

## KNOWLEDGE MANAGEMENT SYSTEM IN LAW USING K-CLUSTERING TECHNIQUE

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### ABSTRACT

Knowledge has recently been discovered to be one of the most essential assets of organizations. Managing knowledge has grown to be vital for a company's success. Knowledge management System (KMS) is a vital application to transform knowledge resources in learning organization (LO) into intellectual capital for competitive advantage. However, the adoption of knowledge management system in law is less prominent especially in developing countries as there is no clear mechanism on how to motivate and encourage legal practitioners to share and reuse knowledge, as well as to generate new knowledge in a collaborative environment. Therefore, this work aims to overcome these problems by developing a Knowledge Management System in Law (KMSL) that would ensure knowledge creation by converting the tacit knowledge of the legal practitioners to explicit knowledge for storage in a repository and knowledge reuse in a law firm. K-clustering technique was employed for knowledge exploitation and easy reuse.

**Keywords:** Knowledge, Knowledge management System, Law, Learning Organization, Knowledge sharing.

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### 1. INTRODUCTION

In this century that we are, it has been discovered recently that the importance of knowledge in an organization like law firms cannot be over emphasized. Any leading organization in the world must have a good number of knowledgeable and skillful employees who use their knowledge for the running and upkeep of the company. Those companies with little knowledge are found beneath the progression ladder. But all these are tacit knowledge because it reside in the heads of the employees, it can be lost at any time due to resignation of employees, death or through other means. This problem has paved way for the popularity of knowledge management system. Knowledge Management (KM) concept was introduced in the beginning of 1990. Knowledge Management System in Law (KMSL) is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives (Jennifer R. 2000). KM is a systematic, organized, explicit and deliberate ongoing process of creating, disseminating, applying, renewing and updating the knowledge for achieving organizational objectives (Awad et. al., 2008).

Knowledge management system is now being widely used in so many organizations to tap into the wealth of knowledge by maximizing the efficiencies for clients. This work aims to overcome the problem of resource wastage by creating a knowledge repository where information would be stored for one's use and others in future. It is basically for a law firm. Lawyers are mobile and move from firm to firm during their careers. Firm clients are sophisticated consumers of legal services and the buyer is often an attorney who spent years in a law firm before joining the corporate law department. In response to these changes, individual lawyers today work on many levels to achieve efficient reuse of their own work, and to capitalize on the work product of both colleagues and strangers.

### 2. THEORETICAL BACKGROUND

Bontis (2000) believes that by the year 2010, the world's codified knowledge will double every 11 hours. Not only is the production of knowledge increasing but the rate of knowledge production itself is increasing (Laszlo, 2002). The assumption that the concept of knowledge is fundamental to comprehending organizations is reflected through the emphasis of an organization's competencies and knowledge as being crucial to its strategic performance. As we enter an information era, there is an abundance of knowledge available, though the management of it appears less than satisfactory. The poor organization of knowledge within firms prevents these firms from benefiting financially and/or socially.

During the last few decades, we have witnessed a growth in the discussion and significance of knowledge; focusing on the concept and application of KM within the rise of knowledge-based organizations. According to Gold (2001) the infrastructure for successful KM consists of a flexible organizational culture, up-to-date and supportive technology, and a solid corporate structure.

A firm only gains sustainable advances from what it collectively knows, how efficiently it uses what it knows, and how quickly it acquires and uses new knowledge (Davenport and Prusak, 1998). An organization in the knowledge age is one that learns, remembers, and acts based on the best available information, knowledge, and know-how. All of these developments have created a strong need for a deliberate and systematic approach to cultivating and sharing a company's knowledge base — one populated with valid and valuable lessons learned and best practices.

### 2.1 Data, Information and Knowledge

In order to fully understand the concept of knowledge, we must differentiate it from data and information. According to Gomes (2001) data are 'simple facts and figures out of context that are, therefore, not directly meaningful.' In order for the firm to consider data useful, it must be processed into information by connecting it to a context. Gomes (2001) thus believes that information is defined as organized facts and data, which are converted into context for specific use. Knowledge is commonly referred to as what we know. It involves 'the mental processes of comprehension, understanding and learning that go on in the mind, however they also involve interaction with the world outside the mind, and interaction with others' (Wilson, 2002). Vat (2003) believes that knowledge is intriguing as it is always open to interpretation, is constantly changing, and is constructed over time. Hitherto, there is no universal definition of knowledge, according to Oladejo et al, (2009), knowledge is defined as facts with its attributed meaning, where meaning is a function of an observation, learning, experience, and understanding of a reality in a particular situation or context at a specific period of time by an individual (in: Oladejo et al, 2010). Although the creation of knowledge is not merely a compilation of facts, it is a uniquely human process that cannot be easily replicated.

