Knowledge Harvesting System for a Business Enterprise

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ABSTRACT

Globalization has created new opportunities for business enterprises and their employees. Employees have started leaving the organization to avail themselves of the opportunities. Consequently knowledge gained and developed by them is lost when they quit the organization. Many business enterprises have started realizing that they need a solid and ongoing system that will capture and store the knowledge of their organizations and employees in information systems. It is required to establish synergy between the concepts of knowledge management and information technology for the creation of knowledge management system. This paper talks about the steps to be followed for incorporating the concept of knowledge harvesting with the human centered component in intellectual capital in business practices of an organization. Further it explains the role of Information and Communication Technologies (ICT) in this process.

Keywords: Knowledge harvesting, Intellectual capital, Knowledge worker, Data ware house, Data mining.

INTRODUCTION

The existing ways of doing business are constantly changing due to rapid changes in global economy. It is apt to recall here the observation of Arnold Kransdorff and Russell Williams(2000) who say that industrial conditions determine the options available and competitive advantage stems from business to it's environment (PP399). It has become a necessity for business enterprises to respond quickly to these changes. Many business enterprises have started realizing that managing knowledge as well as innovative process is the way to remain competitive in the changing business scenario. It is generally perceived by many business enterprises that knowledge management is a technology for preserving and enhancing the knowledge base of an organization. But after a close look at their own organization they may find that many elements related to knowledge management are already available in their own organization itself. In reality they are required to make use of the elements of knowledge source in their organization for their competitive advantage. George Friedman, Meredith Friedman, Colin Chapman, John S Baker Jr. (1997) rightly observe that the geography of information is not quite like a map of New Jersey. Information exists in a Variety of domains, some further away and harder to access, some closer and easily accessible. Further they say that we must draw a peculiar map to describe the geography of information, charting the zones or domains in which information resides (PP46-47). The overall challenge that many enterprises face today is identifying where the knowledge resides and to leverage it across to their organization. In spite of heavy investment in information technology business enterprises seem to think that they are fighting a losing battle. Business success lies in converting the information in their systems into knowledge. Now it has become important that one should use one's own wisdom to convert information into knowledge in the new scenario of business world. Business enterprises also seem to think that 'INTELLECTUAL CAPITAL' and 'KNOWLEDGE MANAGEMENT' are one and the same. The word 'MANAGEMENT' in knowledge management clearly indicates a process whereas 'INTELLECTUAL CAPITAL' is an entity and asset and not a process. This paper recommends a model for a business enterprise to design a knowledge harvesting system with the elements of Intellectual Capital. It comprises of five sections covering (1) Existing Scenario in Business Enterprises (2) Knowledge management and Intellectual capital (3) New Brand of Professionals (4) Steps in creation of knowledge harvesting system and (5) Globalization Scenario.

EXISTING SCENARIO IN BUSINESS ENTERPRISES

The greatest challenge in implementing effective knowledge management is helping employees make the transmission from knowledge hoarders to knowledge sharers. With knowledge comes power and influence in an organization and in today's business scenario one may find most employees working in knowledge hoarder's environment. Many of them also follow the practice of a selective distribution of knowledge. While comparing sharing patterns in knowledge, Melissa M.Appleyard (2002) gives an example of knowledge sharing in semi conductor industry in the US and Japan. Employees in the US semiconductor industry are more likely to rely on private channels of communication than their Japanese counterparts (PP 539). Generally executives do not intend remaining with an organization for long, they do not recognize the value of an accumulated knowledge. All they focus on is completing the tasks assigned to them as soon as possible in order to take on other assignments or leave the organization. This is one reason why they are unable to adapt to the new knowledge management environment. They need to realize that they have to work under competitive pressure in the present globalization scenario. Mary Crossan and John Hulland (2002) state that adjustment and joint action are crucial to the development of shared understanding (PP 714 – 715). This is most relevant in the present business scenario. Janie Nahapiet and Sumantra Ghosal (2002) explain that the cooperation among individuals in the organization will be possible only when individuals and functional experts are structured, coordinated and communicated (PP673). The essence of a knowledge management environment is to manage carefully 'Human centered assets' in business enterprises. What is required is a change in mindset among managers. Managers are expected to act as mentors to help employees change to knowledge workers and make use of the organizational knowledge base. Arjan Raven (2003) rightly points out that instead of looking at individuals as just information processors or decision makers, it is required to understand their work and support for making them feel their importance in the business of the organization (PP 292).

