Promoting Knowledge Sharing in Government and Non-Government Organizations Using Open Source Software: The pKADS Story

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Abstract: This paper reports on the development of an innovative Open Source Software solution called the *Portable Knowledge Asset Development System* (*p*KADS). pKADS is a desktop-based knowledge management system whose purpose is to promote knowledge sharing in government and non-government organisations, which the United Nations views a being pivotal to the inclusion of developing nations in the knowledge society. The institutional context for the development of this system is delineated, as are the system's conceptual and technical architectures. The paper concludes with suggestions for the application of pKADS and its implications in shaping subsequent e-Government initiatives.

Keywords: Knowledge Management, Knowledge Society, Open Source Software, e-Government, Non-Government Organisation (NGO), Action Research

1. Introduction

This paper describes the development of a knowledge management system (KMS) called the Portable Knowledge Asset Development System (pKADS). Two organisations participated in the development of this innovative software solution—the United Nations Population Fund (UNFPA) in New York and Business Information Systems (BIS) at University College Cork. The Government of Ireland funded the project through the auspices of the Department of Communications, Marine and Natural Resources (DCMNR). This collaborative initiative resulted in the development and release of an open source, desktop knowledge management (KM) tool, implemented in Java™, whose aim is to promote knowledge sharing in government and non-government organisations (NGOs) across both the developed and developing world.

UNFPA, Business Information Systems, and the Government of Ireland jointly launched pKADS 1.0 at the *World Summit of the Information Society* (WSIS) in Geneva, Switzerland in December 2003. The Jordanian Minister for Information announced at the launch that his government would fund the localisation of the application in Arabic. The software was distributed on CD-ROM at WSIS and is available on the World Wide Web (http://pkads.bis.ucc.ie).

pKADS is a stand-alone version of UNFPA's nascent in-house, on-line Knowledge Asset Development System (KADS), which was employed to promote its organisation-wide Knowledge Sharing Strategy. Significantly, pKADS represents an innovative open source knowledge sharing tool that may be used to gather, distil and synthesize experiential knowledge in a way that improves results, informs policy and helps strategy development in the UNFPA and a range of organisations.

This paper discusses UNFPA's achievement in implementing its Knowledge Sharing Strategy and in elaborating its implementation of the Knowledge Asset concept, which had already been adopted by a number of organisations, notably Microsoft Corporation (see Conway and Sligar, 2002). The paper then describes the relevance and importance of knowledge management in the context of multi-national, citizen-facing organisations such as NGOs; it then outlines the architecture of pKADS, with emphasis on the importance of open source software and open standards. The paper also presents an analysis of interest in, and reports on

the uptake of the pKADS application. Two subsequent research and development projects aimed at developing web-based KM tools for the Government of Ireland (*e*Government Knowledge Platform (eGovKP)) and UNFPA (enterprise-wide Knowledge Asset Development System (*e*KADS)) are also briefly discussed.
The remainder of this paper is structured as follows. In section 2, we discuss three areas of interest that inform the research, namely the Knowledge Society, Knowledge Management and Knowledge Management Systems. In section 3, we discuss the research methods employed in the study. In section 4, we present a description of the case. In section 5, we present the paper's conclusions.

2. Knowledge management and knowledge management systems in the knowledge society

In this section, we discuss three concepts that inform the research, namely the Knowledge Society, Knowledge Management (KM) and Knowledge Management Systems.

2.1 The emergence of the knowledge society

The "Information Society" is generally accepted to refer to a post-industrial society where Information and Communication Technology (ICT) plays a central role to a nation or region's economic and/or social well-being (OECD 1998). The Information Society also connotes the potential for using ICT to improve quality of life (e.g. the reduction of poverty around the globe) and as a vital tool for economic advancement in developing countries (ITU 2003). In December 2003, the *World Summit on the Information Society* (WSIS) was held in Geneva, Switzerland. One of the aims of the conference was to address the global divide that exists between developed and developing nations, and bridging the digital divide by improving access to ICT.

