THE VALUE OF CONCEPT MAPS FOR KNOWLEDGE MANAGEMENT IN THE BANKING AND INSURANCE INDUSTRY: A GERMAN CASE STUDY

Louis C H Fourie and Jörg Schilawa, University of Stellenbosch, South Africa
Eric Cloete, University of Cape Town, South Africa
Email: Lchf@sun.ac.za, www.usb.sun.ac.za

Abstract Major industrial countries gradually developed from industrialised economies to information- and knowledge-based economies, where people became the most valuable asset to companies due to their abilities and valuable tacit knowledge. Unfortunately tacit knowledge is contained in people's minds, is difficult to access and therefore needs to be captured so it can be shared amongst employees. Concept maps are such a tool that can gather knowledge from individuals and groups, facilitate the knowledge creation process, function as a discussion and communication tool, and assist in the distribution of knowledge and learning processes within an organisation.
In order to evaluate the value of concept map technology, to gain detailed information about the company's current knowledge management system, the technical infrastructure, and to acquire insight about the possibilities and problems of concept maps, a survey was conducted at a banking and insurance company to determine the employees' degree of satisfaction with the current knowledge management system; their familiarity with concept map technology; and their willingness to work with concept maps. The results indicated that the employees are not fully satisfied with the current knowledge management system because of its unstructured character. The company's knowledge workers require, and therefore search for a wide range of knowledge currently spread over a number of different sources. Documents and other sources of knowledge are not sufficiently linked, and do not contain key words or descriptions for complex searches. This influences the acquisition of knowledge and search results negatively. A very positive reaction was thus expressed by employees concerning new concept map technology. Concept maps were familiar to a large portion of the participants, and an even higher percentage said they would use this new technology for knowledge acquisition and distribution.
Interviews with several employees and senior managers from the company were also conducted. Insight was gained by applying concept mapping technology to different fields in the company.

1   Introduction

Knowledge management in the business sector began in the early 1990's when organisations realised that harnessing a company's knowledge and collective expertise, and distributing it to the right people at the right time, is essential to every organisation and can give the organisation a competitive advantage over competitors if the knowledge assets are utilised more effectively and wisely (Demarest, 1997; Drucker, 1999a, 1999b; Grulke, 2000; Hardijzer, 2000; Birkenshaw, 2001; World Bank, 2002; Riches, Kemp, Wolf, Pudlatz and Le Moult, 2003). Managing and leveraging knowledge thus has to be at the core of any attempt to improve an organisation's performance (Barquin, 2001). Therefore the last few years have been characterised by an ever increasing need for tools and applications that capture this knowledge effectively, promote efficient distribution, enhance intuitive usage and provide the ability to link concepts of knowledge to other (multi-media) sources.

Companies are therefore investing large amounts of money in the development of knowledge management systems of which intranets, document management systems and data warehouses are the most popular technologies (McCune, 1999). When these systems are applied correctly by following a knowledge-centric approach with the necessary emphasis on information technology, as well as creating an environment conducive to knowledge creation and sharing, companies often experience a large increase in their return on investment (Skyrme & Amidon, 1997; Wiig, 1999).

One of the tools being used for knowledge management is concept maps, which entail a graphical method of acquiring and representing tacit knowledge. Although the graphical display of tacit knowledge has been in use for centuries as a method of expressing individual thinking, concept maps provide a functionality, which enables the user to share his or her knowledge, to collaborate with others, and to show the logical connection between concepts. Furthermore, concepts can be re-used, and information in the form of voice, documents, or movie clips can be added. Concept maps are therefore a very useful cognitive tool in acquiring knowledge and making it available to others in the science and business environment. Concept mapping is not the only mapping technology available, but unlike concept maps with their hypertext function and hierarchical structure (Novak, 2002), other mapping technologies, like the Petri-Network, often face the problem that as complexity increases, clarity decreases. This phenomenon is sometimes referred to as "lost in hyperspace" (Mandl & Fischer, 2000).

