An action research study on the design and development of core IT artifacts for knowledge management systems

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AN ACTION RESEARCH STUDY ON THE DESIGN AND DEVELOPMENT OF CORE IT ARTIFACTS FOR KNOWLEDGE MANAGEMENT SYSTEMS

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Abstract

Researchers report mixed findings on the successful application of information technologies (IT) for Knowledge Management (KM). Action Research, with its emphasis on praxis and on the importance ‘practical theory,’ is an ideal vehicle for deepening the IS field’s understanding of developing IT-enabled Knowledge Management Systems. It can also help identify IT artifacts that are core, as opposed to non-core, KM Tools. This paper reports on the outcomes of two related action research studies involving the University R&D team and practitioners from the United Nations Population Fund (UNFPA) and a Government Department. The first of these studies focused on the design and development, using ‘practical theory,’ of a desktop-based IT artifact for knowledge sharing, while the second elaborated, extended, and applied the lessons learned from the first, to develop an enterprise-wide IT artifact for the Government Department’s Knowledge Management System (KMS). These studies contribute to both research and practice by: (1) offering a conceptual schema based on practical theory to inform the design and development of a core IT artifact for KMS; (2) presenting a list of features for the core IT artifact; and (3) differentiating between core and non-core IT artifacts for knowledge sharing in organizations.

Keywords: Knowledge Management Systems, Action Research, IT Artifact
1 INTRODUCTION

Drucker (1999) argues that information technologies (IT) have not provided adequate support for capturing, storing, transferring or applying firms’ knowledge resources. Practitioners therefore approach the application of IT for knowledge management (KM) with some caution, unsure as they are of its potential for knowledge sharing (Kransdorff 1998, McDermott 1999). This concern seems warranted, as research indicates that many KMS initiatives are unsuccessful (see Schultz & Boland 2000, Huber 2001), with Storey and Barnett (2000) reporting failure rates of over 80%. Take, for example, the recent experience of the World Bank, which invested $280 million on IT-based KM solutions over 6 years in both regional and global knowledge sharing initiatives. It is significant that World Bank failed to achieve its strategic objective of embedding knowledge sharing into its work processes (World Bank 2003). The reasons for such failures have been summarized by Malhotra (2002), who indicates that the following dimensions enable and/or constrain KMS deployment in organizations: business and technology strategy, organization control, information sharing culture, knowledge representation, organization structure, management command and control, and economic returns. Hence, given the current state of practice, Sambamurthy and Subramani (2005, p. 3) conclude that “there is a clear sense that there are currently many unresolved issues, challenges and opportunities for information systems researchers in the domain of knowledge management.”

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*Table 1 Knowledge Management Processes and IT Artifacts (adapted Alavi and Leidner, 2001)*

A range of diverse IT artifacts are posited to support the creation, storage, retrieval, transfer, and application of knowledge in organizations. Table 1, which draws on Alavi and Leidner (2001), lists these IT artifacts and indicates their posited relevance to KMS. Additional technologies include, but are not limited to, email, collaboration and communication tools (including telecommunications and videoconferencing technologies), group decision support tools, social network analysis tools, and knowledge codification tools (cf. Davenport & Prusak 1998, Chua 2004). However, Sambamurthy and Subramani (2005, p. 2) point out that the “focus of the deployment of knowledge management systems has been on developing searchable document repositories to support the digital capture, storage, retrieval, and distribution of an organization’s explicitly documented knowledge.”

Practitioners at the United Nations Population Fund (UNFPA), who participated in the first action research study on which this paper is based, argue that while the various KM technologies referred to previously are important ingredients in a KMS, they do not help knowledge workers to systematically capture and share their experiential knowledge of key organizational processes and practices. The UNFPA’s Knowledge Sharing Branch (KSB) arrived at this conclusion after a comprehensive assessment of KMS-based IT artifacts from major vendors in order to select one to support the organization’s Knowledge Sharing Strategy. Brendan O’Brien, Chief of the KSB, stated that “we were disappointed to find that none of the commercially available [KM Tools] met our needs…so we decided to build one that did.” In contrast to the point made by Sambamurthy and Subramani (2005, p. 2, Table 1).
2), both O’Brien and his colleagues at the KSB were of the opinion that KM Tools such as “searchable document repositories” constituted non-core KM technologies—the IT artifacts listed above were regarded as important but supplemental to a core KM technology. Indeed it is interesting to note that an electronic bulletin board/discussion forum, email, and a knowledge directory of sorts were already in use in the organisation. Being highly intimate with the World Bank’s unsuccessful experience with deploying their IT-based KMS, O’Brien is adamant that one of the major “unresolved issues” and “challenges” in knowledge management is the design of core IT artifact for KMS.

