

CUSTOMIZABLE PORTALS FOR KNOWLEDGE SHARING

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Abstract:

The paper defines knowledge portals and how they can be customized to support different environments. It defines a portal as composed of generic knowledge services and application services. Application services include ways to maintain a body of knowledge and ways to integrate and evolve this body of knowledge into business processes. The generic knowledge services include ways to use this body of knowledge to create new knowledge. Customization combines these services in a space and structures the space to support community practices. A prototype system that illustrates these services in learning is then described.

Key Words: portals, web services, knowledge management, customization

1 Introduction

Knowledge management is now considered essential in enterprise processes. It defines the processes needed to develop improved products and services [1], [2] to gain competitive advantage. Knowledge management support can be provided on a functional project basis or as an infrastructure that can be used throughout the organization. Infrastructure support is particularly useful where the products and services are themselves highly knowledge intensive. Portals can then present customized interfaces to support individual activities. Such services can also depend on the knowledge management strategy. Knowledge management can differ between enterprises and will depend on the type of business process as well as on organizational culture. Perhaps the most relevant difference here is between organizations that use codified or personalized strategies [3] in knowledge management. The paper proposes that the infrastructure approach is optimal to recover investment over a number of applications. It then proposes customizable portals as a way of providing such services to individuals.

The paper suggests two kinds of services, generic knowledge services and application services. The generic services are common to any knowledge sharing process. Application services are specific to some application or problem domain. Customizable portals can be used to package such services into a form specific to a given

business activity. This paper defines the generic services using Nonaka's knowledge creation process [4] as the underlying theory. These activities include socialization, developing an understanding of concepts, articulation of ideas, followed by artifact construction and evaluation. Information technology must then provide the places and media to carry out knowledge management activities and to customize them to business process needs.

2 Knowledge Portals

Knowledge processes involve communities of practice creating and sharing knowledge using knowledge portals. Such communities can contribute to the knowledge base of the portal and add to it further through expert interpretation of such contents.

2.1 Communities of Practice

Communities of practice depend on the kind of application. The community of practice can include a variety of roles. The simplest is where there are simply teachers and learners. These can be expanded to include tutors or assistants that work together with the teacher. In more elaborate environments, there can be owners, experts, novices or apprentices as well as a variety of users. They can also be people responsible for specific business process steps. These become the portal roles, each with their responsibilities and provided with appropriate services. Thus the responsibility of the owners may be to create and update the body of knowledge. They can also give permissions to users to access the portals. They can also consult with experts on adding to the body of knowledge. Communities of practice can also include a variety of experts such as subject specialists to discover, classify and distribute knowledge.

2.2 Portal Structures

Portals can be seen as a way of providing services to the community for knowledge creation. Figure 1 illustrates the portal structure. It allows members of the community of practice to access portal services and add to the body of knowledge. The application services include the knowledge map, which defines the major concepts in the system. It also includes the knowledge repository, which

can be accessed by the people, who use the portal. The knowledge repository may take many forms such as stories, analysis results, forms useful to users and so on. The generic services include support for collaboration, knowledge discovery through searches of the knowledge map and the repository, as well as services specific to knowledge creation. These latter services may include management of interactions such as discussions, analysis of information and developing common dictionaries.

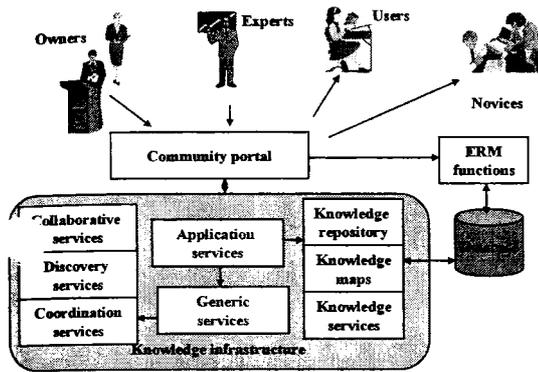


Figure 1 – Portal Structure

3 Generic Services

Much literature on portals is devoted to using search engines to retrieve information needed for some specific task. Our proposal goes beyond this and suggests that portals should support business activities. Thus the paper makes a distinction between generic and application activities, which can be combined to support business processes. Generic activities include information retrieval, discussion systems and document management. Application activities depend on the kind of application allowing the system to be used with a business purpose in mind. For example, in learning this may be self-assessment, group case analysis, or joint review of a document [5]. In corporate portals they can be sales protocols, best practice development or competitive analysis (<http://www.plumtree.com>). Such application activities are composed of the generic activities, which are customized to the application need. The portals must thus provide services that go beyond elementary actions.