The value of concept maps lie in the ability to formalise and display tacit knowledge, as well as to transfer it with the help of pictures, movie clips, voice, text, structure or other forms of description to explicit knowledge. There are currently three major fields where concept mapping is used, namely as a teach-and-learn

strategy tool, a cooperation process application, and as a tool for knowledge gathering, diagnosis, and modelling (Mandl & Fischer, 2000).

2   Objective and scope of the research

2.1   Objective

Since the use of concept mapping tools in knowledge management is relatively new, the objective of the research was to investigate the above-mentioned value of concept maps in the management of knowledge in the banking and insurance industry, because banking is an information- and knowledge-based business.

2.2   A German case study

To research the value of concept mapping in the banking and insurance industry it was decided to follow the case study approach. The head office of a company located in the northern part of Germany that provides banking and insurance services to its customers was selected. The company is highly information and knowledge based, and must meet the requirements of 200 head office employees. The customer base of the company is almost 255 000 customers and the balance sheet amounts to more than 5.6 billion Euros.

Almost all 200 employees have access to the local network and work with Lotus Notes applications, which are directly connected to an in-house Oracle database. Lotus Notes is used for the following tasks: messaging; news distribution via "info-tiles", actualised by each department; applications for workflow and organisation; providing forms; platform for programmed problem solutions; InDoc job description and work instructions; and user service for technical problems.

Lotus Notes was chosen by the company because it is an integrated groupware package; is fast enough for all required applications; and provides the security facilities required in a banking environment. It creates a group communication environment that allows the user to access and share information. Beyond standard email, database, and bulletin board features, Lotus Notes provides text editing, and facilities for document and workflow management. It has a graphical interface and uses client/server architecture that renders itself very suitable for implementation in a company wide intranet.

2.3   Knowledge management within the company

Experts' knowledge and best practises are presently exchanged through the news service ("info tiles"), the Lotus Notes bulletin board, meetings, seminars, or informally. All employees have access to the "info tiles", sorted into topics by each department. The departments are responsible for their own sections and have to update important topics. All employees are able to publish an article within the "tile" of their department, and depending on the topic, also in some of the other departments. Additionally, news messages are sent to inform employees about important issues. External knowledge is acquired through a service that provides economic and business news, analysts' reports, industry changes, and regulative changes issued by government.

In addition to the technological support of knowledge management, employees receive training with regard to the exchange of knowledge, especially for the dissemination of best practises. Regular seminars are not only provided to facilitate knowledge creation within the company, but also to provide details and information about new company products. The company concentrates very much on product training and best practice seminars to facilitate knowledge creation and its distribution. Therefore, a great deal of effort is put in the provision of regular training and seminars to all employees.

Similar to other companies, knowledge is facilitated in project teams, through investment projects, company evaluations, and in product innovation team sessions. Teams usually comprise members from different backgrounds and with a variety of skills. These may include a business analyst, a professional investor, different customer consultants (for private and organisational customers), cashiers, and client advisors. Cashiers and client advisors work in different positions and rotate jobs regularly. They therefore have good customer knowledge, important for decision-making in most projects.

For technical problems, the company has implemented a sophisticated document management system with direct enquiry and archiving features. With the help of document descriptions and key words, searches and solution entries can be undertaken by all employees.

3   Methodology

After interviews with management and key employees within the company to gain insight into the organisational structure, different kinds of work tasks, key performance areas, and present electronic and non-electronic sources of knowledge, a questionnaire was developed consisting of three categories:

- Demographic details;
- An evaluation of the company's current knowledge management system - its use, different possibilities to manage knowledge, and how the system fulfils the employees' needs; and
- An evaluation of employees' knowledge of concept maps, their experiences and the usability of concept maps in the company.