The UNFPA’s experience in developing the core IT artifact for its KMS, and their desire to share this tool with other organizations, led to the first action research study discussed in this paper. This was the collaborative development of a desktop KM Tool called the Portable Knowledge Asset Development System (pKADS), which began in September 2003 and finished in April 2004. pKADS drew on the UNFPA’s ‘practical theory’ of KMS design to arrive at a conceptual architecture for a core KM Tool that would serve as a model for future IT-based KMS. This paper focuses on this architecture, and its role in the successful implementation of pKADS. It then elaborates and extends this discussion by drawing on a second action research study, which had as its objective the design and development of an enterprise-wide IT artifact for KM within a Government Department. Phase 1 of this project began in March 2004 and was completed in September 2004, while Phase 2 began in October 2004 and was completed in April 2005, the final phase (May-December 2005) involved the further customization and pilot roll-out in two departmental divisions. The following section sets the stage for the remainder of this paper by describing the context of the study and the research approach adopted.

2 A PARTICIPATIVE ACTION RESEARCH STUDY ON IT ARTIFACTS FOR KM

In action research projects, researchers collaborate with practitioners to solve practical problems while expanding scientific knowledge (Jönnsson 1991, Baskerville & Myers 2004). Citing Blum (1955), Baskerville and Myers (2004, p. 330) argue that action research is a two-stage process: “First, the diagnostic stage involves a collaborative analysis of the social situation by the researcher and the subjects of the research. Theories are formulated concerning the nature of the research domain. Second, the therapeutic stage involves collaborative change. In this stage, changes are introduced and the effects studied.” The two outcomes are the action taken to solve the problem and the generation of research findings that inform theory (McKay & Marshall, 2001). It is interesting to note that Baskerville (1999, p. 9) argues that action research is a “class of research approaches, rather than a single monolithic research method” (see also, Avison & Lau & Myers & Neilsen 1999)—this observation is supported by the range of action research approaches taken by researchers in the recent special issue in MIS Quarterly (see Baskerville & Myers 2004). Drawing on John Dewey’s pragmatism, Baskerville and Myers (2004) argue that action research is dominated by an underlying pragmatic orientation. The emphasis on praxis is especially evident in participatory action research, which extends traditional action research approaches (Baskerville 1999). In participatory action research the responsibility for theorizing lies with both practitioners and researchers; practitioners have the status of “co-researchers” as they “bring situated, practical theory into the action research process” (Baskerville 1999, p. 17). This was very much the case in the present study, where the ‘practical theory’ of the UNFPA’s Knowledge Sharing Branch was married with that of Government Department and the University’s R&D team.

The design and development of the pKADS application began in September 2003. Developed using Open Source technologies, several thousand copies of version 1.0 of the software were released under an Open Source license in December 2003 at the World Summit on the Information Society (WSIS) in Geneva, Switzerland; subsequently there have been 2000+ copies downloaded from the pKADS website up to mid-2005. The product of the first action research project is, therefore, available for public evaluation. The participants in the R&D project included 4 academic researchers (including two former IT professionals) from the University, 2 software developers (contracted in by the lead
researcher), four members of the UNFPA, and a third-party IT consultant retained by the UNFPA. The researchers began the initial study on the system requirements on September 9th and the major research and development phase continued to the 12th of December 2003. The second phase of the research lasted until April 2004, with the launch of the Version 1.1 of the software. The software application is available in Windows, Linux and Mac OS versions, and is downloadable for free with accompanying documentation from the pKADS Open Source Software site.