The generic services proposed here can be configured into either strategy or indeed provide a mixed strategy. The generic services include:

Collaborative services including ways for community members to socialize and exchange messages and can include management services to organize communities. Again depending on the strategy such collaboration can be synchronous or asynchronous or a combination of the two. It should provide ways to carry out any of Nonaka's processes.

Management services including registration and subscription services, setting up community roles and inviting people into the community, and assignment of services to these people.

Discovery services including search engines, catalog systems. They include ways for learners to not only find relevant information but also to learn how to use this information in their environment and how to discover knowledge from related information.

Knowledge services including ways to capture and organize the body of knowledge and maintain knowledge maps and repositories. Knowledge services include the capture of experiences and interpreting them for inclusion in the body of knowledge.

Knowledge services must:

- support a body of domain knowledge and allow this knowledge to be integrated into the business process,
- allow the knowledge to evolve using inputs from portal users to create new knowledge and pass it on to others,
- allow users to exchange views and interpretations through portals, thus creating a knowledge sharing environment,
- present services in terms familiar to users,
- support governance structures [6] to facilitate and use knowledge effectively to achieve organizational goals.

3.1 Identifying knowledge services

Provision of a systematic way for knowledge management requires a clearer definition of the knowledge services required for knowledge management. Our approach is to develop a framework for generic services using the work of Nonaka [4] as grounded theory. Nonaka sees knowledge sharing and creation following the process shown in Figure 2. These identify the kind of activities that are fundamental to knowledge management.

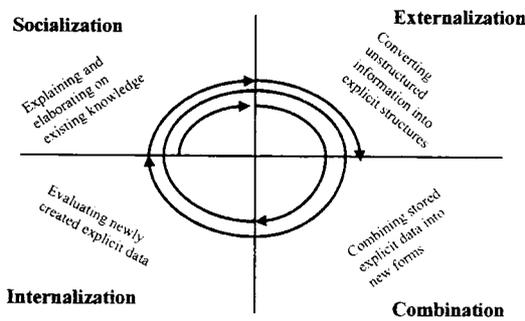


Figure 2 – Nonaka's knowledge creation process

Nonaka's process includes four phases. These are:

- socialization to bring people together and share their experiences and insights in an area. For example, this may be a description of subject material in lectures and in informal ways to exchange experiences, develop trust, share values,
- externalization, is where some of this captured expertise is framed and interpreted into a form that can lead to further actions. For example, tacit knowledge about subject material is externalized through examples and experiments. This requires articulation on new ideas using agreed upon terminologies to externalize them to familiar contexts, usually assignments. The emphasis is on dialoguing, sharing of mental models, articulation of concepts, development of common terms and requires ways to visualize interactions, construct artifacts,
- Combination is where ideas generated in externalization are compared to earlier outcomes, as for example previous assignment solutions, to relate newly created artefacts to previous stored ones,
- The ideas are then combined where necessary with existing information and then applied in practice during internalization in completing assignments followed by reflection on the outcomes after assessment.

Our goal is for portals to provide generic services that support Nonaka's knowledge creation phases and provide ways to customise them to particular application needs.

3.2 Describing generic services in detail

Figure 3 shows a more detailed structure of generic services that relate to knowledge. It includes a knowledge map that is the prime point of access to the body of knowledge. It includes ways for owners to refine the body of knowledge primarily through the analysis of feedback. Feedback can be either codified as for example through discussion databases or personalized through face to face interaction. During such feedback messages are received about experiences in self-learning. These can be analyzed and sorted and used to refine the body of knowledge. Such refinements can include adding experiences, refining

processes or adding to explanations and suggestions made to users. At the same time feedback on processes can include experiences and suggestions at each process steps and ways of improving activities at each step. These can be either ways to solve some problem, or steps in the business process.

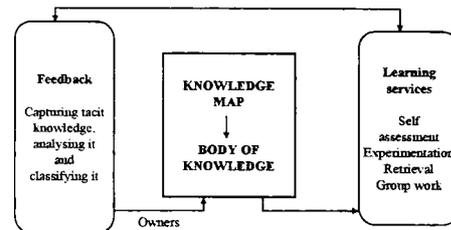


Figure 3 – Detailed Structure

4 Application Services

Some writers classify generic knowledge management services as either personalized or codified [3]. Within a personalized culture the emphasis is on greater sharing of tacit knowledge to provide new perspectives. Within a codified culture the emphasis is on codified knowledge with the goal of reusing it with amended to provide solutions to new problems. Portal services often provide a balance between codified and personalized approaches. Codified approaches can be based on what are known as "knowledge centers" that include a body of knowledge that evolves as experience grows. These are made available to communities of practice that use this body of knowledge and add to it. In addition services can be provided to support personal exchanges within the context of the body of knowledge.