Using a staff list as sampling frame of the population of 200 employees, 80 employees were randomly selected throughout all levels of the organisation, which included employees from the banking, real estate, and insurance sectors of the company. From the 80 distributed questionnaires, 25 responses were received, which represents a response rate of 31.25%.

A second phase of the empirical study involved the creation of various concept maps with company experts to evaluate the value and possible applications of concept maps in the company.

4   Results

4.1   Demographics

The demographic responses indicated that the majority of the responses (28%) came from private customer consultants, followed by 16% from general consultants. Employees of the insurance department and corporate customer consultants each amounted to 12% of all responses. The rest of the answers were spread over the various other departments and is a good reflection of the real distribution of all employees.

The distribution of the age and length of employment of respondents are respectively illustrated in Figures 1 and 2 below.
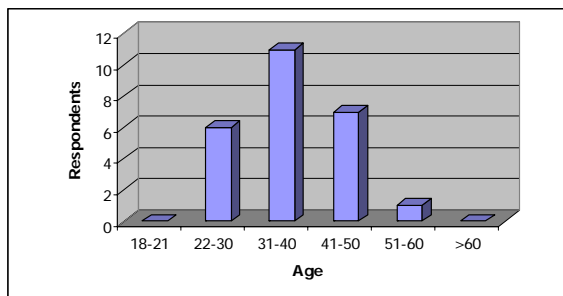

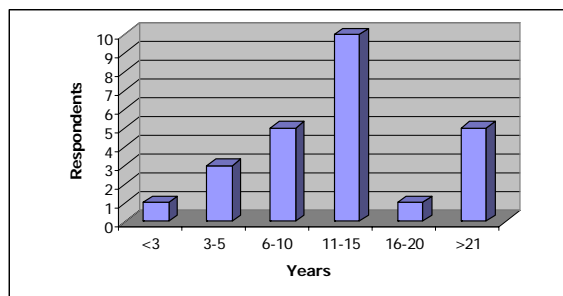**Figure 1:** Age distribution of employees   **Figure 2:** Length of employment

From Figure 1 it is evident that the majority of respondents (44%) were between 31 and 40 years old, with the lowest number between the ages of 51 and 60 (4%). The rest were evenly distributed between 22 and 30 years (24%) and 41 and 50 years (28%). Figure 2 shows that the length of employment peaks at category 11 to 15 years (40%), followed by 6 to 10 years and more than 21 years of employment (both 20%). With only 16% of employees working less than 5 years for the company, it is apparent that most employees have been working for the company for a considerable time.

4.2   Current knowledge management

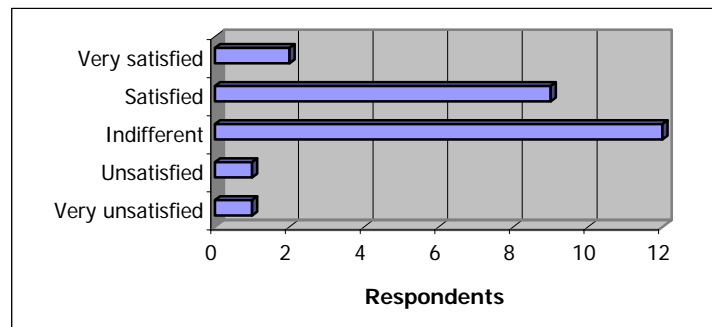Various knowledge resources are presently being used by employees, as is illustrated in Table 1.