While the importance of ICT *per se* cannot be understated, researchers and policy makers are now placing increasing emphasis on the important role(s) played by knowledge, and on the transformation of 'Information Societies' into 'Knowledge Societies' (Moser 2003). Similarly, the emergence of the 'Knowledge Economy has been commented on by Drucker (1995; 1999) who argues that knowledge *has* become the only critical factor of production. This is in sharp contrast to the "old economy" in which land, labour and capital were the vital factors of production.

Thus today's economic climate is characterised by globalisation, increasingly sophisticated ICT, and the coming of the Knowledge Society (Stiglitz 2003). Echoing Peter Drucker, Nonaka (1991) argues that in a constantly changing economic environment the only certainty is that knowledge is the only source of sustainable competitive advantage. Unlike the traditional factors of production, knowledge is not subject to the laws of diminishing returns. In contrast, knowledge is subject to the law of increasing returns, whereby every unit of knowledge used effectively will result in a marginal increase in performance (Romer 1986). It is argued that only those who exploit the opportunities offered by the knowledge economy will increase their prosperity, while those that fail to adapt will face declining economic fortunes (DTI 1998). In a global economy, institutions and nation states alike must invest heavily in the management and exploitation of their knowledge capital if the benefits of globalisation are to be realised.

Although commercial organisations have been active in implementing knowledge management strategies for some time now, there is an imperative for public institutions to follow suit, as there is evidence that public sector bodies are falling behind private sector enterprises in managing their knowledge resources (OECD 2001). There is, therefore, a need for e-Government initiatives in the area of knowledge management. Indeed, such initiatives are congruent with objectives of e-Government, which are to enhance citizens' access to information and services, increase transparency, and provide clear accountability by the public sector for the services they deliver (Information Society Commission 2003).

2.2 What is knowledge management?

Knowledge management (KM) is a multi-disciplinary domain of interest that has its origins in several fields viz. philosophy,

economics, organisation theory, information systems, marketing, management strategy, innovation research, and organisational learning (Earl 2001; Gray and Mesiter 2003).

Despite the promise that surrounds the application of KM concepts, many organisations fail to realise the potential of marrying ICT and KM theory to build Knowledge Management Systems (KMS). One possible explanation is that many of the earlier conceptualisations of knowledge management were based primarily on the traditional view of computers as data processing devices and organisations as processors of information (Butler 2003). In fact, a McKinsey survey of 40 European, American and Japanese companies revealed that many executives believed that knowledge management was the outcome of the application of sophisticated ICT (Hauschild, Licht and Stein 2001). Thus the over-reliance on the technological support for the management of knowledge has weakened the effectiveness of KM initiatives by ignoring the tacit knowledge contained in people's heads, which, in any event, is difficult to codify and store using ICT (Butler 2003). Drucker (1999) argues that while ICT support operational aspects of organisational activities, they do not support knowledge work in organisations.

Table 1: Knowledge management processes & potential role of IT (Alavi and Leidner, 2001)

Knowledge Management Processes	Supporting Information Technologies	IT Enables	Platform Technologies
Knowledge Creation	Data Mining. Learning Tools.	The creation and combination of new sources of knowledge. Just in time learning.	Groupware and communication technologies. Intranets.
Knowledge Storage and Retrieval	Electronic bulletin boards. Knowledge repositories. Databases.	Support of individual and organizational memory. Inter-group knowledge access.	
Knowledge Transfer	Electronic bulletin boards. Discussion forums. Knowledge directories.	More extensive internal networks. More communication channels. Faster access to knowledge sources.	
Knowledge Application	Expert systems. Workflow systems.	Knowledge to be applied in and across time and space. More rapid application of new knowledge through workflow automation.	