In March 2004, the University researchers undertook a second knowledge management action research project with a Government Department. The initial three month phase of this project saw the pKADS application successfully deployed on a pilot basis in one division of the Department. However, the Government wished to have an enterprise-wide KMS based on Web technologies. Thus the eGovernment Knowledge Platform (eGovKP) was developed from the ground up using the conceptual design schema from the first action research study and Open Source technologies. While a working prototype of eGovKP was successfully deployed in the pilot site in July, a full-featured eGovKP Version 1.0 was released in September 2004. The integration of this system into departmental enterprise systems continued with the deployment of eGovKP Version 2.0, first on an Open Source-based technology platform and then on Oracle 10g, in the sponsoring Government Department in May 2005. The participants in this action research R&D project included 6 academic researchers (including three former IT professionals) and 5 research assistants from the University, 3 experienced software developers (contracted in by the lead researcher to code the system), while a team of 5 knowledge workers from the Government Department formed the pilot project team, along with 12 business and IT managers from the department’s HQ, and a third-party business consultant from Cap Gemini. The experiences of knowledge workers in this second action research study confirmed the findings of the first, in that people from a different culture and tradition, domains of knowledge, and areas of expertise, found the conceptual architecture on which the pKADS and eGovKP KM Tools were designed to be intuitive, easy to understand and ‘logical’—it therefore informed the design of the department’s core IT artifact for Knowledge Sharing.

Both R&D studies were publicly funded to a total of approx. €670,000 ($804,000). Academic researchers participated in ALL project related activities except coding (e. g. requirements gathering, design, detailed design (Inc. GUI), testing, drafting technical and end-user documentation, end-user training, and so on). Both projects were viewed by the participating University Department as an opportunity to make a public service contribution to the wider community. For the duration of the projects, team members were in daily contact (informal), while formal project meetings were held on a fortnightly basis and joint meetings with participating institutions occurred on a monthly basis or as required. Four of the researchers attended the WSIS conference with two of the UNFPA KSB team to demonstrate the pKADS KMS and obtain feedback from practitioners. Field notes of observations and informal conversations (telephone and interpersonal), detailed minutes of the various meetings, memos, email threads, documentation and other project artifacts formed the research database. As the first action research study with the UNFPA provided much of the ‘practical theory’ that informed the conceptual architecture of the KM Tool, the following section focuses on how this came about.

3 PRACTICAL THEORY AND THE DESIGN OF CORE IT ARTIFACTS FOR KM

This section reports on the lessons from the first action research study and how they were applied and elaborated on in the second.

3.1 IT-Enabled Knowledge Sharing in the UNFPA

The United Nations Population Fund (UNFPA) was founded in 1969 to support developing countries through the promotion of reproductive health and the equality of women. In order to meet the challenges of delivering global services more effectively, the UNFPA realized that it had to capture,
distil, validate, store, apply, and reuse the know-how of its people for learning and innovation. In early 2002 the Knowledge Sharing Branch recognized that “technical and social processes interact in complementarities to shape knowledge management efforts” (Sambamurthy and Subramanil, 2005). There is ample evidence in the UNFPA’s documentation and from participant researchers that the organization recognized such issues; indeed the KSB studied the available literature on KM and KMS to inform their strategy. The core of UNFPA’s approach to knowledge sharing is the systematic collection, synthesis and dissemination of UNFPA worker’s know-how and experience. The organization’s pilot project in knowledge sharing saw its personnel experiment in the knowledge capture and transfer that allowed inexperienced workers to quickly gather the requisite knowledge and competencies required in three specific areas of service delivery.

**Knowledge Networks and Communities-of-Practice:** The UNFPA views two social and organizational groupings as being vital to the success of its knowledge sharing initiative. The first of these is a formal grouping of knowledge workers Knowledge Networks (KN); these are structured teams of individuals who share a common functional interest in particular domains of knowledge. The roles and responsibilities of KN members are strategically defined and formally delineated by the KSB. In keeping with the participatory nature of the UNFPA’s approach to KM and the focus of knowledge sharing on key organizational processes, knowledge domains are to be “be developed through action-oriented collaboration in support of actual work in progress in UNFPA.” The second group involves members of informal communities-of-practice, which have shared knowledge interests that may, or may not, have organizational processes as their subject (cf. Wenger et al. 2001). In addition, the UNFPA recognized that one of its major challenges in managing knowledge is to provide adequate incentives and rewards for performance, so that its professionals in the field would use the system.