Resource	Resources used		Preferred resource	
	Number	Percentage	Number	Percentage
Intranet	22	21.0%	15	30.6%
Colleagues	20	19.0%	13	26.5%
Internet	18	17.1%	6	12.2%
E-mail	15	14.3%	6	12.2%
Internal database	9	8.6%	4	8.2%
Training/seminar	4	3.8%	1	2.0%
S-Finanzberatung	4	3.8%	0	0.0%
Internal brochures	3	2.9%	1	2.0%
Job description	2	1.9%	1	2.0%
Magazines/literature	2	1.9%	1	2.0%
Other (all < 1% each)	6	5.7%	1	2.0%

Table 1: Information and knowledge sources

From Table 1 it is clear that the Intranet, especially the Lotus Notes "info-tiles" (21%), direct communication with colleagues, managers, and experts (19%), Internet searches and investigation (17.1%) and e-mail (14.3%) are the most important sources of knowledge. Although many sources of knowledge are being used, knowledge provided in the Lotus Notes environment (30.6%) and direct communication to colleagues (26.5%) are the preferred sources and are perceived to be of a higher quality than the others.

When the level of fulfilment of users' needs by the current knowledge management system was measured, almost 48% of all respondents indicated that they feel indifferent, 36% were satisfied, and 8% very satisfied, with only 8% unsatisfied or very unsatisfied with the quality of their searches and requests on the current system. The results are displayed in Figure 3 below.

Respondents were asked to motivate their evaluation of the current knowledge management system (Figure 3). Respondents mentioned that the current system lacks an attractive layout, which prevents employees from using it. Other major issues concern the current quality of linkages between documents, key words, and short descriptions used to identify the correct or desired document. This functionality is currently not working sufficiently, and decreases the quality of search outcomes. It also leads to an additional information overflow and reduces

Figure 3: Employees' evaluation of the current knowledge management system

the use of the system. One respondent mentioned that direct contact with colleagues makes more sense than a computer based knowledge management system. It is more praxis orientated, connects knowledge to real life cases, and offers an important social component (communication and confirmation). An additional concern was the speed of the current knowledge management systems, which is too slow for complex internal searches. This has led employees to use other knowledge sources, like the internet to acquire information and knowledge. However, the comment that probably best explains the distribution of the respondents in Figure 3 is the comment that the company's information system is sufficient for all basic tasks but fulfils no higher needs.

4.3 Concept maps

Eleven respondents (44%) indicated that they have heard of or have previously worked with concept maps. Mapping technology, for instance, was used by members of the human resources department, employees in project management, and staff councils for training/seminar planning, brainstorming, development of new products, presentations, discussion platforms, taking notes in presentations, projects (especially for recurring structures – re-use of possible guidelines and framework), and personal knowledge archives.

When respondents were asked if they would use concept maps as a tool to make their knowledge available to others (assuming the implementation of such a system on the company's intranet), 60% reacted positively and

indicated that that such an application would be useful to the company. A total of 28% percent of all respondents were not sure if they would use concept maps to make their knowledge available, and 8 percent indicated that they are already using this technique. Only one participant said that she/he would not use such an application (See Figure 4 below).

Respondents were next asked if they would use concept maps for knowledge acquisition purposes such as the learning of problem solving processes, expert knowledge, and gaining knowledge from other professionals. A total of 68% of all respondents said that they would use the concept map technique to benefit from other people's knowledge. Only 28% were not sure if it would be the right tool for such a purpose. The same respondent, who would not use concept maps for knowledge sharing, would not use this technique for knowledge acquisition. Due to the unavailability of concept maps, the two employees, who already use concept maps, obviously do not use concepts maps for knowledge acquisition. The results are summarised in Figure 4 and are probably predicated on their previous experiences or lack of experience.
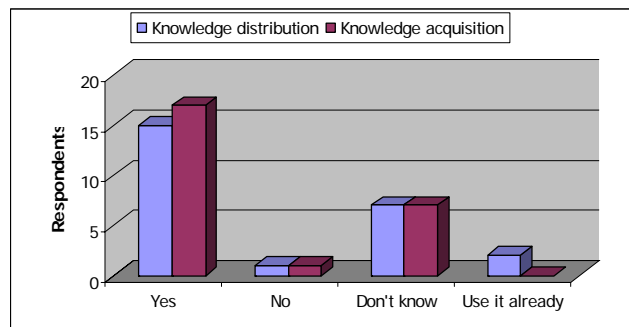