KNOWLEDGE MANAGEMENT AND INTELLECTUAL CAPITAL

Evolution of Knowledge Management

One would know from the study of history of any country that the concept of knowledge management is not new. The only difference one could observe is the methodology followed by them. Emperors of China preferred to have scholars as their advisors than politicians. The services of educated priests were used by Roman emperors like Greeks to know the possible trends in future. It is said that Kings in ancient India were particular mainly about four elements while developing a township in their Kingdom. They were places for worship (DEVALAYA), places for learning (VIDYALAYA), LIBRARIES (GRANDHALAYA) and Hospitals (OUSDALAYA). Indian kings seemed to be concerned with creation of knowledge among people by allocating places for schools and libraries. It may be interesting to note that a British stock broker in 1815 came to know about the defeat of Napoleon at the battle of Waterloo before it was known to others. It is said that this information helped him to make a fortune. In this context Thomas A. Stewart (2001) rightly says that industrial age was knowledge based too and the results of inventions such as steam engines, radio and telephones were based on this concept (PP XI). In the present day scenario these inventions would be classified under human centered assets.

Intellectual Capital

Intellectual capital or Intellectual assets are two words mentioned frequently in the present knowledge economy. The word 'CAPITAL' or 'ASSET' suffix to 'INTELLECTUAL' is not used in strict accounting terminology. It may be noted that the meaning of both the terms is the same. The components of intellectual capital can be classified under four heads. They are 1.Human Centered Assets 2.Intangible Assets 3. Market Assets and 4.Tangible assets. It is apt to recall the observation of Stephen E. Little (2002) on knowledge creation in a global context: "The speed of technical and infrastructural changes in business practice together with a new understanding of the centrality of intangible assets to wealth creation has brought the Silicon valley Paradigm of innovation to prominence (PP 369).

Knowledge Harvesting

The world 'Harvesting' generally applies to agriculture and refers to the practice of increasing the yield of cultivable land. In the same way organizational Intellectual asset is considered as equivalent to Cultivable land, where the employees' wisdom is the 'Manure'. With the help of employees' wisdom, the knowledge management process is developed by making use of the Intellectual assets of an enterprise. 'Knowledge Harvesting' means an integrated set of processes that capture the often hidden insight of human expertise in business. Just as individual skills are acquired through practice over a period of time, so are the skills of an organization developed and sustained only through experience.

Codification of Knowledge

It may be interesting to note that major portion of corporate knowledge is in employees' brains and documents. They are not easily shareable. Knowledge harvesting process is needed for making it shareable. The output of knowledge harvesting is the codification of Human centered assets in business enterprises. This is required to be stored in information systems. This creates value for business enterprises and it belongs to them. Further it has to be used for guidance and decision making. All critical decisions recorded will help to create Meta knowledge for adopting changes in business. The importance of reuse of intellectual capital can be understood from the statement of David E. Smith (2000) who says that reuse of intellectual capital is possible only when leveraging the experience of others who are not on the current team in an organization (PP XI).

New Brand of Professionals

Recent convergence of information and communication technologies has come to be termed as ICT. Professionals associated with these technologies are known as ICT Professionals.