### 2.2 Knowledge in Law Firms

Classification of knowledge into categories and dimensions may depend on industry. For example, there are likely to be different knowledge categories in a bank compared to a law firm. At the same time, there will be certain generic knowledge categories such as market intelligence and technology understanding in most companies independently of industry. When classifying knowledge in a firm, it is important to do the analysis without the organization chart. If you classify knowledge into technology knowledge, production knowledge, marketing knowledge, and financial knowledge, it may be because the firm according to the organization chart consists of a development department, production department, marketing department and financial department.

It might be more useful to introduce new knowledge categories such as product knowledge, which includes knowledge of development, production, marketing, and finance. By identifying cross-sectional knowledge categories and dimensions, solutions for improved knowledge flows in the organization will emerge. A law firm is a good example. A law firm is organized according to legal disciplines. Some lawyers work in the tax department, while others work in the department for mergers and acquisitions. The types of knowledge involved in the practice of law can be categorized as administrative, declarative, procedural, and analytical knowledge. Edwards and Mahling (1997) describes these categories as follows:

- ❖ **Administrative knowledge**, which includes all the nuts and bolts information about firm operations, such as hourly billing rates for lawyers, client names and matters, staff payroll data, and client invoice data.
- ❖ Declarative knowledge which is knowledge of the law, the legal principles contained in statutes, court opinions and other sources of primary legal authority; law students spend most of their law school time acquiring this kind of knowledge.
- ❖ **Procedural knowledge** which involves knowledge of the mechanisms of complying with the law's requirements in a particular situation: how documents are used to transfer an asset from Company A to Company B, or how forms must be filed where to create a new corporation. Declarative knowledge is sometimes labeled know-that and know-what, while procedural knowledge is labeled know-how.
- ❖ **Analytical knowledge** that pertains to the conclusions reached about the course of action a particular client should follow in a particular situation. Analytical knowledge results, in essence, from analyzing declarative knowledge (i.e., substantive law principles) as it applies to a particular fact setting.
- ❖ Classification of knowledge into categories and dimensions has important limitations. For example, the classification into **explicit and tacit knowledge** may create static views of knowledge. However, knowledge development and sharing are dynamic processes, and these dynamic processes cause tacit knowledge to become explicit, and explicit knowledge to become tacit over time. Tacit and explicit knowledge depend on each other, and they influence each other. In this perspective, Alavi and Leidner (2001) argue that whether tacit or explicit knowledge is the more valuable may indeed miss the point. The two knowledge categories are not dichotomous states of knowledge, but mutually dependent and reinforcing qualities of knowledge: tacit knowledge forms the background necessary for assigning the structure to develop and interpret explicit knowledge.

According to Alavi and Leidner (2001), the linkage of tacit and explicit knowledge suggests that only individuals with a requisite level of shared knowledge are able to exchange knowledge. They suggest the existence of a shared knowledge space that is required in order for individual A to understand individual B's knowledge. The knowledge space is the underlying overlap in knowledge base of A and B. This overlap is typically tacit knowledge. It may be argued that the greater the shared knowledge space, the less the context needed for individuals to share knowledge within the group and, hence, the higher the value of explicit knowledge. For example in a law firm, lawyers in the maritime law department may have a large knowledge space so that even a very limited piece of explicit knowledge can be of great value to the lawyers.

### **2.3 The Law Firm**

In order to fully realise the advantages of KM within the industry, it is essential to understand the structure of law firms, the stakeholders involved, and the motivation behind the creation of a law firm. According to Khandelwal and Gottschalk (2003), law firms are similar to social communities which specialise in speed and efficiency in creating and transferring legal knowledge. When this statement is broken down into separate components and examined further, it exemplifies the 'ideal' firm. The ideal firm consists of a community of individuals who create and transfer knowledge quickly and efficiently. Unfortunately, because of the stakeholders involved, this is not always the case. As Hunter (2002) notes, a law firm is generally composed of lawyers, paralegals, managers, support personnel and administrators. These diverse occupations have distinct functions, yet these individuals must work together to achieve the desired outcome of adding value to the firm. It is also important to note that, depending on the size of the law firm, its organizational structure may vary significantly.