Figure 4: Willingness to use concept maps

When respondents were asked to evaluate their experience with regard to concept maps, a few respondents stated that concept maps are an excellent tool for the representation of knowledge. One respondent was more specific and remarked that concept mapping is an excellent knowledge management tool, but is only suitable for introductory representation of a topic, or to obtain an overview of a subject. If a map is extended with details and special knowledge, the clarity of the map is lost. Other respondents explained that their experience with this technique as a simple presentation method has been very positive. Concept maps can be applied as a tool for different problem solutions. Different examples were mentioned such as the use of concept maps for implementing guidelines (safety and environmental guidelines, workplace descriptions, etc.), for transferring knowledge in a learning environment, or whenever simple navigation is required. A critical response highlighted the problem that concept maps are transparent presentation techniques, but cannot be successfully applied to all kinds of users.

4.4 Significant relationships

Correlation analysis (to measure the strength of linear association between variables) provided further insight into the data. However, only significant correlations ($r > 0.5$) will be discussed (Keller and Warrack, 2000; Saunders, Lewis & Thornhill, 2003).

From the correlation analysis it is to be noticed that employees of a specific department prefer specific search methods when searching for the required knowledge. For example, a consultant uses more brochures ($r = 0.5$), while the private customer consultant prefers the company's intranet (especially the news service) to search for new products ($r = 0.51$) and developments in financial markets ($r = 0.55$).

People from the insurance department of the company are generally not optimistic about the use of concept maps, as indicated by the positive correlation coefficient of 0.6 with the negative response to the questions regarding the use of concept maps for sharing and acquiring individual knowledge. Surprisingly enough, there is also an intermediate relationship ($r = 0.6$) between a negative response to the use of concept maps for sharing and acquiring individual knowledge and people who have worked between 3 to 5 years for the company, probably due to previous training or educational backgrounds of the employees. More specific reasoning will require more detailed research, but the current findings can already be used to identify these groups of employees as target groups for special seminars, if concept maps were to be implemented.

The analysis also indicated that there is no significant relationship between age and the knowledge of concept maps, which is surprising, because it is a relatively new method of representing knowledge.

4.5 Creation of concept maps

To evaluate the value and possible applications of concept maps in the company various concept maps were created through interviews with company experts and team discussions to capture knowledge in their specific

domains, *inter alia* industry analysis, private banking, and credit evaluation process maps. Form these exercises it became evident that although very valuable in knowledge management, concept maps are not able to fulfil all the tasks of a knowledge management system. This is probably because concept maps were not intended to provide all the functionality of a knowledge management system. However, concept maps do have an essential significance in knowledge gathering, job descriptions, training and seminars, presentations, as discussion support tools, and project work such as workflow management. The advantages of concept maps are their cognitive use and understanding, their self-explanatory structure, the interactivity with the user, and the implementation of multi-media in combination with special layout features.

5   Conclusions and recommendations

5.1   Conclusions

Based on the research it can be concluded that a knowledge management system within the banking and insurance company must provide a broad spectrum of knowledge. This need led to one of the major issues the company currently faces, namely the huge variety of knowledge sources available to employees. Users are presently overloaded with a large amount of single knowledge sources without proper linkage or a unified search functionality, which is able to access the different sources and to deliver high quality results.

Although the company has implemented sophisticated information system technology, it provides only limited knowledge management facilities to its employees. Employees are able to publish and share specific knowledge in the Lotus Notes environment, on the bulletin board, "info-tiles", and via e-mail. Lotus Notes provides a good information management system, but is basically used as a document management, e-mail and news distribution system in the company. Although these functionalities are relatively sophisticated, the system lacks substantial search functionality and a workflow management facility. The documents are not connected to cases, processes, or current projects in the company. The provided tools for knowledge gathering and knowledge distribution are thus currently not properly used for knowledge management and function more as an electronic newsletter.