Following Malhotra (1998), this study views knowledge management as addressing the vital issues of organisational adaptation, survival, and competence in face of increasingly complex and turbulent environmental change: Malhotra argues that knowledge management is based on and incorporates organisational processes and the data and information-processing powers of IT. At the core of KM initiatives, however, lie the innovative capabilities of human beings. This definition proves useful as it incorporates the traditional data and information processing view of the firm, while also including vital social and cultural issues, and recognising the dynamic capabilities of social actors.

2.3 Knowledge management systems

Knowledge Management Systems (KMS) facilitate the capture, storage and sharing of 'knowledge' (Alavi and Leidner 1999; Garavelli, Gorgoglione and Scozzi 2002). However, such systems have had limited success because many merely support the data and information processing in organisations, rather than the capture, sharing, transfer and management of knowledge (Sutton 2001; Hendricks 2001; Butler, 2003). It is also clear that in a high proportion of KMS development and implementation projects, critical social, cultural and motivational issues are neglected (McDermott 1999; Schultze and Boland 2000; Huber 2001).

While Management Information Systems (MIS), Decision Support Systems (DSS) and Executive Information Systems (EIS) have been quite successful in enabling managerial and executive decision making, such systems do not support the activities of knowledge workers (Drucker 1999). Hence, Knowledge Management Systems (KMS) are proposed to facilitate the knowledge capture, sharing and transfer (Alavi and Leidner 1999). Alavi and Leidner (2001) outline the roles IT plays in enabling knowledge management viz. knowledge creation, storage/retrieval, transfer, and application (see Table 1). Alavi and Leidner argue that no one technology comprises a KMS; rather they report that the three most common knowledge management tools enable; (1) the coding and sharing of best practice in organisations; (2) the creation of corporate knowledge directories; and (3) the creation of knowledge networks. In contrast, Berghoff and Pareschi (1999) maintain that many tools promoted by vendors as knowledge management applications, merely support data and information processing. Significantly many researchers argue that KMS cannot capture, store and transfer knowledge, rather they merely manipulate codified representations of knowledge (Butler 2000, 2002, Sutton, 2001). Hence, McDermott (1999) argues that IT supports, but cannot realise knowledge management strategies. McDermott claims that the difficulties in many knowledge management initiatives arise in the failure to change organizational culture and to get people to take the time to articulate and share their knowledge. This viewpoint is echoed by Schultze and Boland (2000), who report high rates of failure in KMS implementations, and Storey and Barnett (2000) who catalogue failure rates of over 80%. Reviews of the academic literature reveal that while there is there is much debate, theorising, and writing of a normative nature on KMS, there is a dearth of in-depth empirical research on the development and implementation of such systems (Butler 2002; 2003).

Given the forgoing observations on the knowledge society, knowledge management and KMS, the objective of this study is therefore to investigate how KMS can be successfully developed to enable knowledge sharing in organisations. The process by which this objective was achieved is now outlined.

3. Research method

In this section, we outline the process by which the research was conducted, in addition to describing the theory and method of action research in the Information Systems (IS) field.

3.1 Research activities

Following an in-depth feasibility study in early September 2003, the development of the pKADS desktop application commenced in the last week of September with Version 1.0 of the software being released for production in CD-ROM format on November 14th. The application was launched in December 2003 at the *World Summit on the Information Society* (WSIS) in Geneva, Switzerland. In the intervening weeks the pKADS team developed multimedia demonstrations of the software. The participants in the R&D project included 4 academic researchers and 2 software developers from Business Information Systems, University College Cork, four members of UNFPA, and a third-party IT consultant retained by UNFPA. The research was funded by the Irish Government with the backing of the Department of Communications, Marine and Natural Resources. The second phase of the research lasted until April 2004, with the launch of the version 1.1 of the software. Another outcome of this phase was the release of French and Spanish versions of the application and documentation. The Arabic version of the application is to be released in August 2004. As many Arabic-speaking countries have been under-represented as participants in the knowledge society, the localisation of pKADS into Arabic is viewed as an important factor in the creation of ICT as a supporting mechanism for development. Hence, researchers at BIS collaborated with researchers from the National Information Technology Centre in Amman, Jordan, on the development of an Arabic version of pKADS following the an undertaking by the Jordanian Minister for Information and Communication Technology to support this endeavour.