**Organizational Routines for Knowledge Sharing:** Practical research at the UNFPA has illustrated that people are willing to share their experiential knowledge, but are often unable to do so due to the unavailability of suitable procedures and mechanisms. Staff at the KSB concluded that in order for information to become knowledge, it needs to be relevant and provide adequate descriptive context. This requires a knowledge sharing process that stimulates knowledge workers to provide relevant data, insights, ideas, ‘rules of thumb’ and contextual information so that their codified know-how becomes useful to others. According to the UNFPA, such an approach does not require the elimination of existing KM tools; however, it calls for the systematization, standardized design and configuration of knowledge sharing processes, enabled by, and embedded in, IT, and a readily accessible, unambiguous knowledge ‘product.’ The former were codified in the organization’s Knowledge Sharing Strategy and practices, while the latter was conceptualized as a Knowledge Asset (KA).

**IT as an Enabler of Knowledge Sharing:** The UNFPA had limited experience with the application of IT to support organizational processes. In building a Knowledge Sharing Technical Environment (KSTE), the KSB made sure that the lessons learned by the World Bank in the failure of its IT-enabled KM Strategy were not forgotten in formulating the UNFPA’S Knowledge Sharing Strategy and in the design and deployment of the KMS’ core IT artifact. As indicated, the outcome of an extensive evaluation of a KM Tools then available in the marketplace was unsatisfactory viz. Brendan O’Brien, the Chief of the KSB stated that “we wanted a tool to capture and disseminate data, information, experiences and know-how of people…we also wanted the ability to easily share that knowledge with others in the organization—no matter where or when.” He added that “search capabilities, data mining, document management, discussion forums and expert directories are all important…and we are currently using some of these…but unless you can systematically capture the knowledge in people’s heads, and in a format that renders it easy to access and understand, then knowledge sharing is not going to happen.” The outcome of the KSB’s efforts was the prototype Knowledge Asset Development System (KADS), which was implemented on a pilot basis. While the functionality of the technology platform was limited, the nascent conceptual schema of the organizational Knowledge Asset (KA) was incorporated into its design.
3.2 Building on pKADS: The eGovernment Knowledge Platform

The eGovernment Knowledge Platform (eGovKP) was researched, designed and developed in partnership with a large Government Department using practical theory and experiences gained in the UNFPA pKADS action research study. The department is structured into 6 Sectors (Business Units) and 30 Divisions nationally, but some have an international brief also, liaison with the UN being part of this brief. Hence, a diverse range of knowledge interests exist in and across the department, which is due to undergo restructuring in the not too distant future.

![pKADS Knowledge Asset: Quality of SRH Care](image_url)

**Figure 1 pKADS Web-view: Knowledge Map and Knowledge Asset Structure**

The department’s relationship with the UN brought it into contact with the UNFPA and its knowledge management activities. Witnessing the success of the UNFPA’s endeavors, it wished to emulate that organization’s experience with knowledge sharing. It comes as no surprise then that the department’s knowledge management strategy is highly similar to that of the UNFPA’s and has been implemented in textbook fashion, albeit in a shorter timeframe. The first of the two KM pilot projects began in March 2004 and involved the University R&D team and the department’s Marine Division in a study on the pilot deployment of the pKADS platform. Following the pilot deployment of pKADS, the department’s business and IT managers asked the University’s R&D team to further evolve the UNFPA’s conceptual schema in collaboration with participating users from the pilot team. This led to the development of a Web-based KMS, the first release of which was piloted in the same division in July 2005: this participative research process led to the release of eGovKP Version 1.0 in September.