The overall response to concept maps was positive, and provides a good starting ground for future implementation. The response to the idea of applying concept maps for the sharing and acquiring of knowledge was very positive, while the willingness of employees to work with a new technique was high - significant factors for the success of implementing a new knowledge management system. This positive response is further supported by the observation that although the company employs relatively young people – people who are more likely to change jobs for career reasons - the period of employment in the company is relatively long, which creates a good working environment, corporate identity, and stability for the implementation of a knowledge management system. The high acceptance of concept maps, especially amongst the 44% of respondents who are familiar with it, can mainly be attributed to their ease of use, logical navigation, and cognitive approach.

From the above-mentioned research and the present use of concepts maps in the company it became apparent that concept map technology provides excellent facilities for knowledge sharing and acquiring processes in the banking environment. Experts, consultants, professional investors, as well as other employees, can make their knowledge available to employees working in remote places, or other employees who want to acquire professional knowledge. The most important kinds of expert knowledge in the company are: investment strategies; portfolio management; and customer relations. Professional brokers, for example, have a vast amount of knowledge of development in financial markets. The majority of their knowledge is due to experience, while a smaller part of their knowledge is gained from books, magazines, or lectures. To gather this experience in connection with established knowledge; market indicators, such as industry growth rate; and other influential factors, are the aim of concept maps. In this context it is important to gain knowledge not only from leading brokers in the company, but also from brokers with less experience and knowledge of financial markets. Concept maps from leading brokers can be used to establish a common standard throughout the company. Maps from less experienced brokers can be utilised to detect possible weaknesses. The results of the correlation analysis indicated that the different requirements pertaining to job category should be taken into consideration as it can lead to different solutions, such as a special concept map database for stock brokers in the company.

As the empirical research and interviews indicated, concept maps are not only suitable for corporate knowledge management purposes, but can also be used as an individual knowledge management tool for the storing of knowledge and personal thinking.

The information technology infrastructure of the company that was researched is an excellent platform for implementing concept maps. Most client computers are "fat" clients with their own hard disk and processor capacity. All work stations are connected to a local-area-network and thus to the various databases, as well as to all external information and knowledge sources. The Lotus Notes environment is able to present hypertext mark-up language documents which can also display concept maps. A planned, web-based knowledge management system creates an even better environment for the use of concept maps.

Benefits to the company could be immense. Concept map technology could support the present informal transfer of knowledge in the company by capturing the expertise of colleagues. Although this informal transfer has a positive social component, it is time consuming, inaccurate, inefficient, and the distribution to all parts of the company is not guaranteed. If concept maps are used within Lotus Notes or in a web application, tacit knowledge about best practice and processes could more easily be captured, stored and transferred to colleagues because the content can be visualised. Eventually work processes in the company would be streamlined and the efficiency of all employees and project teams would be increased. The employees would be able to offer a better final product to customers because they would draw on collective knowledge to create value for the customer and the company. These advantages would also be valid for the outcome of team projects.

Concept map technology is an enabler of many new possibilities, and can greatly contribute to creating and sustaining competitive advantage for the company in the banking and insurance industry. However, a knowledge-centric approach requires not only the necessary information technology, but also an environment conducive to knowledge creation and sharing. Fundamentally, as was pointed out by the research, the company already provides a good environment for knowledge sharing, and employees possess openness and a high tolerance for newly developed techniques.

5.2   Recommendations

In order to successfully implement knowledge management measures in the company, the value of knowledge must be recognised, especially by top management. The company currently emphasises information technology and the dissemination of information, but does not yet realise the value of knowledge management in creating a competitive advantage by improving internal processes, customer services and products, and by creating a good environment for employees. Without the recognition of the importance of knowledge management, an essential backbone of all business processes would be missing. Most business activities, from important strategic decisions, to basic investments, measuring performance, or creating the right company culture, are based on knowledge. Hence, the combination of different knowledge sources into one, strong, company-wide knowledge base plays an important role in the company's future success.