3.2 Action research

The goals of action research are to: a) to increase understanding of a particular social situation; b) simultaneously assist in practical problem-solving while contributing to scientific knowledge. This approach was particularly relevant to the attainment of this study's research objective, as theoretical perspectives on knowledge management are well-publicized and participants from the UN's Population Fund (UNFPA) were well acquainted with them, as were the BIS researchers participating in the study. Furthermore, BIS researchers brought their theoretical, practical and technical knowledge of information systems development to bear in creating the technology platform. As Baskerville (1997, 1999) argues, the research setting is therefore free to self-organize rather than be artificially determined by researchers who are external to the situation—this was certainly the case with the pKADS project.

Beween September 2003 and April 2004, several project meetings occurred on-site in the *BIS Innovation Centre*, while others were conducted via video conference with participants in UNFPA's headquarters in New York. The BIS R&D team also held fortnightly meetings throughout the development phase of September through November. Minutes of the various meetings, memos, email threads, notes of telephone conversations, documentation and other project artefacts formed the research database which was analyzed using standard qualitative data analysis techniques.

4. Case study description

This section describes the case study background, environment and findings.

4.1 The United Nations Population Fund (UNFPA)

The United Nations Population Fund (UNFPA) began operations in 1969 as the United Nations Fund for Population Activities (the old acronym is retained under the new title).

UNFPA works with governments and non-governmental organisations in 142 countries and territories in four regions. The organisation supports developing countries through the promotion of reproductive health and the equality of women. UNFPA also works with governments to formulate population policies and strategies to achieve sustainable development. The organisation has provided close to $6 billion in aid to countries in the developing world, making it the largest international source of funding for population and reproductive health programmes.

4.2 An Overview of UNFPA's Knowledge Sharing Strategy

The UNPFA Knowledge Sharing Branch was established in 2000 with the mission of helping UNFPA become *"a community that dynamically generates and uses knowledge to affectively accomplish its mission"* (UNFPA 2002). In 2001 the organisation launched a change management process under the stewardship of its new Executive Director, Dr. Thoraya Obaid. The objective of this change management process, known as the "The Transition", was to improve the work of the organisation and achieve better results by responding to an ever-changing environment while leveraging the opportunities presented by the Millennium Development Goals. "The Transition" involved six working groups, one of which was the Knowledge Sharing Branch: these were supported by a variety of outside consultants. Brendan O'Brien, Chief of the Knowledge Sharing Branch, was responsible for guiding the change management process and also supervising the integration of knowledge sharing into the change process. A formal Knowledge Sharing Strategy was formulated and adopted in May 2002. This led to a pilot project that saw the development and deployment of UNFPA's Knowledge Asset Development System (KADS) in 2002/2003.

Knowledge sharing in UNFPA is a synergistic relationship between people and organisational processes, enabled by technology. Central to UNFPA's approach to knowledge sharing is the collection, synthesis and dissemination of UNFPA worker's know-how and experience. This ensures that knowledge can be easily passed and leveraged throughout the organisation, rather than being stored in a collection of disparate information silos. UNFPA's pilot project in knowledge sharing saw the continuous collection and

refinement of internal and external knowledge which allowed inexperienced workers in one area of its activities to quickly gather the requisite knowledge and competencies that are needed to complete their work.

UNFPA strives to achieve their operating objectives in a number of different geographic locations. Although many of the projects undertaken are similar, the environments in which they are undertaken vary greatly with regard to operating conditions, timescales and cultural differences. The ability for the organisation to learn from the its past mistakes and to capitalise on its successes will allow it to eliminate costly and unnecessary repetitive mistakes while also encouraging best practices and nurturing core competencies. Thus members of UNFPA's Knowledge Sharing Branch argues that its IT-enabled strategy allows relatively unskilled workers to perform tasks immediately *"with the competence of an old hand – even hundreds of old hands – without always having to ask the old hand for help and advice"* (UNFPA 2002).