It was agreed that the new schema would be backwards compatible with that of pKADS, thereby allowing eGovKP, pKADS and KADS to be interoperable. This is an important consideration, as the application and its source-code will be made available under an Open Source-type license for distribution to government, non-government and private sector organizations.
3.2.1 Applying Practical Theory from pKADS to Build a Knowledge Asset Schema for the eGovernment Knowledge Platform

Although the Knowledge Asset (KA) concept is widely used in business and academia, the UNFPA’s conceptualization has particular strengths. Knowledge at UNFPA is conceptualized as “how to do things”, “where to find examples” and “who to ask for help”: hence, KAs contain the “distilled experiential knowledge of organizational actors on a well-bounded subject area or topic of interest”. According to O’Brien, KAs are “…the living repositories of our collective know-how…[they] represent the very best and most current knowledge in areas that are critical to UNFPA.” Thus, KAs are typically based on the key work processes of the organization. They are designed and structured as to provide an intuitive, empirically grounded, logical structure to systematically capture, store, and share knowledge. The KA concept was readily adopted by practitioners both in the initial pilot project phase and subsequent phases of the Government action research study for inclusion in the eGovernment Knowledge Platform.

In the pKADS schema, the UNFPA groups related Knowledge Assets into Knowledge Domains. A Knowledge Domain simply describes the context for a collection of related Knowledge Assets. KAs that are grouped by domains describe the various areas of interest, activities, etc., which together constitute a recognizable body of knowledge in the organization. This was a departure from the original KADS schema, where asset groupings were termed Super Assets. The Government Department wished to change the emphasis from a bottom up Knowledge Asset to Super Asset to a top-down Knowledge Domain Hierarchy that mapped onto functional and cross-functional areas of operation, typically in the form of Business Units (Departmental Sectors) and Divisions, which constitute Knowledge Domains and Sub-domains; KAs are then mapped onto function-specific and cross-functional processes.

![Figure 2 Knowledge Domains, Assets, Topics, and Dialogues](image)

In pKADS and KADS, the visual representation of a KA is a ‘Knowledge Map.’ Its purpose is to enable users to navigate and graphically explore a KA. Figure 1 represents the Web-View of a Knowledge Asset (the sample Sexual and Reproductive Health Care Knowledge Asset) within the pKADS system. The key conceptual vehicle for navigation in the eGovKP is the Knowledge Tree (the department’s preferred option, as it enables more Knowledge Asset Topics to be added than the upper
limit of eight under KADS and pKADS): this enables users to traverse, in an easy-to-use manner, the eGovKP knowledge taxonomy. The tree structure accommodates the nesting of several levels of Domains and Sub-Domains and associated Knowledge Assets. An example will illustrate the benefits of the pKADS Knowledge Map and help further delineate the conceptual schema. In the top left-hand frame of Figure 1 is the Knowledge Map. At the centre of the circle is the name of the KA, while the circumference is ringed by the named Categories for that asset. KAs are structured into Categories in order to make them accessible. A Category is therefore a sub-topic of a KA. Categories are further divided into, and described by, a set of Questions and Answers. (As users navigate the KA, Categories and associated Questions and Answers details are displayed in the right hand frames.) UNFPA posits that to be effective, a KA should have about eight Categories. In the eGovKP schema (or knowledge taxonomy, as the Government Department refer to it as) Knowledge Assets are structured into Topics. The term Topic was chosen over pKADS Category following consideration and debate by participants in the eGovKP study: As were the other changes to the original schema in order for eGovKP taxonomy to be logically consistent. An example will illustrate the purpose of this schema: Just like a textbook is composed of chapters, a KA is composed of Topics. Please note that the textbook analogy, while useful for explaining the structure of KAs, is limited in its explanatory power, as texts are static repositories, while Knowledge Assets are viewed as being dynamic, living entities that grow over time through use. Chapters in a textbook are subdivided into sections—so too are Topics, except that Topics are composed of groups of Questions and related Answers—these are called Topic Dialogues. According the UNFPA’s KSB, a KA should have about eight Topics to be effective; however, government participants in the eGovKP action research project put no limitation on the number, as indicated.