STEPS IN CREATION OF KNOWLEDGE HARVESTING SYSTEM

Case Illustration

ROA Software Ltd was started two decades ago by a group of software professionals at Madras in India. Their area of operation mainly related to development of application software in the financial services sector across the globe. They have specialized in the segments such as Portfolio Services, Financial Services and Risk Management in Financial Sectors. Their approach has been to develop software on the basis of the business practice followed in the financial sector of the country concerned. It is because of this approach the members of the software development team have acquired good knowledge of their software. If any changes had to be carried out for any client, their efforts would be minimum. ROA Software Ltd has been considered as reliable and dependent IT solution provider in the global market. Their market share has been 75% and they were considered as market leaders. The policy of the company has been to group five project teams as one SBU (Strategic Business Unit). There are 7 to 10 such SBU's in every country wherever they have their business. Each SBU has its own team of Domain and Functional experts and software, hardware and telecommunication professionals. It has been the responsibility of the head of SBU to generate income for their operations. Capital Investments decisions are taken at head office and the funds are organized by them for acquisition of assets.

In recent times they have started feeling the impact of competition due to globalization policy followed by many countries. Consequent to this many of their seasoned employees have started leaving them to avail themselves of the various opportunities available in the global market. Knowledge gained and developed by them was lost due to their exit. The management has realized that a solid and ongoing system is required to archive the human centered assets and to have methods in place. This proposed system is expected to help their employees to share the knowledge that has been developed internally over a period of time. The management has created a task force consisting of senior executives who have rich experience in the business related to Portfolio Services, Financial Services and Risk Management in financial sector.

Observations of the Task Force

The task force has studied the existing practices, procedures and methods at various SBUS. They have also assessed the utilization of the resources such as Hardware and Software. They had interaction with the Domain and Functional experts, and ICT professionals at the SBUS. Their observations have been that neither knowledge nor the resources have been shared among the different SBUS in the same country. There has been no method to capture the knowledge and experience of their employees either by manual documents or electronic mode. While explaining culture and its relationship to knowledge Joseph M.Firestone and Mark W.Mcelroy (2004) state that to realize full value of the organizations' knowledge resource, if it is required culture in the organization has to be changed (PP 261).

Action Plan from the Task Force

The task force has created a core team. This team will consist of Domain and Functional experts, Human knowledge codifiers and ICT Professionals. The Core team has initiated the steps for creating knowledge harvesting system by integrating the components of Intellectual capital at ROA software Ltd. Table 1 – explains the components of Intellectual capital at ROA software Ltd. While establishing relationship between knowledge intensity and process complexity, Amrit Tiwana (2001) divides the business process in three phases such as Translation based, Activity based and Knowledge oriented base (PP 45-46). The core team identified the business activities in the countries of their operation as market assets. The three segments of the business activities in the financial sector have been classified under intangible assets. The various experts at ROA software Ltd are

Table 1. Intellectual capital at ROA Software Ltd.

MARKET ASSETS
• BUSINESS ACTIVITIES IN • WESTERN COUNTRIES • ASIAN COUNTRIES • MIDDLE EAST COUNTRIES
INTANGIBLE ASSETS
• PORTFOLIO SERVICES • FINANCIAL SERVICES • RISK MANAGEMENT IN FINANCIAL SECTOR
HUMAN CENTERED ASSETS
• DOMAIN EXPERTS • FUNCTIONAL EXPERTS • KNOWLEDGE CODIFIERS • ICT PROFESSIONALS
TANGIBLE ASSETS
• HARDWARE • SYSTEM SOFTWARE • APPLICATION SOFTWARE

grouped under Human Centered assets. The elements needed for the process of their business activities are considered as tangible assets.

Role of Core Team
While understanding the importance of human-Centered assets, it would be apt to recall the observation of Arnold Kransdorff (1998) on sustaining internal knowledge: "One of the first things to do is to create a simple 'KNOWLEDGE MAP' that identifies an organization's key individuals whose functions and experiences are considered important for the smooth running of the business. In identifying them, the broad rule of thumb is: would we be in trouble if these people fell under a bus? (PP33). The role of Domain experts is to provide inputs for creating database in their areas of business activities at ROA software Ltd i.e.; Portfolio services, Financial services and Risk management. Their inputs will be based on their knowledge and experiences in their areas of specialization. The functional experts will explain the procedures, methods and practices followed in the above business activities and stored in a database. The Core team has decided the employees who are in the middle level management will be designated as knowledge workers. The core team has insisted that all interactions among the knowledge workers, Domain and Functional experts should be stored in a database by using Groupware software. Further the core team selected a group of knowledge workers who have created impact in their area of work have been given the responsibility as knowledge codifiers. ICT Professionals would design a system on the basis of the inputs provided by the other members of the core team. This design is termed as ROA Knowledge Harvesting System.