There is no doubt that concept maps can fulfil this role as a single knowledge management application with a knowledge base consisting of maps with a variety of knowledge from different employees and departments. A single knowledge base will provide a tool for capturing, modeling, preserving, and sharing of knowledge by all employees, as well as standardising the company's knowledge products and providing all employees with the required knowledge necessary for increasing the quality of the final product or service.

Although concept map technology at the current stage of development is able to provide very important support in the management of knowledge, not all functions within the wide spectrum of a knowledge management system are provided. It is therefore recommended that concept maps within in the banking and insurance industry should be implemented into bigger applications in order to maximise the utilisation of the valuable functions of concept maps in combination with the functionality of other applications.

However, despite missing functionality, concept maps can be advantageous tools to be implemented in the banking and insurance industry. They are easy to understand and use, because they describe concepts and connections in a cognitive way. The users do not need to learn guidelines or rules beforehand as most of the maps are self-explanatory. This guarantees high overall acceptance of concept maps. The implementation of concept maps as part of a company's knowledge management system is one successful step to be taken towards obtaining and sustaining competitive advantage.

6   References

Barquin, R.C. (2001). What is knowledge management? *Knowledge and innovation: Journal of the KMCI*, *1* (2), 127, 15 January.

Birkenshaw, J. (2001). Making sense of knowledge management. *Ivey Business Journal*, March-April, 32-36.

Demarest, M. (1997). Understanding knowledge management. *Long Range Planning*, *30*(3), 374 – 384.

Drucker, P.F. (1999a). Knowledge-worker productivity: the biggest challenge. *California Management Review*, *41*(2), 79-93, Winter.

Drucker, P.F. (1999b). *Management challenges for the 21st century*. New York: Harper Business.

Grulke, W. (2000). *Ten lessons from the future*. Parklands: @One Communications.

Hardijzer, C. (2000). Harness tomorrow's knowledge. *People dynamics*, 22-27, September.

Keller, G. & Warrack, B. (2000). *Statistics for management and economics*. 5th Ed. Boston: Duxbury.

Mandl, H. & Fischer, F. (2000). *Wissen sichtbar machen – Wissensmanagement mit Mapping-Techniken*. Göttingen: Hogrefe-Verlag.

McCune, J. (1999). Thirst for knowledge. *Management review*, *88*(4), 10-12, April.

Novak, J.D. (1998). *Learning, Creating and Using Knowledge: Concept Maps as Facilitative Tools in Schools and Corporations.* Lawrence Erlbaum Associates.

Novak, J.D. (2002). *The theory underlying concept maps and how to construct them*. [Online]. Available: http://cmap.coginst.uwf.edu/info/.

Novak, J.D. & Gowin, D.B. (1984). *Learning How to Learn.* Cambridge Press.

Riches, P., Kemp, J., Wolf, P., Pudlatz, M. & Le Moult, D. (2003). *Future of KM: Business roadmap.* [Online] Available: http://www.kmadvantage.com/docs/ km_articles/Future_of_KM-Business_Roadmap.pdf.

Saunders, M., Lewis, P. & Thornhill, A. (2003). *Research methods for business students.* 3rd ed. Harlow: Prentice Hall.

Skyrme, D.J. & Amidon, D. (1997). The knowledge agenda. *Journal of Knowledge Management*, *1*(1), 27-37.

Wiig, K.M. (1999). Successful knowledge management: Does it exist? *European American Business Journal*, Autumn Issue, 106-109, August.

World Bank. (2002). *Building knowledge economies.* [Online] Available: http://lnweb18.worldbank.org/ ECA/ECSSD.nsf/a3b026a6ee1e272585256ad2007130d3/9e9735587b22d64285256bce005ddbad/$FILE/B uilding%20Knowledge%20Economies-final%20final.pdf.