In order to be as accessible as possible to end-users, the UNFPA schema viewed KA Categories as consisting of one or more question and answer pairs, depending on the complexity of the Category. UNFPA practitioners argue that questions and answers should be concise and to the point and be designed to elicit essential information. This schema was altered slightly in the second action research study in that Topics were structured to have two or more Dialogues in the form of Question and Answer pairs; the number of such pairings depending on the complexity of the Topic. Hence, as with pKADS, a KA presents information in a Question and Answer (Q&A) format. However, the new schema permits more than one Answer to a Question.

Finally, in pKADS, Questions and Answers are supplemented with informational resources external to the KA; these Related Resources include ‘examples’ of best practice and ‘further reading’. KAs also incorporate links to experts or individuals who can provide additional information and guidance; the conceptual architecture explicitly delineates the role of ‘experts’ and provides mechanisms for referencing ‘external’ experts. This element of the pKADS schema was altered in the eGovKP project where it was decided that all elements, including Questions and Answers, should be supplemented with Rich Knowledge Links to related Domains, Assets, Topics, Dialogues and external sources of information. Rich Knowledge Links include examples and further reading that can be uploaded or included as linked documents and/or URL (Web) references (to the Intranet or the Internet): Rich Knowledge Links may also contain video and audio links, and so on. Extending beyond the functionality of pKADS’ Related Resources, Rich Knowledge Links also provide a vital mechanism for eGovKP to hook into other systems and link to or import relevant data sets, images, email threads, and so on. In addition, eGovKP also has the capability to link to experts or individuals who can provide additional information or offer guidance both internally and externally. Like KADS and pKADS, it provides a built-in ‘Golden Pages’ of subject matter experts (contributing authors), however, it also incorporates an Instant Messaging tool, to facilitate communication.

Textbooks may have one or more authors; similarly, a Knowledge Asset may have several contributing authors called KA Members. In pKADS, subject matter experts who contribute to the building of an asset by sharing their knowledge are termed Knowledge Asset Coordinators, and Primary and Secondary Contributors. The eGovKP schema adopts a top-down approach to designating key players of subject matter experts in order for the application to map unto its organizational structure.
viz. Knowledge Domain Administrator, Domain Coordinator, Knowledge Asset Coordinator, Knowledge Asset Contributors, Domain and Knowledge Asset Members. In pKADS, KA Members consist of contributing authors or readers. In single author scenarios during KA creation, the author/expert adopts all the roles in a Knowledge Network, while other members constitute the target audience for the asset. As knowledge is distributed in organizations and across societies, a dynamic KA will have a network of contributing authors and a ready audience. In such scenarios, a Network Member will be responsible for each Category. The same and/or other Network Members will be responsible for the various questions and answers that constitute a Category; these are called the Primary and Other Contributors. The left-hand bottom panel in Figure 1 provides a comprehensive list of these subject-matter experts, with links to contact details. In the eGovKP IT artifact, a Knowledge Asset Member will, typically, be appointed coordinator for one or more Topics. The same and/or other Members will be responsible for the Topic Dialogues (i.e. Questions and Answers) that constitute a Topic. All contributors, including Knowledge Asset Member will be both visible and contactable in eGovKP.

In conclusion, eGovKP employs a well-defined knowledge taxonomy based on a conceptual hierarchy that includes Knowledge Domains, Assets, Topics, Topic Dialogues, Rich Knowledge Links, Domain and Asset Coordinators and Members. The structure of this conceptual design is illustrated in Figure 2.

