offered by the regional information networks (Evan-Wong, 1997:4-5).

One of the results of the research project was the development of a map of information resources in the Commonwealth Caribbean. This map is currently produced commercially and a percentage of the proceeds of sales are used for the regular updating and expansion of the map (Evan-Wong, 1997:5). The author of the article (Evan-Wong) does not link the information auditing process to the production of the information map, but the researcher reckons that the results of the information audit, might have been used to develop the "infomap".

5. Comparison of different information audit methodologies

In the next section of this discussion, the researcher will attempt to compare the different information audit methodologies that have been discussed in this chapter. Since the terminology that is used by different authors to describe similar concepts, the researcher will have to generalise the terminology in order to make it possible to compare different phases.

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5.1 Operational advisory audits

	Barker	Du-bois	Eddison	Gib-son	LaRosa	Robert-son	St Clair	Swash	Webb
Define organisational environment	✓				Identify potential markets	✓			
Planning		✓			Select specific markets; Identify contact persons	Deter-mine purpose of audit; Identify who will perform audit		✓	
Identify users' information needs	✓			Iden-tify users of infor-mation					
Design questionnaire							✓		

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	Barker	Du-bois	Eddison	Gib-son	LaRosa	Robert-son	St Clair	Swash	Webb
Send memo to interviewees; Make appoint-ments with interviewees						✓			
Investigate technology				✓				Infor-mation tech-nology audit	
Analysis	Identify strong & weak points; Evaluate weak points	Blue-print	✓	✓	✓	✓	✓	✓	✓
Costing and valuing								✓	
Test key control points	✓								
Generate alternative solutions; Evaluate alternatives	✓								

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	Barker	Du-bois	Eddison	Gib-son	LaRosa	Robert-son	St Clair	Swash	Webb
Monitor adherence to standards & regulations	✓								
Write report	Make recom-men-dations	✓					✓	✓	
Implement monitoring mechanisms		✓					Imple-ment recom-men-dations		

Although very few authors include the defining of the organisational environment as a phase in their information audit methodologies, the researcher regards this as a very important phase that should be included. Less than half of the authors include a specific phase for planning. Once again the researcher regards this as a phase essential to the success of an information audit. The same applies to the information needs assessment. It is of the utmost importance to know what the information needs within the organisation are as this enables one to determine whether the information resources are relevant and of any value. The majority of the authors include a phase during which an information inventory is compiled. The researcher agrees with this as one of the aims of an information audit is to collect information on organisational information resources. Only three of the authors indicate that monitoring mechanisms should be implemented upon completion of the information audit. The researcher also feels strongly that the results of the audit should be implemented and used so as to make the exercise worthwhile.

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5.2 Geographical audits

	De Vaal & Du Toit	Haynes
Analyse users' information needs		
Compile information inventory		✓
Match information needs to information sources		Information resources mapping; Map information flows
Identify strong and weak points		✓
Design a solution	✓	
Design implementation plan		✓

Very few authors follow the geographical approach when performing an information audit. The researcher likes this approach because of the emphasis on the visual presentation of information. This has various advantages as has been discussed earlier in this chapter, as well as chapter 3 (Infomapping). Many of the same elements that have been highlighted as important to the operational advisory audit are also present in geographical audits, e.g. the information needs assessment, the information inventory, the analysis of the information by comparing the information needs to the identified information sources and the follow-up procedures in the form of solutions and/or implementation plans. Unfortunately the methodology of De Vaal & Du Toit, an example of one of the few practical case studies, include very few of these elements.

5.3 Cost-benefit approach

	Alderson*	Riley
Patterns of use	✓	
Costing	Cost-savings Costs of online searches Return on investment	Cost factors - Time - Space - Equipment - Personnel costs - Redesign efforts - Currency - Completeness - Accuracy

*Alderson does not discuss the information audit methodology in detail, nor does Riley, therefore a proper comparison cannot be made – both authors discuss only components of the audit.

The researcher finds it difficult to comment on the cost-benefit audits as the ones that were studied are not discussed in great detail in the literature. The approaches that are used to cost information sources can however be looked at when designing an information audit methodology.

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5.4 Hybrid approach

5.4.1 Operational advisory approach and geographical approach

	Booth & Haines	Buchanan & Gibb	Lubbe & Boon	Quinn	Stanat
Promote the information audit		✓			
Define organisational environment	Review corporate objectives	✓	✓	Profile current set-up - Purpose - Scope - Services - Role - Cost - Users	✓ (as part of pre-audit procedure)
Planning	Design questionnaire; Training & support				✓
Collect data	Conduct interviews	Identify information flows; Identify organisational information resources (finalise preliminary inventory)	Identify all internal & external information sources	Identify staff requirements	Determine organisational information needs; Identify information resources

	Booth & Haines	Buchanan & Gibb	Lubbe & Boon	Quinn	Stanat
Analysis	✓	✓	Evaluate & valuate information resources		✓
Costing		✓	Capital & operating costs		Evaluate corporate investment in internal & external information sources
Compile report		✓	✓		Develop strategic intelligence blueprint

The hybrid approaches that are compared in the table above combine many of the best elements of the methodologies that have been looked at thus far. For example: the promotion of the audit (i.e. obtaining top management support and "marketing" the audit); defining the organisational environment; the planning phase; the collection of data (including the information needs assessment); the analysis of the information; the costing of the information sources; and the conclusion, i.e. the compilation of the final report. The researcher reckons that these phases form a solid basis from where one can look at developing guidelines for an information audit methodology.

5.4.2 Operational advisory approach and cost-benefit approach

	Hamilton	Jurek	Orna
			Pre-audit: Initial investigation
Planning	Prepare proposal		✓
Preparation	Design questionnaire; Select interviewees		

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	Hamilton	Jurek	Orna
Collect data	Conduct interviews	Articulate information needs;	Identify information available in the organisation; Identify resources for making information available.
Set up databases; Key in data	✓	Compile profiles of information sources	
Cost & value information resources	✓		✓ Determine how information is used to further the purposes of the organisation
			Identify those responsible for managing & processing information
			Identify & evaluate information technology used to manage information resources
Compile final report	✓	Develop information management plan	(Part of post-audit procedure)
Present final report	✓		

In contrast to the previous hybrid audits the ones in this table do not regard the initial investigation as very important – only one author includes it in the methodology. The researcher regards the absence of this phase as a limitation. The planning phase seems to be more important (i.e. two authors make mention of it). All the authors focus on the collection of data (including an information needs assessment). The capturing of the collected information receives attention. This is important in view of the information being available again at a later stage to be used as a knowledge base of the

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state of information in the organisation. The costing and valuing of information sources are also regarded as important, as is the compilation of the final report that can even include the development of an information management plan.

The researcher therefore comes to the conclusion that the best examples of information audit methodologies are those that are highlighted in paragraph 5.4.1. In Chapter 6 the researcher will either formulate an information audit methodology or develop guidelines for such a methodology.