Developing an information model for an enterprise: a South African case study

P.W. van der Walt
Centre for Information and Knowledge Management
University of Johannesburg
Johannesburg, South Africa
pvdwalt@hotmail.com

A.S.A. du Toit
Centre for Information and Knowledge Management
University of Johannesburg
Johannesburg, South Africa
adutoit@uj.ac.za

Contents

Key words: Information architecture, information model

1 Introduction

Enterprises in today's complex world are experiencing rapid changes in highly competitive situations. There is an increased need to be able to respond quickly to changing market conditions, new business opportunities, threats and emerging alliances that were unthinkable a few years ago (Wigand, Picotand Reichwald 1997:1). Pressures of global competition and growing dependence on information technology mean that the effective use of information is more important now than ever before.

Enterprises have made substantial investments in information technology, but commitment to using information as a corporate resource appears to be lacking (Evernden and Evernden 2003:ix). The ease with which information can be created, extracted and transmitted by e-mail and communication links has created expectations of the ability to exchange information faster and more frequently between enterprises and end-users (Fisher 2004:5).

The cost of ineffectiveness of enterprises in managing information can be substantial. An example related to information life cycle management is information being kept too long; time is wasted when looking for information, penalties are risked for non-compliance or even failing to keep mission-critical information from loss or destruction. Information provided is frequently not what the end-user wants or needs or the information may not be available. The key to quick responses is to be able to access the right information at the right time, to deliver it in the correct medium and present it in the most suitable format. Immediate access to critical information could determine the success of a business transaction, the establishment or continuance of a business alliance or partnership or even the reaction to environmental conditions (McGee 2004:28).

According to Fisher (2004:7) an information model provides a layer of commonality to bridge the differences between information systems and makes it easier to manage and use information in a consistent way. In this article, the development of an information model for a large South African enterprise is discussed. The different steps in the development of such a model are discussed and it is illustrated how an information model can help an enterprise to manage its information resources effectively. The following problem is addressed: How can an information model help an enterprise to deal with information overload?

To solve this problem, the different steps in the development of such a model are discussed and it is illustrated how the model can help an enterprise to manage its information resources effectively.

The case study as research method is used to establish a group corporate information model that will cater for the information requirements of senior management at a large investment holding company.

2 Information modelling

A level of abstraction is required to make the variety and complexity of information relationships available within an enterprise easier to understand. The information model provides a high-level logical representation of all the key information elements that are used in the enterprise as well as the different relationships between them.

The information model developed by Fisher (2004:7) consists of an 'as-is' view or an audit of the enterprise's information, as well as the 'to be' or blueprint to provide direction for the future development of information environments and systems within the enterprise. The information model addresses two aspects of the enterprise's information environment, namely:

- The static view – covering the structures of information (elements and the relationships between them). The static view focuses on the following elements:
    - *A classification scheme or taxonomy* – a predetermined catalogue or hierarchy that segments elements of information into sub-groups that are mutually exclusive and unambiguous
    - *Controlled vocabulary and thesaurus* – the vocabulary of a classification or taxonomy scheme, formally organized so that the former relationships between concepts are made explicit
    - *Metadata* – information that describes information, usually limited to formal information elements such as author, date, etc.
    - *Data standards* – the rules and conventions set to ensure consistency in the way information is maintained and used
    - *A logical data model* – a model that shows the relationships between the different types of information.

- The dynamic or behavioural view – focusing on the process or the information life cycle describing how information is created, managed and used. The dynamic view focuses on:
  - *A business process model* – to define the information needs of and the interaction between the core business processes and the supporting business processes
  - *An information process or workflow model* – to define the activities in the life cycle of information sources
  - *A data flow model* – to define the transitions and the various states of information during its life cycle.

The outcome of an information model is a set of documented information structures, information processes, standards and guidelines for implementation.

Information technology architecture links together four technology focus areas for the enterprise, namely the external environment, organizational architecture, information systems and the technical infrastructure. It provides an overview of the technical and business environment and their respective interdependencies. It is of benefit to the enterprise as it enables the users to understand the information technology services provided and allows IT managers to understand their users, both internally and externally (Fisher 2004:8). The information model developed within the context of the organizational information technology architecture provides a blueprint to assist in bridging the gap between business and technology, in the context of the information technology applications.

The traditional information systems approach provides a variety of standards, frameworks and methodologies that can be used to create an information model within the enterprise (Evernden and Evernden 2004:98). Many models start off with the design of software applications and these are readily visible in definitions put forward for a technical audience. Although there is no argument that technical definitions are required for the detailed design of software applications, they are considered unfit for the thorough understanding of information usage (Fisher 2004:8).

Evernden and Evernden (2004:98) suggest that a model which is comprehensive enough and based on explicit information architecture is used to establish an information model for the enterprise. The involvement of individuals within the enterprise is critical as good understanding of the subject matter at hand provides a good basis for the information model. High-level understanding of the overall enterprise and specific information domains being studied, as well as the information methodology being utilized, is required. By its nature the enterprise-wide information model spans different functional groups, therefore necessitating a consistent approach throughout the development of the model to ensure that a unified view of information is achieved (Fisher 2004:10).