4.2.1 People

People are central to UNFPA knowledge sharing initiative. UNFPA employees are educated and informed about the benefits and importance of knowledge sharing to the organisation as a whole. Staff are motivated to think beyond titles and job descriptions and consider themselves part of a larger worldwide learning community. One of the tenets of their approach is that workers who contribute to knowledge sharing can also expect to receive the same kind of assistance in return. So important is the role of people to knowledge sharing at UNFPA, that employees' job descriptions now include the role of knowledge sharing. Measurement on this dimension not only ensures that workers are aware of the critical importance of knowledge sharing to the organisation, but also motivates employees by providing avenues for career advancement and performance related rewards. Thus UNFPA recognises that one of its major challenges in managing knowledge is to provide adequate incentives and rewards for performance.

UNFPA view two social groupings, one formal, the other informal, as being vital to the success of its knowledge sharing initiative:

- **Communities of Practice (COP)**: Communities of practice are an example of the intricate and social nature of knowledge creation. Wenger et al. (2001, p 4) describe them as "*groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.*"
- **Knowledge Networks (KN)**: Unlike COP's, UNFPA's Knowledge Sharing Branch views knowledge networks as formal, structured teams of individuals who focus on knowledge domains that are of critical strategic importance to the organisation. The roles and responsibilities of KN members are strictly delineated. KN members must actively collaborate as part of their job descriptions and their knowledge sharing efforts are fully accountable.

4.2.2 Process

Efficient and consistent processes are required to enable knowledge sharing. People who are willing to share their experiential knowledge are often unable to articulate this know-how to others. UNFPA uses a number of instruments including annual reports, trip or field reports, lessons learned and project reports to inform its activities. However, such reports are frequently seen as unnecessary burdens that actually hamper knowledge sharing. For example a trip report often summarises an agenda, but regularly neglects to include information that would make the report useful to others. In order for information to become knowledge it needs to be relevant and provide adequate descriptive context. This requires a process that provides relevant data, insights, ideas, rules of thumb and contextual information so that is useful to others in the organisation. Such an approach does not require the elimination of existing instruments; it calls for additional formats such as checklists which cater to different types of thinking. In particular, UNFPA's adoption of the widely-used Knowledge Asset (KA) concept is considered to be a major component of UNFPA's knowledge

management process. KAs will be discussed in detail later in this paper.

4.2.3 Technology

Staff at UNFPA's Knowledge Sharing Branch believe that an over reliance on the technology component of knowledge management dilutes the concept by ignoring the vital role of tapping into the knowledge contained in people's heads. UNFPA's use of technology includes the provision of tools to capture, store and disseminate data, information, and experiential knowledge. As of 2004, UNFPA's knowledge sharing toolset consists of a knowledge sharing portal, a corporate calendar, a development gateway, an Internet supermarket, a collaboration workspace, staff directories and the Knowledge Asset Wizard, which is a KADS component used to create new KAs (UNFPA, 2004).

The availability of technology support for knowledge sharing does not necessarily guarantee that it will be used (Butler 2003). For example, despite an expenditure of over $220 million on corporate networks and regional knowledge sharing activities, and over $60 million on three global knowledge sharing initiatives over a period of six years, the World Bank has failed to implement adequate business processes and management tasks based on its KM programme. As a result, it has failed to achieve its strategic objective of embedding knowledge sharing into its work processes (World Bank 2003). Brendan O'Brien, Chief of Knowledge Sharing at UNFPA, believes that the lessons learned in the World Bank report have been incorporated into UNFPA's Knowledge Sharing Strategy, thereby ensuring its success.

4.3 The core concept: knowledge assets

Knowledge assets are defined as "stocks of knowledge from which services are expected to flow for a period of time that may be hard to specify in advance" (Boisot 1998, p3). Although the knowledge asset concept is widely used in business and academia, UNFPA approach has specific idiosyncrasies. Knowledge at UNFPA is about "how to do things", "where to find examples" and "who to ask for help". UNFPA Knowledge Assets (KAs) are seen to contain the distilled experiential knowledge of organisational actors on a well-bounded subject area or topic of interest.

