Knowledge Repository and Knowledge Mapping

K.L.Sumathy
Asst.Prof Shri Krishnaswamy College for Women
NO.AC-48 Opp to Ayyappan Temple, 6th Main Road, Anna Nagar, Chennai-40

C.M.Thangamani
Asst.Prof Shri Krishnaswamy College for Women
NO.AC-48 Opp to Ayyappan Temple, 6th Main Road, Anna Nagar, Chennai-40

A.Cathreen Graciamary
Asst.Prof A.M.Jain Collge
Meenambakkam, Chennai.

ABSTRACT
In this paper we use the concept of knowledge repositories and its uses in various applications, we have explored how to construct a strong knowledge repository, what are the fields to be considered while constructing a knowledge repository and how these knowledge repositories influence knowledgeable action. We have also discussed about knowledge mapping, constituents of knowledge mapping. Different stages of Mapping from the Knowledge Repository and the different types of mapping. We subsequently explored the factors that is to be considered while constructing the knowledge repository. we have suggested a model for DSS using knowledge repository. finally we have given a simple area where knowledge mapping can be applied with knowledge repository.

General Terms

knowledge mapping, knowledge repository, decision support systems.

Keywords

knowledge mapping, knowledge repository, decision support systems.

1. INTRODUCTION
Organized repository of knowledge consisting of concepts, data, objectives, requirements, rules, and specifications. Knowledge repositories depends on 1.artificial intelligence 2. expert system based retrieval, and 3. Human based retrieval. In AI , it takes the form of data, design constructs, couplings, and linkages incorporated in a software. In Expert system it takes the form of physical documents and textual information.
An Knowledge Repository is a system that systematically captures and continuously analyses the knowledge assets of an organization. It is a collaborative system designed for a 2 way communication where people can query and browse both structured and unstructured information in order to retrieve and preserve organizational knowledge assets and facilitate collaborative working. . A Knowledge repository can be basically constructed in 2 ways 1. structured 2. unstructured. A structured repository can be constructed by any RDBMS packages stored in the form of tables. In unstructured knowledge repository, the main focus tends to be on storing unstructured, explicit, forms of knowledge such as unwritten local rules and procedures. The aim is to be able to retrieve data in a context sensitive way using the simple keyword-based retrieval. Such systems might use techniques such as Social Network Analysis or collaborative filtering in order to provide the required "context" for the data. By providing context sensitive retrieval of data these systems claim to move beyond simple information retrieval and to act like a true Knowledge Management System (KMS). The term KMS is also justified by the capacity of such systems to use inference mechanisms to (semi-automatically) generate new information by filling sections of a document, proposing hints or showing reasons "why" and "why not" a certain outcome should happen.
Some potential application areas for such systems are:

(a) to identify relevant experts
(b) to identify potential areas for collaboration
(c) to identify Networks of Practice
(d) to uncover hidden knowledge.

Knowledge and knowledge maps
Knowledge is the key term in knowledge management. Knowledge can be defined as a form of solution with context, experience, interpretation, and reflection. It has a rich value form of information that is ready to be applied to decisions and actions (Davenport, Prusak 1998). The knowledge is generally defined as a dynamic human process of justifying personal beliefs as a part of the aspiration for truth.
There are numerous definitions of the terms ‘knowledge map’ and ‘knowledge mapping’. Stanford (2000, 2001) defines it as follows: “Knowledge mapping is any visualization of knowledge beyond the textual one for the purpose of eliciting, codifying, sharing, using and expanding knowledge”. graphical symbols play a important vital role in each knowledge map; their positions and relationships are mostly expressed with the use of arcs or edges. The knowledge map must show a progression of ideas with relationships, beyond their being just spatial. Knowledge maps include conceptual relationships such as the chronological, hierarchical, associative, causal, logical and evaluative ones (Stanford 2001). The solving process should contain at least four steps of the Simon’s problem decomposition, i.e. intelligence activity, design activity, choice activity, and review activity (Simon 1960). gordon (2002) also shows that knowledge maps may be referred to as the maps of the way of acquiring knowledge. The knowledge maps are important as building knowledge tools as well as thinking tools (rogers 2000).
Baron (2004) states that each knowledge map simplifies the visualization of the reality and it has to be segregated based on the attribute it exists, of the evaluation or solution of the (successfully) solved problem. A knowledge map is a special type of a reality model, for instance a reality image. According to us a Knowledge map is “A knowledge map displays, sources, flows, constraints and sinks of knowledge within an organization. It is a navigation aid to both explicit (codified) information and tacit knowledge, showing the vital information and the relationships between knowledge stores and the dynamics” .
(Šubrt, Brožová 2007) suggested the following classification of knowledge maps