2.1 Defining the objectives

Before any information modelling exercise can commence, it is critical to define the objectives and scope of the exercise. This will prevent the project from losing focus, since the subject matter can easily expand in area as well as depth of coverage and therefore upfront agreement on the boundaries is required. However, it is possible that the objectives and scope may change as the project progresses, but these changes should take place in a controlled manner. Enterprises must develop a practical approach that recognizes the richness and ambiguity of managerial information, and also ensures senior management support by refining governance mechanisms and clarifying the value of information for the enterprise (Kalakota and Robinson 1999:293).

The objectives of the exercise will be closely linked to the objectives of the enterprise and it is important to understand the business framework in which the enterprise exists (Orna 2004:20). If the enterprise's existence is not understood, the decisions it makes in respect of environmental influences cannot be interpreted correctly. This could lead to assigning inappropriate values to information resources and choosing information solutions that are totally unsuitable and could harm the enterprise.

Further aspects that should be taken into account are the information technology infrastructure that is in place and how it supports the current information requirements of the enterprise. The converse is also true in the sense that the information technology infrastructure cannot provide effective input into the enterprise until the enterprise has effectively defined the information needs for which it requires support

(Leloup 2004:36; Orna 2004:26).

In addition to the aspects discussed, Orna (2004:26) identifies a number of 'soft' factors that will inherently have an impact on the interpretation and presentation of the information model of the enterprise. Organizational history, structure and culture will all provide insight into strengths that can be built on, threats that need to be avoided, areas that should not be approached and strategic alliances that should be sought.

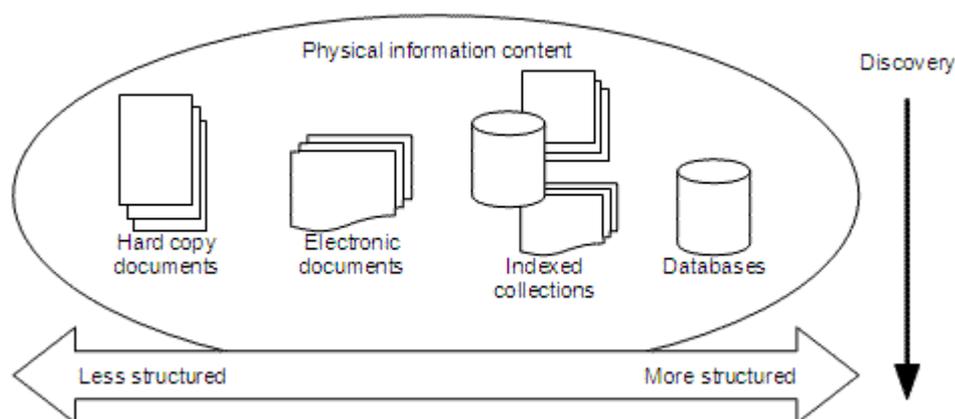## 2.2 Identifying information domains

When a high-level enterprise-wide information model is undertaken, it requires the identification of the information domains that exist within the enterprise. The information domain does not necessarily reflect the different departments or reporting entities within the overall enterprise, but rather refers to the information sources created, managed or used in specific groups and departments.

The process of identifying the information domains involves listing the main areas of business activities in the enterprise and the relevant supporting functions, such as human resources, finance, training, information technology and others. Compiling a high-level map of the information domains can serve to identify areas where the enterprise can gain the greatest benefit from rationalization and integration of information resources spread across it.

2.3 Discovery step

The discovery step's goal is to gather raw information to enable the creation of the 'as-is' view of the information model that serves as a detailed record of the current state of the information environment within the enterprise (Figure 1).

Figure 1 Discovery step (adapted from Fisher 2004:7)

The discovery process is carried out for each of the identified information domains. Fisher (2004:14) considers it essential that a common methodology be used for all the domains being studied, which will ensure consistency in analysing the data being produced.

The discovery process involves the collection and documentation of facts and details about information structures and processes and results in the creation of an information sources catalogue. The catalogue should list the following:

- *Information type* – as part of the information identification
- *Information source's names, titles and descriptions* – the identification of specific databases or information collections
- *Information source's owner* – the individual who is responsible for the maintenance of the information source content
- *Information source's reference number* – to ensure that each source can be identified and tracked

throughout the information model development and to prevent ambiguities during the analysis and design steps when the incorporation and reorganization of information sources are being considered.