However, Hunter (2002) also states that each law firm has a unique set of distinct characteristics and operating procedures that can play an important role in the creation and implementation of a KM strategy. To understand the reasons why KM is such an important business driver, it is essential to be aware of the scope and purpose of a law firm. A firm's mission statement can be useful in providing a clear and accurate snapshot of both the scope and purpose of the firm. In general, the mission statement of a professional service firm provides three main objectives: to deliver outstanding client service, to provide fulfilling careers and professional satisfaction to employees and to achieve financial success to grow (Hunter, 2002, p.8). These three objectives can have a major impact on the decision to implement a KM program.

According to Southon (2002), a firm must have access to the best minds and therefore the best knowledge in their chosen fields to provide outstanding client service. It was asserted that this service includes such things as clear and timely billing, an ability to respond to the unexpected, and an ability to create innovative solutions. KM can play an important role in achieving these objectives because it has the potential to increase efficiency and effectiveness within the firm.

### **2.4 Knowledge Creation**

The significant difference between information, data and knowledge is that knowledge always contains a human factor, as it is regarded as something individuals possess. It has always been the main contributing factor, in the business world, to the good performance of a firm. Gomes (2001) strongly believes that knowledge is an asset and should be managed, in a similar fashion to the traditional cash flow, human resources, or raw materials. The concept of knowledge as an 'intangible asset' is growing in popularity and value within our knowledge-based economy.

By the end of the 1990s, references to intellectual capital in business were commonplace (Bontis, 2000). Intellectual capital is generated within one's intellectual space. Each member of an organization possesses his or her own knowledge space, which is subject to some level of description and may be 'architected, integrated, and designed into an organization' (Vat, 2003). In accordance with Vat (2003), as the source of a firm's wealth shifts from tangible assets to knowledge, it is evident that firms who create their own communal knowledge space between their members will embrace a great advantage over those who choose not to. The same belief can be, and is, applied to firms. In order to benefit from and develop a communal knowledge space, one requires a context for knowledge fusion, which should aid in the structure and facilitation of knowledge implementation and interconnectivity within a firm (Vat, 2003). From figure 1, one can identify the processes involved in a knowledge management system from the identification, gathering, use and reuse.

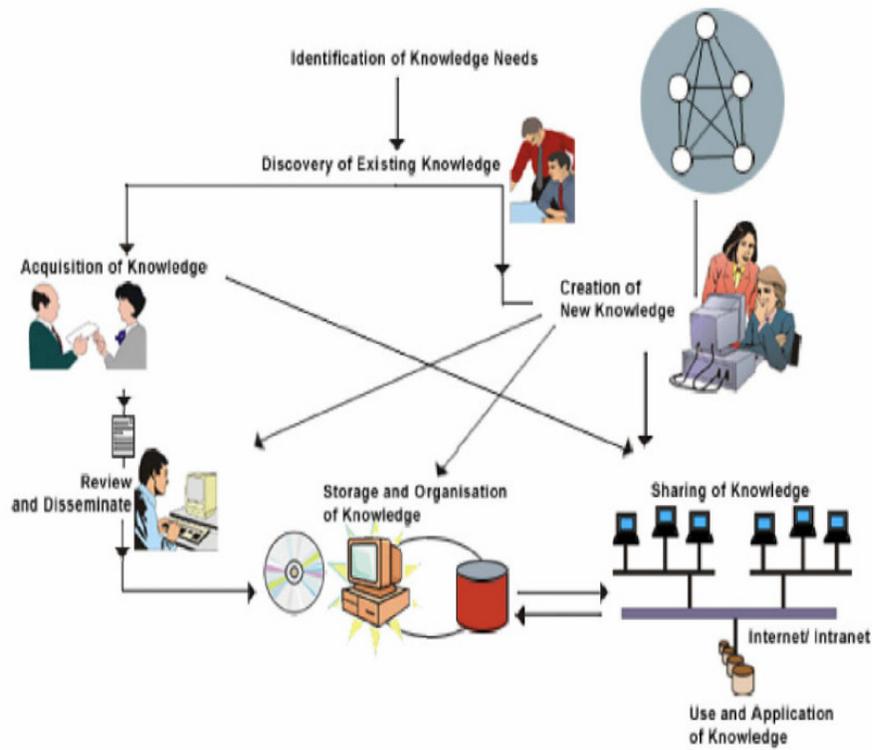


Fig. 1: Knowledge Management Processes (Van, 2003)

### 3. ARCHITECTURE OF KNOWLEDGE MANAGEMENT SYSTEM IN LAW (KMSL)

A feasibility study of operations in law firms was conducted for information gathering purpose using observation and interview as extraction tools. A knowledge repository is built to capture the information from knowledge workers and attorneys in the firm and thereby generate knowledge from such information from employees' head (tacit knowledge) and make it available for future use and reuse. The system ensured that the information is well arranged and indexed for easy retrieval.