– Descriptive maps,
  – Weak descriptive maps ,
  – Strong descriptive maps
– normative maps ,
– Prescriptive maps

Descriptive maps (weak and strong) describe and simulate the real situation. Weak descriptive maps describe the real situations using different kinds of symbols and arcs connecting them. Graph theory models are typical tools for building this kind of maps. Passing through this map helps the user to understand the problem and to increase his/her level of knowledge of "how" to solve a problem. The mutual positions of objects (elements) are unimportant, only the symbols themselves and the quality of their relationships are relevant for the map reading and problem solving. not only objects, symbols or texts are important for strong descriptive knowledge maps. To be a knowledge map of this type, the item must use spatial relationships to elicit, share and codify knowledge (Stanford 2001). Such a knowledge map must show a progression of ideas with relationships beyond their being just spatial. geographical maps are typical representatives of strong descriptive maps. Normative maps are related to a typical standard or norm, to optimal solution, or to the best decision. in this case, the aim of the knowledge map is to introduce the approach of how to reach the target (solution), or how to reach the comparative norm. Strategy maps cover the major part of this knowledge map type. Strategy maps are a way of providing a macro view of an organization strategy, and provide it with a language in which they can describe their strategy, prior to constructing the metrics to evaluate the performance against their strategy (Stanford 2001).Prescriptive maps (Baron 2004) follow the normative and descriptive maps. They help to find ways to the solution selected according to the normative map. The prescriptive maps are mainly oriented on
the process, not on the state or decision, so they have to consist not only of elements and branches but also of milestones.

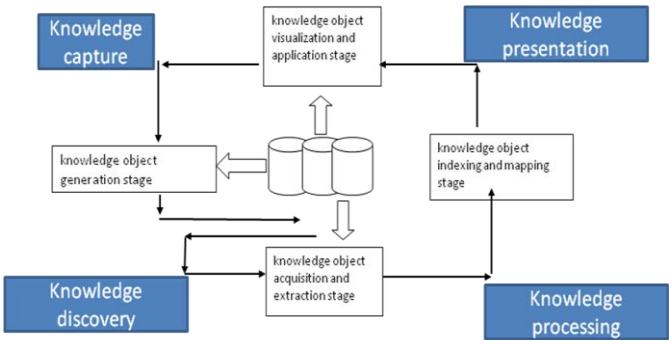
Usage of Knowledge map for knowledge seekers .
Using knowledge map in organized knowledge involves large bodies of interconnected facts. A Knowledge Map is useful for organizing related information in a structured manner that facilitates comprehension by showing the connections between the information pieces. Knowledge Maps can be used with other tactics such as Knowledge Frames, Outlines, and Analogies. When used with a Knowledge Frame, a Knowledge Map can show the structured layout of the information, while the Knowledge Frame provides the details. knowledge seekers look for Location, ownership, validity, timeliness, domain, sensitivity, access rights, storage medium, use statistics, medium and channels used, Documents, files, systems, policies, directories, competencies, relationships, authorities, boundary objects, knowledge artifacts, stories, heuristics, patterns, events, practices, activities and flows, explicit and tacit knowledge which is closely linked to strategies, core competencies and market intelligence.

Various System approach and their knowledge maps

Knowledge map	System approach	Goal
Mind map Descriptive map	Problem definition	Understanding the problem
Concept map Descriptive map	System definition	Quantification concepts and their relations
Descriptive map Normative map	Mathematical model	The best solution searching, model experiments, model solution
Prescriptive map	Problem implementation	realization of chosen solution

Different stages of Mapping from the Knowledge Repository
Knowledge object acquisition and extraction stage
Knowledge object indexing and mapping stage
Knowledge object generation stage
Knowledge object visualization and application stage

model creation steps	Stages of creating knowledge objects in linking to university site	Knowledge map creation steps
Variables	Knowledge object acquisition and extraction stage	Topics, ideas or concepts
constraints	Knowledge object indexing and mapping stage	Branches
Transformation	Knowledge object generation stage	Branches
Evaluation	Knowledge object visualization and application stage	Evaluation