Leloup (2004:36) adds additional factors in the determination of an information model for the enterprise, namely:

- What kind of information is it?
  Five basic types of information, with different levels of structure, management processes, volume throughputs and sharing capabilities can be identified:
    - *Administrative production*. This is basic paperwork and comprises contracts, manuals, orders, claims, etc.
    - *Reference information*. These are considered to be the real information assets of the enterprise, providing details of its knowledge and know-how. Product catalogues, methodological tools, procedures, operating manuals and quality documents are considered reference information. This is typically highly structured information, available in limited volume, used by everyone but managed by only a few individuals. Reference information, although regularly updated, is considered a long-lasting information asset.
    - *Project information*. This is information about a project, an activity that has a limited duration. Volume throughputs are considered to be substantial at organizational level, but may be limited at project level. Information is partially structured and access to the information within the project varies according to the position of the individual in the project. The higher up in the project hierarchy, the less detail is addressed, versus lower-level individuals in the project who will have exposure to more detail, but are limited to a specific aspect of the project. Typically a project manager will have a fairly good, but not necessarily a detailed overview of the complete project.
    - *Intelligence information*. This is used widely in business information and technology surveillance. Information managers produce value-added reports based on a multitude of structured and unstructured information sources that may range from Web pages, media releases, reports databases, facts and figures, and similar sources. Input volumes may be very high or specific intelligence reports may be confined to a specific niche or limited. An organizational knowledge base can be considered intelligence information.
    - *News*. By definition, news is designed for immediate consumption. It is considered to be greatly unstructured but with the ability to feed other information repositories.
- What is the information used for?
  This question identifies what the key information processes within the enterprise are, namely reading and printing, re-use, sharing and publishing, distributing and relying on someone else to review.
- Who uses it?
  This question defines the actual population within the enterprise who uses the information sources. In this regard content is of importance as opposed to the actual medium of the information source.
- Who manages it?
  Who is responsible for the upkeep or maintenance of the information source once it is disseminated into the greater enterprise?

Fisher (2004:14) advises that during the discovery step a hierarchy of information sources can be identified as part of the information identification process. This can be achieved by the grouping of information sources into certain categories. Further details regarding the information source are obtained by requesting each information source owner to provide detailed information about the information source. This is achieved through questionnaires or interviews.

It is important to note that details of any new information required by the users and how information is utilized (or not utilized) is essential for the design of the future information model (Fisher 2004:15). This is where needs analysis in parallel or as an integral part of the discovery process could be beneficial to identify the requirements of the users. During the interview process with information source owners, the opportunity to identify further information sources that have as of yet not been identified should be extensively used. During the discovery process the focus should not be limited to

any particular format or medium of information sources but should include electronic documents, formal or informal hard copy collections, e-mails, Web pages and databases. A challenge to the process may be the very ubiquitous nature of information (Kalakota and Robinson 1999:293). Some information sources may be difficult to find because they often lie hidden and undervalued in the minds of employees.

2.5 Analysis step

The analysis step (Figure 2) provides the 'as-is' view of the information model from the information details gathered during the discovery process. This step highlights areas of improvement and serves as input into the design of the future information model of the enterprise.

Figure 2 Analysis step (adapted from Fisher 2004:7)
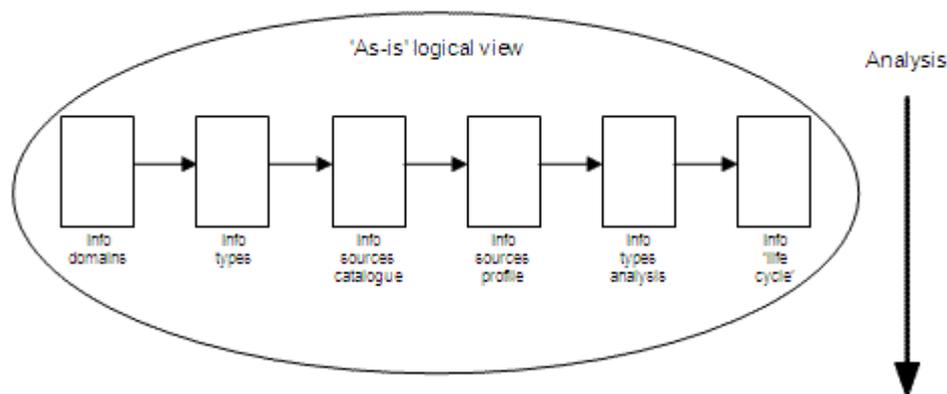
During the analysis step, commonality and variety that exist within the information environment of the enterprise are highlighted. Fisher (2004:17) points out that there may already be some attributes of a well designed information model present in existing information sources, but there is also likely to be a multitude of approaches in the design and hence some inconsistency in the information model. Clearly this inconsistency may have evolved over time or as new information sources have been identified and brought to the enterprise's attention. A major component of the design of the information model involves the introduction of uniformity to the model and ensuring that consistent information management takes place.

The first stage is to identify the main information types that exist within the enterprise. This would have taken place during the earlier step of identifying the information domain being investigated. The second stage is to analyse each information type group in order to establish the commonality and the variations that may exist. The following aspects are addressed:

- What constitutes the information source?
- The major sub-divisions or groups within the source
- The identifiable attributes of fields of the information items
- Any significant issues and features related to the identified information sources.