4.1 The knowledge map

One common set of generic services are those used to develop the body of knowledge. These allow users to create an ontology of related terms and add to the ontology by elaborating it using insights gained from experience and outcomes in business actions. As an example, we have, developed an ontology for teaching about electronic commerce. This is illustrated in Figure 4. It divides knowledge into seven categories:

- Business practices used in electronic commerce including customer relationship management, supply chains and so on,
- Analysis to describe ways to analyze new systems and define requirements,
- Design approaches to design new systems,
- Commercial applications, business services and
- Technologies used in electronic commerce,
- Business services and how to select technologies to provide them,

some self-learning services. With concepts that refer to process steps, they can add to the concept by recording their experiences and interpretation of step guidelines.

5.2 Application services for teaching

An example of application services for learning include self-assessment, or helping in group work. Users can now gain access to explanations of the concepts. This in effect provides feedback to owners of what concepts are best explained.

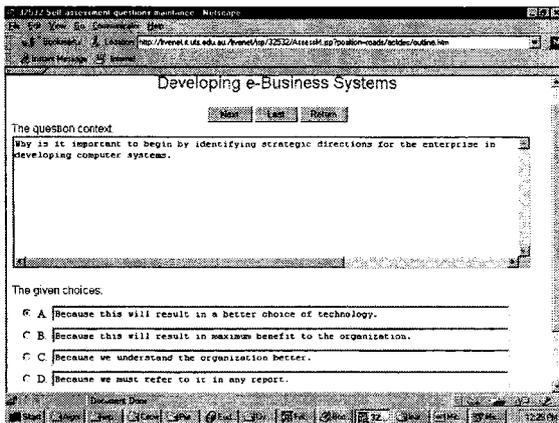


Figure 7 – A self-examination frame

It is of course possible at any time to post a question for further explanation by experts within the community. These can be followed up with questions and discussions for further interpretation.

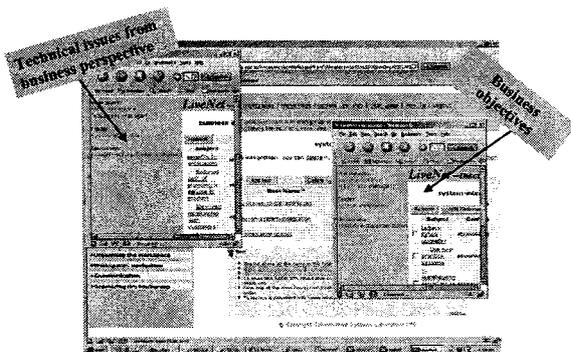


Figure 8 – Interpretation frames

Interpretation can be supported by frames that provide different perspectives of the same information [8]. These perspectives may themselves evolve from interactions between community members. Figure 8 shows one implementation where two separate discussion forums are used to develop perspectives originating from different foundations.

6 Summary

The paper described knowledge portals as places where learning takes place through the gradual construction of a body of knowledge. It described the structure of such portals and illustrated this with an example.

7 References

- [1] Riggins, F.J. and Rhee, H-K. (1998): "Developing the Learning Network Using Extranets" *Proceedings of the Thirty-First Hawaiian Conference on Systems Sciences*, January 1998.
- [2] Grant, R.M. (1996): "Prospering in Dynamically-competitive Environments: Organizational Capability as Knowledge Integration" *Organization Science*, Vol. 7, No. 4, July 1996, pp. 375-387.
- [3] Hansen, M.T., Nohria, N. and Tierney, T. (1999): "Whats your Strategy for Managing Knowledge" *Harvard Business Review*, March-April, 1999, pp. 106-116.
- [4] Nonaka, I. (1994): "A Dynamic Theory of Organizational Knowledge Creation" *Organization Science*, Vol. 5, No. 1, February 1994, pp. 14-37.
- [5] Hiltz, R. and Turoff, M. (2002): "What makes learning networks effective?" *Communications of the ACM*, Vol. 45, No. 4, April, 2002, pp. 56-59.
- [6] Jones, C.T., Hesterly, W.S., and S.P. Borgatti (1997): "A General Theory of Network Governance: Exchange Conditions and Social Mechanisms." *Academy of Management Review*, Vol. 22, No. 4, October, 1997, pp. 911-945.
- [7] LiveNet
<http://linus.socs.uts.edu.au/~igorh/workspace/explore/1ivenet.htm>
- [8] Boland, R.J. and Tenkasi, R.V. (1995): "Perspective Making and Perspective Taking in Communities of Knowing" *Organizational Science*, Vol. 6, No. 4, July-August, 1995, pp. 350-372.

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