KAs are typically based on the work processes of an organisation. They provide an intuitive, empirically grounded, logical structure to capture, store, and share knowledge. The key conceptual vehicle is the Knowledge Map, which enables users navigate and explore a Knowledge Asset. At the centre of the circle is the name of the Knowledge Asset, while the circumference is ringed by the named Categories for that asset (see Figure 1).

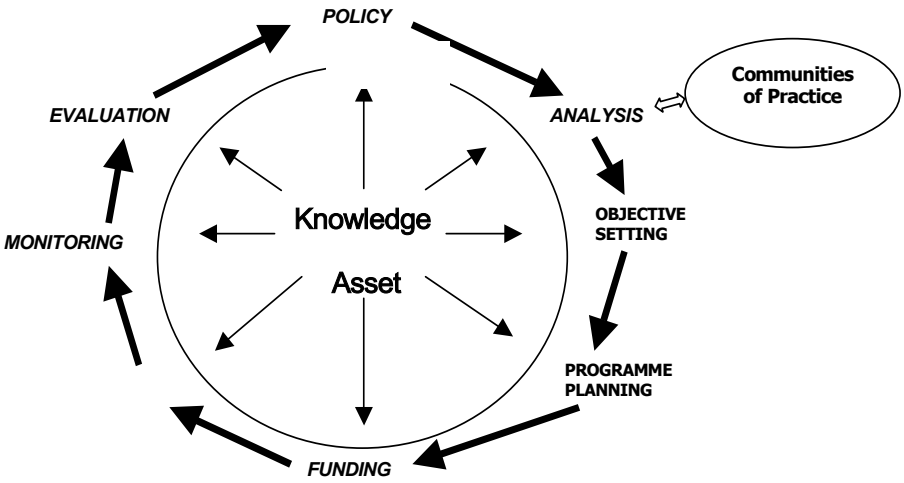

Figure 1: Structure of a Knowledge Map (UNFPA 2002)

Knowledge Assets are structured into Categories in order to make them accessible. A Category is therefore a sub-topic or component of a Knowledge Asset. Categories are further divided into, and described by, a set of Questions and Answers. UNFPA posits that to be effective, a KA should have about eight Categories. A Category should have one or more question and answer pairs, and the number of such pairings depending on the complexity of the category. Hence, at a fundamental level, a KA presents information in a Question and Answer (Q&A) format. Questions should be straightforward and should be designed to elicit essential information. Answers should be concise (typically 200 words) and to the point. Finally, Questions and Answers should be supplemented with informational resources external to the KA, including examples and further reading (these can be uploaded documents and/or Web references).

In addition to 'examples' and 'further reading' style resources, a KA also has links to experts or individuals who can provide additional information or offer guidance. A Knowledge Asset may have several contributing authors, called KA Network Members. In single author scenarios during KA creation, the author/expert adopts all the roles in a Knowledge Network, while other members of a community of practice constitute the target audience for the asset. As knowledge is distributed in organisations 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.

Knowledge Assets are grouped into knowledge domains called Super Assets; a knowledge domain simply describes the context for a collection of related Knowledge Assets. KAs that are grouped by domain or Super Asset describe the various areas of interest, activities, etc., which together constitute a recognizable body of knowledge.

4.4 UNFPA Knowledge Asset Development System (KADS)

In order to provide technical support for their Knowledge Sharing Strategy, UNFPA commissioned the development of an Intranet-based Knowledge Asset Wizard and Viewer using Lotus Notes and Domino technology in 2002. Christened the Knowledge Asset Development System (KADS), this was deployed on a pilot basis initially in 2003.