2.6 Design step

The result of the design step (Figure 3) is the 'to-be' view that forms the blueprint for future information management processes within the enterprise. This step sets the standards that will be followed in the rationalization of existing information sources and for any new sources brought into the fold of the enterprise.

**Figure 3** Design step (adapted from Fisher 2004:7)
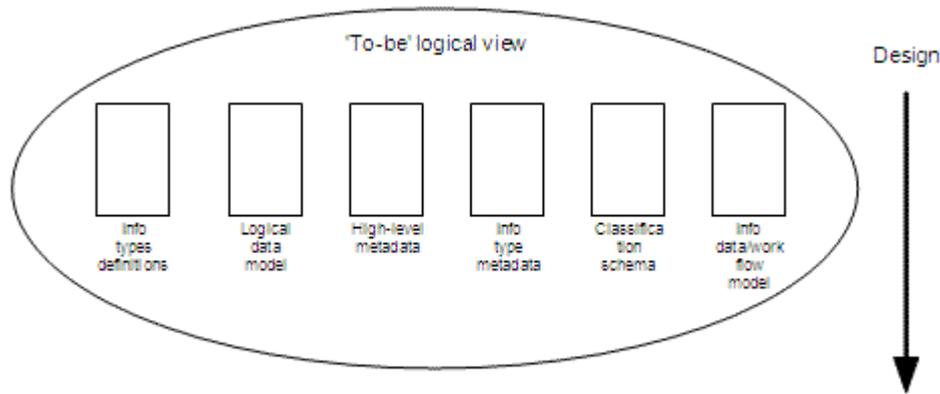
This step is a culmination of the previous four steps. Through this step all the relevant parties, i.e. the information source owners and other information domain stakeholders, are brought together in a collaborative fashion to ensure consensus on the desired design of the information model. Fisher (2004:19) suggests that the designed information model should include some or all of the following points that may evolve over time:

- An agreed list of information domains
- An agreed information types list and definitions
- A high-level logical data model to link information types across different domains
- Agreed metadata for all information types across the information domain
- Agreed extended metadata for each information type within the information domain
- A taxonomy, thesaurus or controlled vocabulary to provide consistency of concept structures and labelling across domains as well as at a more detailed level within each information domain
- An information process view describing the 'life-cycle' of each information type.

2.6 Planning, development and implementation

After the 'to be' information model has been defined, a programme to implement the model should be initiated.

Figure 4 Planning, development and implementation (adapted from Fisher 2004:7)
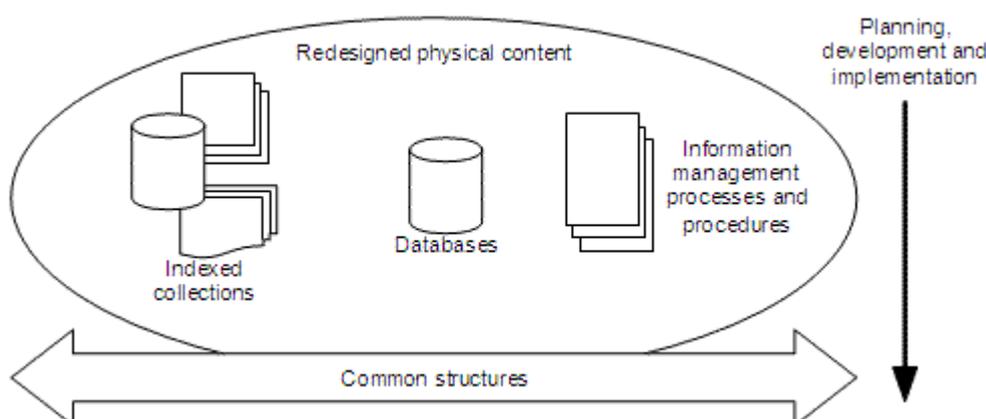
The implementation process is likely to consist of the following aspects:

- The reorganization and even the consolidation of existing information sources to fit into the standard information types defined during the design step
- The creation of database indexes to record metadata for previously unstructured information sources
- The procurement and/or development of software to enable integrated access to and the management of information sources.

3 Case study

The case study used for this article is a large investment holding company for a group of high-technology driven companies operating in the telecommunications and information technology industries. The company required an information consolidation system that would provide for a more flexible and stable information collection, consolidation and distribution solution. The existing system has become inflexible and only focused on the financial information requirements of the business. The company is a publicly listed company on the JSE Securities Exchange in Johannesburg, South Africa. The holding company also has a number of sub-holding companies, of which some are also listed on the JSE.

Within each of the sub-holding companies there exist a number of operational companies that make up the greater group. In 2005 there were approximately 50 operating companies spread across the three sub-holding companies. The majority of these operating companies in turn have a number of divisions or branches reporting to the operating company head office. In total approximately 150 operating units make up the group. Geographically the majority of operations are located in the Republic of South Africa, with international operations in the United Kingdom, Portugal, Spain, Australia and a number of African countries.