Knowledge model overview
A knowledge model has 3 parts each capturing a related group of knowledge structures , each part is called as a knowledge category.
Domain knowledge
Inference knowledge
Task knowledge
Inference knowledge
The inference knowledge contains the description of the basic inference steps. Inferences are the basic building blocks of the reasoning. Reasoning represents the lowest level of the functional decomposition.
Task knowledge describes what goal an application pursues and how these goals can be realized thru a decomposition into subtask and inferences.
Domain knowledge specifies domain specific knowledge and information type that depends on the application. Domain knowledge contains definitions and relationships. A domain knowledge can be compared to data model or object model.
Domain Knowledge
Domain knowledge describes the main static information and knowledge objects in an application domain. The 2 main key ingredients are

1.Domain schemas 2.Knowledge base

Domain schema:
Domain schema is a schematic description of the domain specific knowledge and information thru a no of type

definitions. This schema describes the static information and knowledge structure of the application domain.

Knowledge categories	
Task Knowledge	Task goals
	Task decomposition
	Task control
Inference knowledge	Basic inference
	Roles
Domain knowledge	Domain types
	Rules
	Facts

Domain schema generalization

1. Domain specific schema
2. Generic domain specific schema
3. Method specific domain schema
4. Task specific domain schema

How to build a knowledge repository

Identifying and generating patterns is the fundamental task involved in building a knowledge repository. some of the basic principles involved in the construction of knowledge repository.

1. Pattern should describe concrete solutions
2. Patterns in clusters are easier to understand
3. Patterns describing alternative solutions should have proper guidelines for choosing an appropriate solutions.
4. Links among patterns and to other knowledge sources should be more explicit.
5. Structure of patterns should not be complex
6. Patterns that use words and terms that has different meaning, creates unnecessary confusion which should be avoided
7. Patterns should specify explicit purpose and usefulness of knowledge repository

Patterns in knowledge repositories fall into 2 main components.

1. The knowledge component
2. The usage component

The knowledge component answers question such as,

- What problem does the pattern solve
- How this problem can be solved

The usage component answers questions such as

- When can the patterns can be reused
- How can the patterns be reused
- What are the consequences of reusing pattern
- Where has the pattern been reused
- What are the consequences of reusing the pattern

Knowledge repository can be constructed by using the following fields

Name of the field	Description
Name	Pattern should have a name that reflects on the solution
Problem	Describes the issues that the pattern addresses with the given context
Context	Describes the preconditions under which the problem and the proposed solution seems to occur
Forces	Describes the relevant forces and constraints and how they interact or conflict with one another
Solution	Describes how to solve the problem and to achieve the desired results
Rationale	Explains why the solution presented in pattern is appropriate in relation to the forces, context and problem
Consequences	Describes what the context should be after applying the presented solution, in terms of positive or negative effects
Related information	Relationship to other organizational patterns, related documents, web sources or information systems, these can be located inside or outside
Known applications	Describe where the pattern has been applied
Authors	Creators of patterns and their contact information
Alias patterns	Present aliases of patterns
Examples	References to specific application cases of the solution presented in the pattern. this field can include references to specific models, organizational designs, as well as success stories lessons learned
Usage guidelines	To give an idea how the pattern can be tailored to create specific business solution
Type	Describes the type of pattern(goal, business process, concept, this field is used for structuring the knowledge repository and for searching process
Domain	Describes the business or activity domain for which the pattern is applicable to. e.g. customer servicing, performance indicators, restructuring , organizational policies etc
Keywords	A few keywords are defined for each pattern in order to facilitate search and retrieval

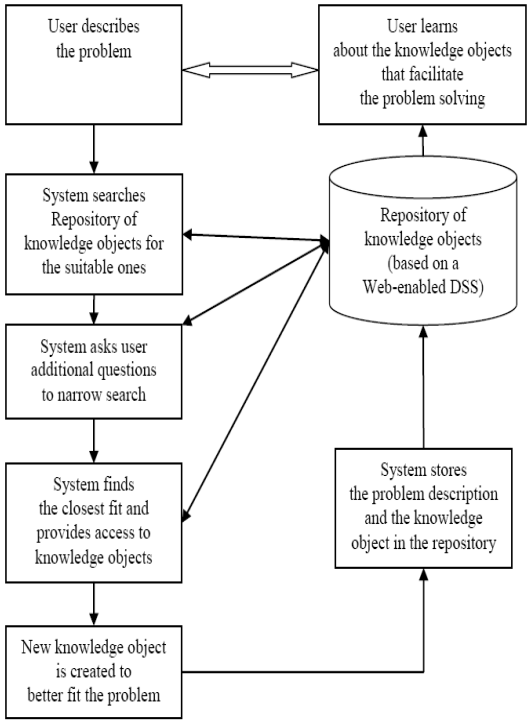
Major issues to be considered when designing a Knowledge repository