The proposed architecture of KMSL is as shown in figure 2 that shows the interaction of the users with the system and the different levels of hardware and software component. It requires the knowledge workers or the attorneys in the law firm to enter law data into the system and the system will index such data and generate knowledge from it. If there arise a new case, the repository could be launched to retrieve relevant information from similar cases that the organization has handled in the past thereby prevent re-investing new resources into the system and saves a lot of time of starting the case from the scratch. Once the KMSL is opened, the attorney or the knowledge workers in charge of the case will query the repository after which relevant information will be fetched from it.

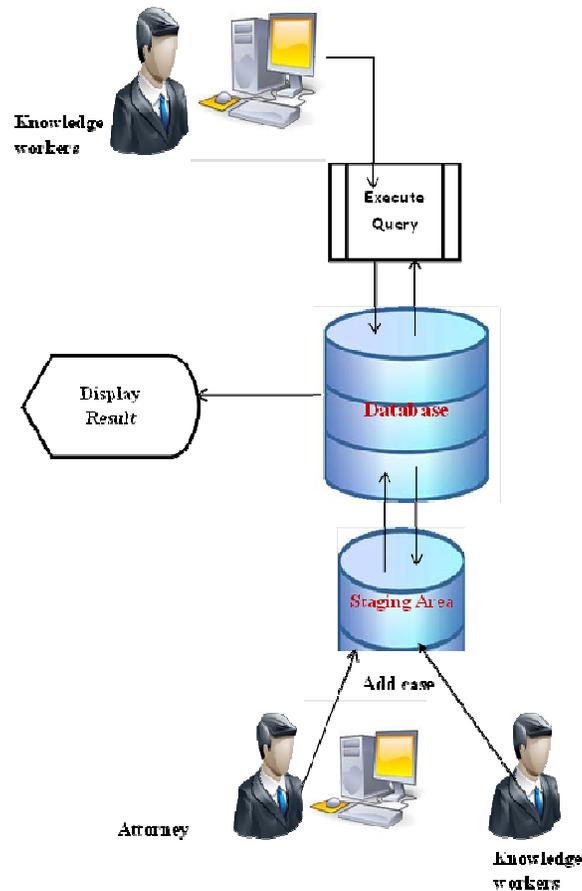


Fig. 2: Architecture of the knowledge management system in law

### 3.2 Knowledge Exploitation Facilitated by K-Clustering Technique

To actually generate knowledge from the information in the organization requires the application of various techniques. The data mining technique employed in this project work is the k-means clustering. This algorithm is easy to implement requiring a k-tree as the only major data structure. K-clustering minimizes the mean squared distance from each data point to its nearest center i.e. it applies internal knowledge in generating the result of any search.

The pseudo code for the k-means clustering algorithm to generate a relevant information has the following process.

*Accept the number of clusters to group data into and the dataset to cluster as input values*

*Initialize the first K clusters*

*Take first k instances or*

*Take Random sampling of k elements*

*Calculate the arithmetic means of each cluster formed in the dataset.*

*K-means assigns each record in the dataset to only one of the initial clusters*

*Each record is assigned to the nearest cluster using a measure of distance (e.g. Euclidean distance).*

*K-means re-assigns each record in the dataset to the most similar cluster and re-calculates the arithmetic mean of all the clusters in the dataset.*

#### 4. RESEARCH FINDINGS AND RESULTS

The ease of searching the firm’s accumulated experience pays dividends not just in handling cases more efficiently, it also helps the firm more effectively leverage its experience in order to win new business and grow business from existing clients. When a prospective client approaches the firm about a new case, attorneys can use KMSL to quickly identify similar cases the firm has previously handled, often in the same jurisdiction. They can then provide these as examples of how they successfully handled similar previous cases. Clients are increasingly looking for efficiency and value. KMSL can save significant amounts of time in managing a case. By not “re-inventing the wheel” every time a new case is opened, attorneys and staff can achieve significantly greater productivity.