Since it is an investment holding company the continuous monitoring of the company's underlying investments is critical to ensure the maximizing of the investment and to ensure that value is delivered to the company's shareholders. Information is critical to ensure that management can make strategic decisions based on accurate information as it is made available from the underlying operations.

3.1 Case description

The group has over the past 40 years of its existence developed into a complex conglomerate of companies primarily through the acquisition and disposal of companies. For the executive management, it remains a challenge to obtain key information from the underlying investments upon which strategic decisions can be based due to a number of reasons – both historical and inherent in the infrastructure that has developed over time.

Although mechanisms exist to feed information from the lower levels in the enterprise to the higher levels, these mechanisms have become largely inflexible and are no longer suitable for an enterprise requiring information more readily.

The group essentially required a more effective and efficient collecting, consolidating and reporting strategy for its key information sources. The primary drivers for this strategy were the following aspects:

- Increasing growth and expansion of the group
- Increase in the complexity of reporting requirements as stipulated by the Johannesburg Stock Exchange (JSE Limited), General Accepted Accounting Practices (GAAP), International Financial Reporting Standards (IFRS) and other financial parameters
- Difficulty in collecting regulatory and statutory information across the group
- Reporting on non-financial information, especially regarding black economic empowerment (BEE) as required by legislation and the South African Department of Trade and Industry (DTI)
- General concerns about the continued integrity, completeness and usefulness of information available in the group and required for reporting purposes
- A process of *ad hoc* reporting and obtaining additional information across the group that is generally time consuming, inefficient and frustrating to all.

A further issue influencing the above is the fact that each operating unit in the group has its own accounting or transactional system in place. Consistent formats and definitions for information to achieve meaningful consolidation of certain types of information across the group are consequently often lacking.

To address these issues, a formal project has been embarked upon to establish a group corporate information model that will cater for the information requirements of senior management. The aim is not to replace any of the existing transactional or information processing systems at operation level, but to replace the current financial reporting system with a more flexible mechanism of collecting, consolidating and reporting information.

3.2 Methodology

Owing to the intricacies and diverse nature of the group in terms of the various environmental influences, regarding technology, market pressures, other legislative factors and strong autonomy of operating companies, a process of interviewing various role-players was followed. Time constraints and the complexity of the group only allowed for a high-level investigation in order to highlight to the executive management team the challenges of information management within the group. No specific operational issues were addressed, as these are typically taken care of at company operational level. However, where applicable, these areas have been taken note of and, if of any value for the rest of the group in terms of strategic reporting purposes, have been captured as part of the interview process.

No structured interview process was followed except for highlighting some major points as per the objective of the project and the questionnaire was structured in such a way as to allow the interviewee to provide his/her information requirements freely. Orna (2004:56) confirms that she doubts the true value of working on a fixed script for an interview and that an informal structure covering the main points allows interviewees to make their own decisions, thereby producing better results.

An external party was contracted to assist the internal project team with the information needs analysis exercise of the project. This was done because of the lack of sufficient internal resources, time constraints and the necessity to ensure objectiveness in dealing with the project. As Orna (2004:53) highlights, an external party or consultants can offer experience of other projects and provide specialist support in areas of questionnaire design or analysis, but the biggest component is the contribution of the internal employees who have the knowledge and experience of their own enterprise. A combination of both an external party and internal resources made up the core project team.

In total the group employs approximately 12000 people of whom approximately 10% are considered to belong to senior management. In view of the enormity of the potential pool of people that could be interviewed, it was decided, in the interest of time and cost for the project, to limit the number of interviews to only a number of influential individuals. These individuals were identified by the Executive Management of the investment holding company and the internal project team and highlighted as major contributors to the project. A representative sample of head office and operational management staff from all management levels was compiled and in total 82 individuals were interviewed on a one-to-one basis. Of the 82 individuals interviewed, 51 were from top management (including seven executives, i.e. CEO, CFO and other senior directors), 24 from senior management and the remaining seven from middle management positions. The spread across the group consisted of 17 individuals from the investment holding company, 18 from the sub-holding companies and 47 from operational companies. As for the functional role of the individuals, a fairly broad range of roles were covered, including strategic management (33), financial (21), information technology (6), procurement (5), internal audit (4), human resources (4), sales (3), investor relations (2), treasury (1), tax (1), secretarial (1) and corporate affairs (1).

The interviews focused primarily on high-level information needs with specific reference to information required by the participant to be able to manage his/her operations or decision process on a day-to-day basis. An example of existing reports used within the enterprise was used to encourage requests for improvements or to establish if a need had been met satisfactorily in terms of the information contained in the reports. Each individual or group was requested to prepare for the interview ahead of time.

## 3.3 Findings

3.3.1 Information domains

The following main trends and important information requirements had been identified in the interview

process and needed to be consolidated across all the companies:

- Financial consolidation and reporting
- BEE and human resources (HR) information
- Supplier and customer information
- Operational performance
- General group information (nice to have).