3.3 eGovKP Architectural and Technical Features

eGovKP was designed to be a highly extensible, standards-based, Intranet application, with a Web-based user interface, and was developed using Open Source Technologies. As with KADS and pKADS, the purpose of this application is to allow people to capture, store, edit, and view their knowledge and expertise as Knowledge Assets. Unlike the stand-alone pKADS application, eGovKP communicates with, and provide links to, organizational databases and other systems that people work with to inform their daily activities. In terms of its internal architecture, the eGovKP possesses both descriptive and navigational knowledge taxonomies, based as they are on the pKADS schema. The presence of such taxonomies makes this IT-enabled KM Tool particularly easy to use for knowledge capture and sharing—thus promoting and enhancing the knowledge sharing experience. eGovKP is designed to be administered centrally by the eGovKP Administrator or Domain Coordinator. The system can either be configured to have its own internal database of users or use Active Directory to assign Coordinators and Members of Domains and Assets. eGovKP is also integrated with Microsoft’s Active Directory, which is used as the data source for Coordinator and Member Details. Once the Root Knowledge Domain has been created, Members can be assigned as Coordinators of Sub-Domains and/or Knowledge Assets and the construction of the knowledge repository can commence. Note: Coordinators come from administrative and businesses functions in the organization and will have full ownership of the development, content and membership of Domains and Assets; however, general system administration and maintenance will rest with the eGovKP Administrator. Table 2 describes the application’s features, which build on the basic schema described earlier, and which enable KA Coordinators and Members share their knowledge. The subheadings in the table map the functions and features of the eGovKP application unto the KM processes suggested by Alavi and Leidner (2001) (see Table 1). An additional KM process of Knowledge Management System Administration is created to accommodate important KM administration and support activities. One of the most significant features going forward will be the eGovKP’s ability to integrate with corporate databases, document and content management systems. It will therefore have all the features of a true knowledge portal.
### eGovKP Version 2.0 Features

**Knowledge Creation and Storage**

1. Create Knowledge Domains and Sub-domains and index content using meta-data.
2. Create Knowledge Assets and relationships amongst related Knowledge Assets.
3. Identify and assign Knowledge Domain and Asset Members.
   
   For example, a Knowledge Domain Member can be selected to coordinate and facilitate the creation of Knowledge Assets, and collaborate with Asset Members to create Topics, Dialogues and so on.
4. Create Knowledge Asset Topics and related Dialogues as Questions and Answers groups.
5. Establish Rich Knowledge Links (RKL) at the level of Domain, Asset, Topic and Dialogue content.
   
   Rich Knowledge Links will at a fundamental level typically be documents, data sets (from decision support tools and internal and external databases), web links, reference sources, video and audio clips etc.).
   
   Rich Knowledge Links provide direct and indirect (searchable) access to external subject matter experts, with ‘Golden Page’ type functionality, to make them highly visible so that they can provide additional information or offer guidance on Knowledge Domain, Asset, Topics and Dialogues.
6. Generate GUI-based Process Maps so that users can easily explore Knowledge Assets.
7. Integrate external applications such as collaboration tools and video conferencing tools from the desktop or using Rich Knowledge Link functionality.
8. Edit Domains, Assets, Topics and Dialogues content, contingent of the possession of appropriate permissions. Newly created or edited content will be held off-line and will only be published ‘live’ once the coordinator authorizes, or if other members validate, content.

**Knowledge Retrieval, Transfer and Application**

9. Navigate, search and view of Domain and Asset content, and also all organizational document repositories (via links to Content Management and Document Management Systems), based on membership permissions.
10. Export Knowledge Assets along with related Topics, Questions and Answers Dialogues, Coordinators, Members and Rich Knowledge Links, as a single XML file with related documents/ folders, that can be imported by an eGovKP compliant system.
11. Publish Knowledge Assets in multiple document formats (XML, Word, RTF, PDF etc.).
12. Communicate with other Domain and/or Asset Members using an integrated Instant Messaging tool that draws on a comprehensive directory of subject matter experts and general users.

**Knowledge Management System Administration**

13. Create and maintain user (Coordinators, Contributors and Members) accounts and permissions with respect to Domains and Assets.
14. Log on to the system using account name and secure password.
15. Log use of Knowledge Assets and employ the instant messaging facility to provide feedback to the system and Monitor and analyze system performance.
16. Provide Coordinators and HR people with highly visible records of knowledge sharing and consumption.
17. Integrate instant message or e-mail threads that elaborate on Domain/Asset/Topic content as either Topic Dialogues or Rich Text Links.