It has been discovered from research and findings that, Legal research, by its very nature, is a form of knowledge management in which lawyers seek the written work of judges, law professors and other lawyers to help uncover legal information and to make predictions about the direction of changes in the law. All lawyers have developed, from the very beginnings of their careers, a sophisticated set of competencies and habits that help them to find the law, locate important facts and apply the law to the facts in creative and appropriate ways to advance the cause of their clients. There is a need for a knowledge management system that will enable knowledge sharing and reuse within a law firm so that there won’t be reinvesting new resources into a case that similar ones have been handled in the past, instead the knowledge repository will be consulted and relevant resources would be retrieved to save time, human effort and resources.

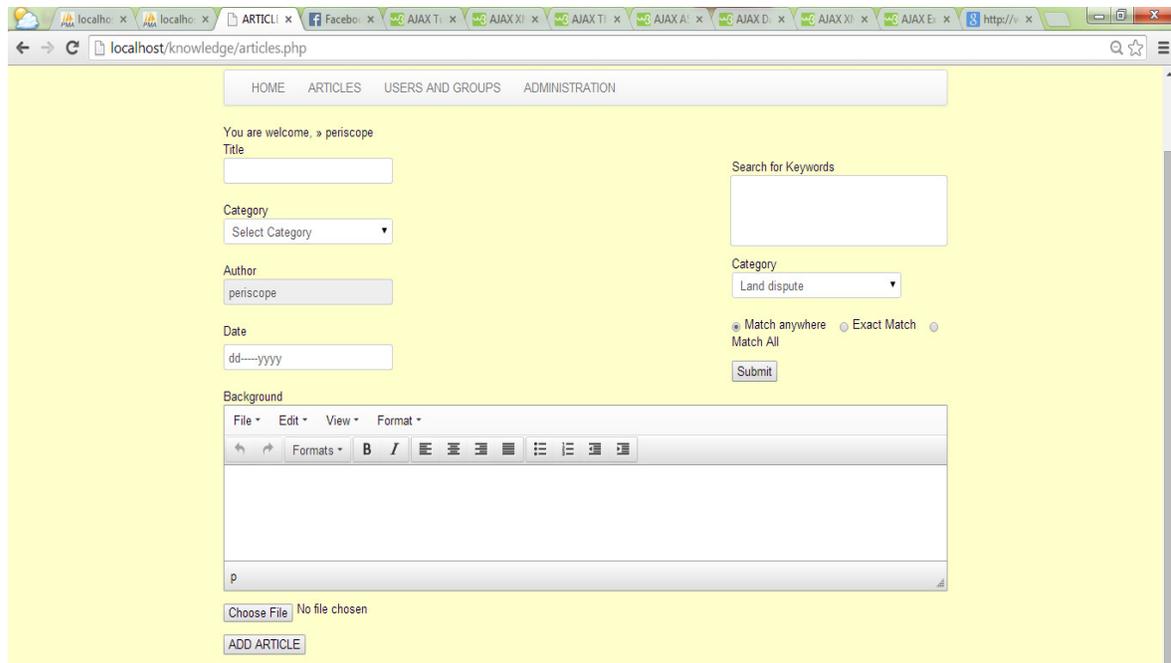


Fig. 3: Knowledge Acquisition and Organization into Clusters

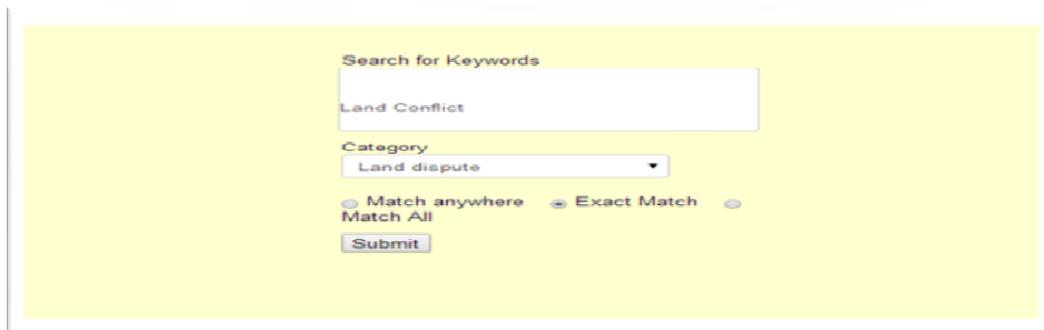


Fig. 4: Knowledge Exploration

**SEARCH RESULT**

Serial No.	Title	Category	Author	Date	Background	Files
1	Land dispute	Private Law	Periscope	2014-04-03	Land dispute between A and B	Related works.docx
1	Land use	Land Law	Izzy	2014-04-01	it is a law case between two me	land use act.docx
3	Land use	Land Law	Izzy	2014-04-01	it is a law case between two me	land use act.docx
03	Land use	Land Law	Izzy	2014-04-01	it is a law case between two me	land use act.docx
13	Land use	Land Law	Izzy	2014-04-01	it is a law case between two me	land use act.docx
14	Land use	Land Law	Izzy	2014-04-01	it is a law case between two me	land use act.docx

**Fig. 5: Clustered Knowledge for Reuse**

From the figures above, figure 3 shows the interface for capturing legal cases knowledge acquisition, where the various fields will be filled and the data will be uploaded to the knowledge/database by the knowledge worker(s). It is in the database that the system will assign a unique ID to every uploaded case document/article. Figure 4 is the interface for retrieving information from the knowledge repository for reuse. Once the user enters a keyword, the system will fetch those information that are relevant to the search and figure 5 is the result of the exploration with respect to the required classification. KMSL enables legal practitioners to easily access and reuse stored and categorized knowledge for faster and effective handling of related new cases.