Since relative freedom was given in allowing all interviewees to supply as many requirements as they could, a number of duplicate requirements were captured. The proportionate contributions of the information requirements as expressed by the number of listed requirements are illustrated in 5.

Figure 5 Proportional contribution of information requirements per information domain
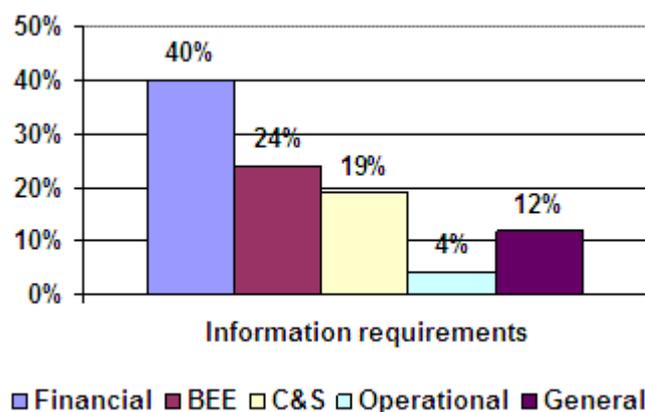
In view of the number of interviewees with a financial function, it was no surprise that the contribution concerning financial requirements was as high as 40%. However, taking into consideration that the second highest requirement was for BEE reporting at 24%, it was clear that the BEE transformation process received high priority in this enterprise and reporting on BEE according to government requirements was a high priority.

With customer and supplier reporting and management requirements at 19%, it is evident that great emphasis was placed on the relationship this enterprise had with both its customers and suppliers.

Operational reporting requirements scored a low 4% and could therefore be considered as a low contributor to the overall strategic decision process at the higher reporting levels in the enterprise.

3.3.2 Financial consolidation and reporting

As with any enterprise that has a number of underlying entities in which it has investments or shareholding, the financial position of the overall investment needed to be monitored and managed continuously. In this instance, one of the drivers of the project was furthermore the replacement of the current application used for financial consolidation purposes. This application had been in use for approximately 12 years. The technology platform on which the application was run had become very outdated. This application had simply become inadequate in providing a dynamic and robust platform for financial consolidation in a large enterprise. It was therefore no surprise that the financial information requirements received most requests for improvement during the interview process.

Although most of the features requested were already in place, there were a number of items that had been listed jointly as requirements, indicating a request for enhancement of existing features. These enhancements could typically be grouped into the following three areas:

- Drill-down capability – Owing to the disconnected nature and lack of a centralized database in the existing consolidation application, there was no drill-down capability. Drill-down is the ability to investigate information in increasing detail, for example being able to see not only the total sales, but also by product, region or even by salesperson. This is an analytical process that

assesses and evaluates detailed data that have been aggregated into interrelated data.

- Trend analysis – Trend analysis allows the analysis of changes in a given item of information over a period of time. Again owing to the lack of a centralized database that would keep historical data and information, trend analysis could not be done for the whole group. The impact of certain parameters on the group could also not be ascertained in order to determine certain outcomes, for instance the impact of the rand-dollar exchange rates on the group's foreign income. This could also be of use in the strategic decision-making process to determine the possible future of the group.
- Dashboards – A dashboard in information representation terms is a user interface that organizes and presents information in such a way that it is easy to read and understand. The analogy is of course the dashboard of a motor vehicle with various dials and indicators, indicating the speed of the vehicle and other aspects required by the driver to steer the vehicle. Its purpose is to help decision-makers make better and faster decisions by consolidating key business information and making it available at a glance through a standard Web browser (Cate 2003).

3.3.3 BEE and HR information

Over and above the pure financial reporting requirements on a monthly basis, the second largest need within the group was identified as the reporting of regulatory information, specifically issues relating to BEE. During the build-up to the project it became quite evident that enterprises within South Africa needed to put into place transformation processes with the proclamation of the *Employment Equity Act 55 of 1998* and the *Broad-based Black Economic Empowerment Act 53 of 2003* that made provision for a legislative framework for the promotion of BEE, issuing of codes of good practice and the publication of transformation charters (Republic of South Africa 2003).

The intended purpose of this act is clearly to guide companies to transform and promote economic transformation. This requires companies to put into place necessary mechanisms to report on their progress in meeting the targets as defined and set out by the industry charters. A number of industry charters have been established and are recognized by the South African DTI, namely the maritime transport and service industry, forwarding and clearing industry, mining, tourism industry, petroleum and liquid fuels industry and financial sector. The information communication and telecommunications (ICT) charter is still in draft format, with many companies in the ICT industry already preparing to align themselves with this particular charter (Department of Trade and Industry 2005).

The investment holding company, of its own accord, established an internal charter, thereby creating its own internal monitoring mechanism but, more importantly, it also created the roadmap for the group in developing its overall BEE outlook. As part of this roadmap, critical areas were identified on which group companies needed to report, namely:

- Ownership
- Board and management representation
- Human resources development (employment equity and skills development)
- Affirmative procurement and enterprise development
- Corporate social investment (CSI).