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*Table 2 eGovKP Version 2.0 Features*
4 CONCLUSIONS

In early 2004 the UNFPA was using the Portable Knowledge Asset Development System (pKADS) application to promote knowledge sharing among its 1,600 knowledge workers. The tool is presently being used by UNFPA officers in the field, where access to the organizational Intranet is unavailable. The UNFPA is also promoting the use of the system in other UN agencies, NGOs and public and private entities in developing countries. In April 2004, Version 1.1 of pKADS saw the release of French and Spanish versions of the application, while University researchers collaborated with developers from the National Information Technology Centre in Amman, Jordan, on the development of an Arabic version of pKADS. Significantly, the lessons learned by the UNFPA in the action research study have been integrated into the latest version of their Knowledge Asset Development System (KADS) to bring it beyond the level of a pilot prototype KM Tool. As of 2005, 10 organization-wide Knowledge Assets have been deployed for global use across the organization.

Pfeffer and Sutton (2000) argue that one of the reasons why KM efforts are divorced from the day-to-day activities of knowledge workers is that those involved in designing and building KMS do not understand the nature of ‘working knowledge’. We argue that this problem did not arise in the action research study described in this paper due to the high degree of participation of a range of knowledge workers from the UNFPA in the design of the IT artifact and its deployment and role as a KM Tool in their in-house KMS. Furthermore, the participants in the project were highly experienced in the administration and delivery of the UNFPA’s programs globally and were active in building Knowledge Assets in the pilot Knowledge Asset Development System (KADS) and transferring them to the Portable Knowledge Asset Development System (pKADS). This contributed to the success of the initiative in the UNFPA. The Government Department has implemented a similar strategy and only time will tell if it is equally successful. Pfeffer and Sutton (2000, p. 21) have observed that “[k]nowledge management systems seem to work best when the people who generate the knowledge are those who store it, explain it to others, and coach them as they try to implement the knowledge”. We can attest that this is exactly what happened at the UNFPA and in the pKADS deployment, and is happening in the government organization described above. Another reason for the success of pKADS and KADS was that incorporated into the design of these applications is the concept of ‘community’, which was implemented as a Knowledge Network of subject matter experts. It is significant also that, from the outset, the UNFPA placed a primary emphasis not on the KM technology component, but on their people and processes encompassed by the knowledge management system. As the pKADS and eGovKP Tools are also targeted at organizations other than the UNFPA and the Government, those who employ them for knowledge sharing need to recognize that the tool will be of little use unless the social and organizational issues surrounding its use by people to support and inform their understanding of work processes receive adequate and full attention.

An earlier section listed the range of IT artifacts that may be employed in a KMS. Although some of these are in daily use by most knowledge workers (email, calendaring, telecommunications and videoconferencing, bulletin boards on Intranets etc.), experience at the UNFPA and the Government Department would suggest that they are non-core or supplementary tools for knowledge sharing, as they are generally employed in an ad hoc fashion. Table 2 highlights the secondary role that such IT artifacts play with respect to the core IT artefact in a KMS. The table also groups the functions and features of the core IT artifact using the KM processes of Knowledge Creation, Storage, Retrieval, Transfer, and Application suggested by Alavi and Leidner (2001) (see Table 1). It is significant that an additional KM process of KM System Administration was created to accommodate important KM administration and support activities deemed to be vital in the deployment and use of the eGovKP technology.

Looking to practice, practitioners at UNFPA concluded from their analysis of the KM Tool marketplace that it would be impractical to deploy, what could be for users, a bewildering range of IT-based tools, with a multiplicity of conduits and formats for communication, to support knowledge
sharing systematically in a successful knowledge management initiative. Returning to first principles, so to speak, they placed primary emphasis on capturing and sharing their knowledge workers’ experiential and technical knowledge of the organization’s core institutional processes. To achieve this, they began with a straightforward conceptual architecture that was designed into their nascent KM tool, the prototype Knowledge Asset Development System (KADS), and, subsequently, refined and elaborated in the pKADS application. These insights were then transferred into the latest version of KADS and into eGovKP, which was deployed in two divisions of a Government Department in November 2005 to support their activities, with further rollout continuing in the remaining divisions during 2006. Thus, each of these IT artifacts provide a central point of access for capturing and sharing knowledge, while the other tools mentioned act in a support capacity only. Once the core KM IT artifact is in place, integrative links to enabling and supplementary tools may be designed in subsequently, as has been the case with pKADS, KADS and eGovKP.

References