System Software for ROA Knowledge Harvesting System
Information Technology is providing many concepts to face the new realities in the present business scenario. Data warehouse and Groupware are among a number of other concepts provided by information technology. Data mining is a software tool needed to make use of Data warehouse. The core team has decided to make use of the above software.

Data Warehouse
There are different definitions of Data warehouse. The essence of these definitions is extraction of the data from the legacy systems in enterprises, integrating it with the external data for analysis purpose. It can be inferred that the purpose of Data warehousing is (1) To slice and dice through data (2) To ensure that past data is stored actually (3) To provide one version of data (4) To operate analytical purpose and (5) To support the decision process. It may be noted that data warehouse is a central store of data that has been extracted from operational data.

Groupware
While describing the groupware applications Kate Ehrlich (2001) says: "Groupware Applications provide computer support for group work. At a general level, group work includes written and spoken communication, meetings, shared information and coordinated work. Some group work occurs where people interact with each other at the same time (SYNCHRONOUSLY). Face-to-face meetings are an example of people working together at the same time and often in the same place. People can also work together at different times (ASYNCHRONOUSLY). Where people leave messages in electronic mail, the communication occurs over a period of time. (PP138).

Data Mining
While explaining about Data mining PIETER ADRIAANS and DOLF ZANTINGE (1996) say that there is confusion about exact meaning of the terms 'DATA MINING' and KDD (Knowledge Discovery in Databases) among many authors and they regard them as synonymous (PP 79 – 81). At the first international KDD conference in MONTREAL in 1995, it was proposed that the term 'KDD' be employed to describe the whole process of extraction of knowledge from data. In this context knowledge means relationship and patterns between data elements. It was further proposed that the term 'Data mining' should be used exclusively for the discovery stage of the KDD process. While talking on KDD process they observe four types of knowledge can be distinguished. They are:

- **Shallow knowledge:** The information can be easily retrieved from databases using a query tool such as Structured Query Language (SQL)

Figure 1. ROA knowledge harvesting system
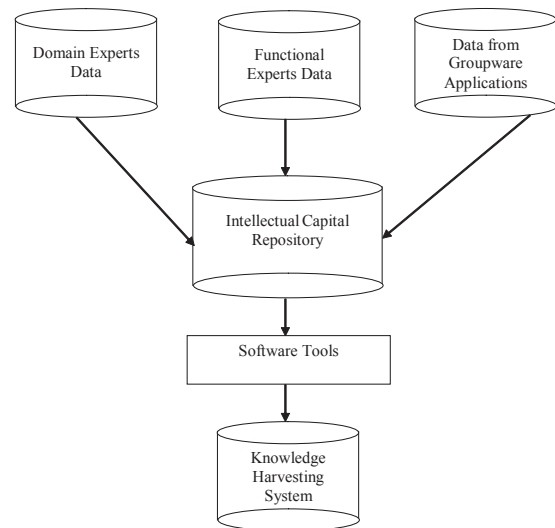
- **Multi-Dimensional Knowledge:** The information that can be analyzed using online analytical processing tools.
- **Hidden Knowledge:** The data can be found relatively easily by using pattern recognition or machine learning algorithms
- **Deep knowledge:** The information stored in the data warehouse can only be located if we have a clue that tells us where to look. It is interesting to note the example given on 'CUE' in knowledge in organization by John Sparrow (1998) who says how courts have tried to formulate definitions of retrieved cues. In legal theory anything that actually refreshes a witness's memory may be used (PP171-172).