Each of the above areas was allocated predefined targets that needed to be achieved annually with a final target date of 2010. As with the financial reporting scenario, information gathered for the BEE scorecard needed to flow up into the group structures to enable top management to monitor the overall progress of the group.

A major constraint was the lack of human resource systems from which the relevant information could be sourced. At that time all reports were compiled using a spreadsheet that was mailed to the next level, where some aggregation of information took place.

- Clear guidelines were provided in the internal charter on the parameters for each of the components, including the relevant definitions, indicators, weightings, conversion factors and targets. Definitions were based on definitions contained in existing legislation, thereby ensuring consistency across not only the enterprise but also the different industry sectors. The policy

statements guided all group companies as to the specific targets to be achieved, as well as the method by which performance would be measured. The so-called red, amber, green (RAG) analysis was adopted as an internal early warning system for those whose performance would be judged, among other things, against the achievement of group targets. A standard reporting system was developed and would be prescribed to facilitate uniform reporting and evaluation at the different levels of companies, including the board of directors. Furthermore to provide feedback on Government's requirements specifically relating to the following acts:

- o *Employment Equity Act, 55 of 1998;*
- o *Skills Development Act, 97 of 1998;*
- o *Preferential Procurement Framework Act, 5 of 2000;*
- o *Broad-based Black Economic Empowerment (BBBEE) Act, 53 of 2003*; and
- o industry or transformation charters where applicable.

A key theme across all the above listed acts is the ability to measure BEE initiatives and to be able to determine the progress made against objectives as determined by these acts or charters. The challenge for any enterprise therefore is to be able to report on the requirements as outlined by the various acts. However, because of uncertainty and lack of clear guidelines, especially the different requirements outlined by the industry charters, the DTI recently published the *BBBEE Act*. This act is largely designed to bring about consistency and equal measurement of BEE activities in South Africa and to integrate various elements of BEE in South Africa, while the BBBEE codes are meant to translate and implement the act. The codes, as outlined by the *BBBEE Act,* include the measurement of ownership, management control, employment equity, skills development, preferential/affirmative procurement, enterprise development and a residual component or corporate social investment.

- There was no overall human resources management system that spanned the whole group. Some companies did have an internal system in place that combined many human resources functions, including benefits administration, payroll, recruiting and training, and performance analysis and review into one package. It would appear that a requirement existed for the group-wide management of employees in terms of assessing skills and experience across the group. In discussions during interviews and project meetings, it transpired that being able to determine the skills level available within the group would be of benefit, especially when specialized skills are required for a specific project or initiative. A further benefit would be to use such a skills database to share information or knowledge, which could be seen as a precursor of a knowledge base.

3.3.4 IT and infrastructure

The accounting and transactional systems or a combination of both was considered to be one of the primary sources of information within each company. However, there was no single accounting or transactional system in place catering for the whole group. Instead each company within the group had its own accounting or transactional system in place. This was mainly due to the autonomous nature of the group and a long history of acquisitions. Some of the many challenges created through this variety of systems were the availability of information in specific formats, standardization of definitions of information and legacy systems that did not allow the easy extraction of information.

With regard to the IT infrastructure, the following was found:

- There was a variety of accounting systems in place, ranging from the purely financially focused to the more complex enterprise resource planning systems. Systems listed included Accpacc, Brilliant Accounting, Fourgen, Great Plains, Mapics, MFG Pro, Oracle, Pastel, Profitability, Sage, SAP/R3, Scala and Syspro.
- The operating systems varied from Microsoft Windows 2000 to some Unix varieties, including Linux.
- Databases on which the primary application was run varied from Microsoft SQL, Oracle and DB2 to some proprietary databases. However, all had the ability to extract data in a usable format, such as comma-separated values (CSV) or ASCII.
- There was a lack of consistency across systems in information definitions and descriptions. Most companies had made up their own definitions of data but, where possible, had based these on definitions published by the DTI, specifically for BEE definitions.
- The following general comments on the company's IT system were made:

- Companies with complex systems, such as SAP R/3 or Oracle 11i, would typically have an overabundance of information available that could be used at operational level. However, the opposite also holds true for smaller companies where the business processes may not be as complex and which would therefore not have information sets available.
- Lack of integration between certain modules within some systems also creates duplication of information sets.
- The general availability of information is problematic in that some companies may have difficulty in making information available because they do not have it or do not cater for it.
- The diversity of information sources within companies creates islands of information. Some information is kept within the primary transactional system of the company, while portions of the information are kept separately in other applications such as Microsoft Excel or proprietary reporting applications.

It is clear that although information applications or resources could easily be identified within a company, the actual data contained in the systems were not consistently defined and managed across the whole group. This can be ascribed primarily to the autonomous nature of the group and the lack of a common system across companies.