The objective for the design of knowledge repositories are

1. The repository should have a scalable and expandable architecture that works well under the current experimental scale as well as for the future multiple domain, multiple knowledge structures.
2. The repository should use XML based schema language to create a neutral knowledge platform for integrating and displaying multiple knowledge structures.
3. The repository should promote interoperability. It should have the capability to import other patterns
4. The repository should be user participatory and user

Problem solving using DSS and Knowledge objects

problem based learning is one of the most important aspect of integration of DSS and knowledge repository



Problem solving using DSS and Knowledge objects derived from [5]

CONCLUSION

Application of Knowledge repository and Knowledge Mapping-one of the main application is to determine the ways to build the knowledge map for e.g. a knowledge map and a repository for universities using a specific information format which contains object, resource and function. The developed knowledge map helps to make links between different concepts and learning pathways which improves the efficiency in learning and collaboration. This paper primarily discusses the design and development strategy for building Knowledge Map and Knowledge repository. We would like to build Knowledge Map for a university to show how the university can utilize the knowledge map by using information searching and processing strategy. This paper will also evaluate the effectiveness of the Knowledge Map in terms of communication link between the knowledge providers and seekers in the university through an evaluation method.

REFERENCES

[1] V. Supyuenyong, N. Islam: Knowledge Management technology Management for the Global Future Architecture: Building Blocks and Their Relationships, Vol. 3, pp. 1210-1219 (2006).

[2] K.C. Laudon, J.P. Laudon: Management Information Systems. Managing the Digital Farm, Prentice Hall, pp. 428-508 (2006).

[3] R. McLeod, G. Schell: Management Information Systems, 10th Edition, Prentice Hall, pp. 250-274 (2006).

[4] P.J. Deitel, H.M. Deitel: Internet and World Wide Web. How to Program, 4th Edition, Prentice Hall, pp. 50-117 (2008).

[5] T. Berners-Lee, et al: A Framework for Web Science, Foundations and Trends in Web Science, Vol. 1, No 1, pp. 1-130 (2006).

[6] Y. Boreisha, O. Myronovych: Web-Based Decision Support Systems in Knowledge Management and Education, Proceedings of the 2007 International Conference on Information and Knowledge Engineering, IKE'07, June 25-28, Las Vegas, USA, pp. 11-17 (2007).

[7] Y. Boreisha, O. Myronovych: Web Services-Based Virtual Data Warehouse as an Integration and ETL Tool, Proceedings of the 2005 International Symposium on Web Services and Applications, ISWS'05, June 27-30, Las Vegas, USA, pp. 52-58 (2005).

[8] Y. Boreisha, O. Myronovych: Data-Driven Web Sites, WSEAS Transactions on Computers, Vol. 2, No 1, pp. 79-83 (2003).

[9] Y. Boreisha: Database Integration Over the Web, Proceedings of the International Conference on Internet Computing, IC'02, June 24-27, Las Vegas, USA, pp. 1088-1093 (2002).

[10] Y. Boreisha: Internet-Based Data Warehousing, Proceedings of SPIE Internet-Based Enterprise Integration and Management, Vol. 4566, pp. 102-108 (2001).

[11] Y. Boreisha, O. Myronovych: Knowledge Navigation and Evolutionary Prototyping in E-Learning Systems, Proceedings of the E-Learn 2005 World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, October 24-28, Vancouver, Canada, pp. 552-559 (2005).

[12] P.H. Winston: Artificial Intelligence, Addison-Wesley, pp. 15-228 (1992). [13] S. French, M. Turoff: Decision Support Systems, Communications of the ACM, Vol. 50, No 3, pp. 39-40 (2007).

[14] Chien-Chih Yu: A Web-Based Consumer-Oriented Intelligent Decision Support System for Personalized E-services, ACM International Conference Proceeding Series, vol.60,pp.429-437(2004).