ROA Knowledge Harvesting System
Fig 1 –ROA Knowledge Harvesting System gives an overview of the system created by ICT professionals. The knowledge codifiers will coordinate and organize to codify the data from the three databases and store them in Intellectual Capital Repository. Data Warehouse software is used for Intellectual Capital Repository and Knowledge Harvesting System.

The intellectual asset repository is developed from Domain experts' data, Functional experts' data, and data from Groupware applications. This repository is the result of the application of Human centered assets on intangible and tangible assets at ROA software Ltd. The knowledge harvesting system is created by using the Software Tool (Data mining) on Intellectual Capital Repository.

IMPORTANCE OF ROA KNOWLEDGE HARVESTING SYSTEM
The knowledge harvesting system developed at ROA Software Ltd is to facilitate the knowledge workers to understand the business process, procedures, discussions and decisions in their business activities. This system is the result of their knowledge coders who have strong ideas about knowledge to be grouped, classified and defined in their Intangible assets such as Portfolio Services, Financial Services and Risk Management in Financial Sector. The knowledge workers will tend to explore the knowledge in the system in terms of how it can be related in the context of their business activity. Further this system illustrates how business, ICT and human elements are integrated. This system ensures ROA Software Ltd to face the complex situations in the present globalization scenario.

GLOBALISATION SCENARIO
It may me noted that the concept of globalization has created virtual organizations. Further business requirements are also changing at rapid phase. Likewise ICT is also emerging with new concepts with an increase in computing power

Figure 2. ROA resource model
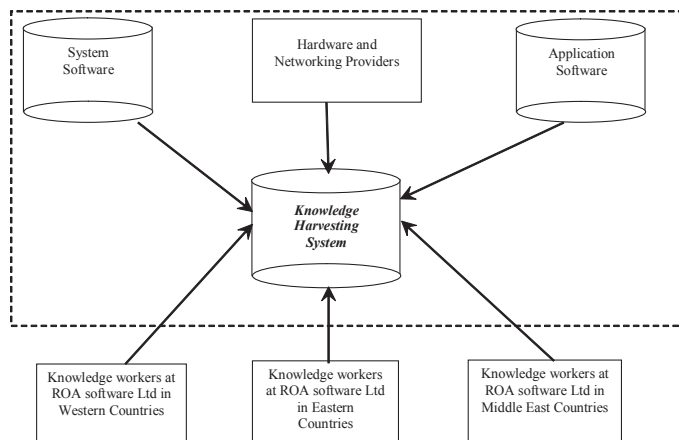
and communication capability. 'Grid Computing' is one more emerging concept provided by ICT. Virtual organization and Networking are the main elements in Grid Computing.

This concept has helped ROA Software Ltd making use of their intangible and tangible assets, and human centered assets across the globe. The knowledge workers have taken advantage of time difference for making use of the resources available at their offices in the respective countries. It enables them in minimizing capital and operational expenditure. The Fig 2 – ROA Global Resource Model explains how the resources at ROA Software Ltd are being used by their knowledge workers from their respective countries. This model facilitates to control and coordinate resources sharing and problem solving among knowledge workers across the countries of their operations. Sharing of resources range from simple file transfer to complex and collaborative problem solving among knowledge workers at ROA Software Ltd. The enormous competitive pressure in the International Market the knowledge workers at ROA Software Ltd can get, is advice and guidance for decision making from the human centered assets from any part of the world through this model.

CONCLUSION

Knowledge Harvesting System is not a Centralized database that contains all the information known by an organization. Business insight comes from capturing knowledge and giving it greater meaning through its relationship to the other information in business enterprises. ROA Software Ltd has illustrated how Knowledge Harvesting System can be developed applying Human Centered Assets in an organization from Tangible Assets. The important elements such as Market Assets and Intangible Assets are described as focal area on which the entire ROA Knowledge Harvesting System relies. It is interesting to note the observation of George Friedman, Meredith Friedman, Colin Chapman, John S.

Baker Jr. (1997) who say that: "The core decision in every intelligence project is: How much time do you want to buy – where do you want to be on the knowledge curve?" (PP53).

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