4 Recommendations

Information sources in the group were generally diverse and dispersed. The wide range of legacy, non-integrated base systems at operational level presented a significant challenge to any potential technical solution. It was clear from the existing distributed and disconnected information architecture that a tremendous amount of value was lost in terms of providing the ability to do group-wide scenario planning and trend analysis. It was impossible to do drill-down and investigation of existing consolidated reports to areas of greater detail to identify potential problem areas. Making use of a centralized area to which companies can upload data based on a standardized and defined set of data definitions could add considerable value to the group.

An investigation of the existing systems in the group revealed a diversity of systems, both accounting and transactional, each with its own configuration and ability to manage data and information. Considerable investment had already gone into the establishment and maintenance of these systems. It would therefore be unreasonable and unwise to change the system for the sake of making particular data or information available to the investment holding company. It was consequently recommended that the underlying systems should remain as they were, except in cases where critical information needed by the investment company could not be produced. In such cases, companies should investigate the possibility of integrating the required information into the existing system before replacement of the overall system was considered.

Although the effect of data definitions and the standardization of data sources from the financial information domain had largely been taken care of by using a single chart of accounts for the whole group, some new areas within the BEE information domain needed to be catered for. Before the proclamation of the *BEE Act* in 2003, there was no particular need for companies to report on BEE transformation. However, since the proclamation of this act and the publication of various transformation charters, it has become a key requirement. Initially some definitions were provided by the DTI and the industry charters, but there is still confusion about most, especially in the area of affirmative procurement.

With the above viewpoint in mind and with the restriction of not allowing for drill-down into the operational company's systems, the detail of data and information required from group companies had also been limited to only what was required at the higher reporting levels, in other words the sub-holding and holding company levels. Investigations into the detailed data available within companies revealed a plethora of definitions and descriptions of entries. Although a level of standardization existed within the operating company, the same level of definitions or descriptions was not necessarily applicable across the whole group. As with the notion of implementing a single instance of an accounting system, attempting to embark on a group-wide data standardization exercise would be

impractical and uneconomical.

The following key decisions were made that will form the basis of the group's information model:

- Additional information sources other than purely financial ones needed to be provided – as clearly highlighted within the overall requirements for the group, information on BEE would need to be reported. However, uncertainty about whether there were existing information sources specifically geared to deliver the required information came into question. Some companies already had an HR management system in place in which most of the information was captured, but conversely some smaller enterprises might not have had the information readily available. Typically this information would reside in a spreadsheet or even in a rudimentary document.
- No direct integration would take place between the centralized information repository and the underlying source systems for the time being. This could become an option but since the information would only be uploaded once a month, this was not required yet.

top

5 Conclusion

Information modelling is a key success factor in an information management system and provides the building blocks for the information architecture of an enterprise. Information modelling must consider content and not focus exclusively on the medium in which information is contained and distributed throughout the enterprise alone. Through the implementation of prototypes, information models can be improved, within shorter time spans, as opposed to the implementation of an extensive information model of which no one understands the value and that will take up unnecessary resources. Importantly, when defining the information model of the enterprise, existing processes and content should not be the only focus of the exercise. In fact these are considered to be legacy systems and processes; from an outside point of view new ideas and technologies should be considered.

The empirical study illustrates that information is a strategic and valuable resource and that it is vital that the investment holding company and sub-holding companies consciously decide at the highest level how important information is and what value it contributes to the strategic decision process in the enterprise.

top

6 References

Cate, J. 2003. Curing information overload with digital dashboards. *Management advisor*. [Online] http://www.pcserv.net/ma_digital_dashboard.html. (Accessed on 15 November 2005).

Department of Trade and Industry, 2005. *BEE charters*. [Online]. Available WWW: http://www.dti.gov.za/bee/beecharters.htm. (Accessed on 1 November 2005).

Evernden, R. and Evernden, E. 2003. *Information first – integrating knowledge and information architecture for business advantage*. Amsterdam: Elsevier.

Fisher, M. 2004. Developing an information model for information- and knowledge-based organisations. In: Gilchrist, A. and Mahon, B. (eds). *Information architecture – designing information environments for purpose*. London: Facet Publishing: 5-26.

Kalakota, R. and Robinson, M. 1999. *E-business – roadmap for success*. Reading: Addison-Wesley.

Leloup, C. 2004. Document, information, data, content – how to model information? In: Gilchrist, A. and Mahon, B. (eds). *Information architecture – designing information environments for purpose*. London: Facet publishing. 27-46.

McGee, K.G. 2004. *Heads up – how to anticipate business surprises and seize opportunities first*. Boston: Harvard Business School.

Orna, E. 2004. *Information strategy in practice*. Aldershot: Gower.

Republic of South Africa. 2003. *The Broad-Based Black Economic Empowerment Act*. [Online]. Available WWW: http://www.dti.gov.za/bee/BEEAct-2003-2004.pdf. (Accessed on 5 November 2005).

Wigand, R.T., Picot, A. and Reichwald, R. 1997. *Information, organization and management – expanding markets and corporate boundaries*. Cichester: Wiley.

Disclaimer

top