**5. CONCLUSION**

Knowledge Management System in Law is a strong weapon for enhancing and improving a law firm productivity. If any firm is to remain relevant and productive in the field, it must be able to produce a maximum output with little resources in a short period of time and that is what this paper has addressed. Also, the knowledge value of an organization must be explicit and not tacit for the use of any member of the organization. By the reason of this fact, knowledge management system in law will capture the employees' knowledge and have it saved in a repository where it can be referenced for future use.

## REFERENCE

1. Awad, H., Elias M., Ghaziri, M., (2008) “Knowledge Management”, (Pearson Education: Delhi)
2. Alavi, M. and Leidner, D.E. (2001). Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly*, 25 (1), 107-136.
3. Davenport T. H. and Prusak L., (1998), *Working Knowledge: How Organizations Manage What They Know*, (Boston, MA: Harvard Business School Press), pp. 23-26.
4. Edwards, D.L. and Mahling, D.E. (1997). *Toward Knowledge Management Systems in the Legal Domain*. Proceedings of the International ACM SIGGROUP Conference on Supporting Group Work Group '97, USA: The Association of Computing Machinery ACM, 158-166.
5. Jennifer R. (2000) Is higher education ready for knowledge management, *International Journal of Educational Management*, Vol.4, No. 7, pp. 325-333,
6. Gomes, J. (2001) *Knowledge infrastructures in new product development*, (Boston: DAI), 5.
7. Nonaka I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5 (1), 14-37.
8. Oladejo B., David A. and Osofisan A. (2009). “Representation of knowledge resource in the context of Economic Intelligence systems”, In Proceedings of IX Congress ISKO Spanish Chapter, Valencia, Spain. 2009, pp. 75-90. Available: <http://hal.inria.fr/inria-00431200/>
9. Oladejo B., Odumuyiwa V. and David A. (2010). “Dynamic Capitalization and Visualization Strategy in Collaborative Knowledge Management System for EI Process. World Academy of Science, Engineering and Technology 66.
10. Wilson, T. (2002). The nonsense of knowledge management, *Information Research* 2 <<http://InformationR.net/ir/8-1/paper144.html>>. accessed 10/3/2014.
11. Vat, K. (2003). *Toward an Actionable Framework of Knowledge Synthesis in the Pursuit of Learning Organization*, *Information Science*.
12. Bontis, N. (2000). *Assessing Knowledge Assets* (Kingston: Queen’s University).
13. Hunter, L, Beaumont, P, and Lee, M. (2000). ‘Knowledge Management practice in Scottish Law Firms,’ *Human Resource Management Journal* 12.2.
14. Southon, G, Todd, R, and Seneque, M (2002) ‘Knowledge Management in three organizations: An exploratory study,’ *Journal of the American Society for Information Science and Technology* 53.12.
15. Gold, A (2001) *Towards a Theory of Organizational Knowledge Management Capabilities* (North Carolina: University of North Carolina).
16. Laszlo, K, and Laszlo, A (2002) ‘Evolving knowledge for development,’ *Journal of Knowledge Management* ,Vol. 6.