January 2004 saw preparation for the incremental deployment of KADS throughout UNFPA as the organisations performance appraisal and development system (PAD) incorporated knowledge sharing as a vital staff competency; it also set out guidelines and responsibilities for the creation of knowledge assets. UNFPA launched an extensive education program as part of the change management process surrounding the implementation of KADS: this sought to explain fully all elements of the transition process, especially the knowledge sharing strategy. This education program consisted of running over 90 workshops over a period of three months in late 2003. These workshops helped educate staff about their new roles and responsibilities and also the strategic goals and objectives of the organisation. Prior to this, several attempts to educate staff via circulars, videos, Intranet sites and formal presentations proved unsuccessful. Consequently, Brendan O'Brien believed that the effectiveness of the training sessions was due to a combination factors viz. the presence of a facilitator, good informational materials, and effective staff participation in each office.

4.5 A Portable Knowledge Asset Development System

UNFPA's KADS comprises an online collection of HTML documents and forms, and client- and server-side scripts, and requires a dedicated database server. However, this software architecture was limited in its scope and its application outside of UNFPA, primarily because it lacked portability as it was tied to proprietary enterprise technologies (Lotus Notes and Domino). UNFPA wanted a portable solution that they could share with other organisations in order to promote knowledge sharing and enhance UNFPA's

standing among government and non-government organisations alike.

In the beginning of September 2003, staff from Business Information Systems, University College Cork, met with representatives from UNFPA in their New York headquarters to discuss the possibility of producing a portable version of KADS in time for the *World Summit on the Information Society* in December 2003. In late September 2003, Business Information Systems, with funding provided by the Government of Ireland, undertook a research and development project to create a *Portable Knowledge Asset Development System* called pKADS. This task had to be accomplished in over six weeks, a tight timescale for a project of this nature and complexity.

4.5.1 Technical Requirement for pKADS

In mid-September the project feasibility team investigated the initial scope and technical architecture. The project feasibility team identified the following criteria as critical to the success of the project:

- **Stand-Alone:** The pKADS architecture should not be based on a complex relational database management system (RDBMS) or other server software for its knowledge base.
- **Portable:** Due to the wide variety of operating systems and hardware platforms used by UNFPA's partner organisations and clients, pKADS would need to be platform independent to ensure compatibility.
- **Extensible:** Many of UNFPA's partners and clients operate in geographically disperse locations with differing work processes and working environment. In order for the system to be extensible, users of the system would require the ability to modify the system at the data and source levels.
- **Flexible Output:** Knowledge asset would have to be output in a number of different formats. For example: XML for sharing between pKADS applications, HTML for the Web and other formats for print, etc.
- **Create a Community of Practice:** pKADS would have to be freely available, modifiable and redistributable in order to foster a community of practice. This would ensure an increased uptake in the number of users and developers involving themselves in the project.

4.5.2 Open Source Software

To address some of the requirements described previously, pKADS was released as open source software. Open Source Software (OSS) is software made available in both source code and binary form, under a license which allows users to freely use, modify and redistribute the software without the need to pay royalties to the original software author. Many open source software projects have been extremely successful (measured by market share), particularly in server/back-office application spaces, and there is enormous industry investment in promoting the growth and improvement of community-based software projects (Feller and Fitzgerald 2002).

The case for Open Source Software for governments in developing countries is a compelling one. OSS lends itself to creating an ICT platform that provides increased ownership and local autonomy (Dravis 2003). It also provides increased flexibility to address localisation issues and extensibility. There are also numerous cost benefits to be gained from the use of OSS. Such characteristics make OSS an ideal candidate for use by governments and non-governmental organisations (NGOs).

4.5.3 pKADS Technical Overview

pKADS is a desktop application written in Java, with an Extensible Markup Language (XML) data storage and exchange layer. Java was chosen for several reasons, including its (relative) platform independence and sophisticated support for localisation, graphical interface elements, event handling, etc. The software follows the Model-View-Controller (MVC) design pattern, which improves performance and robustness by decoupling code related to data access, business logic and data presentation/user interaction (see Figure 2).

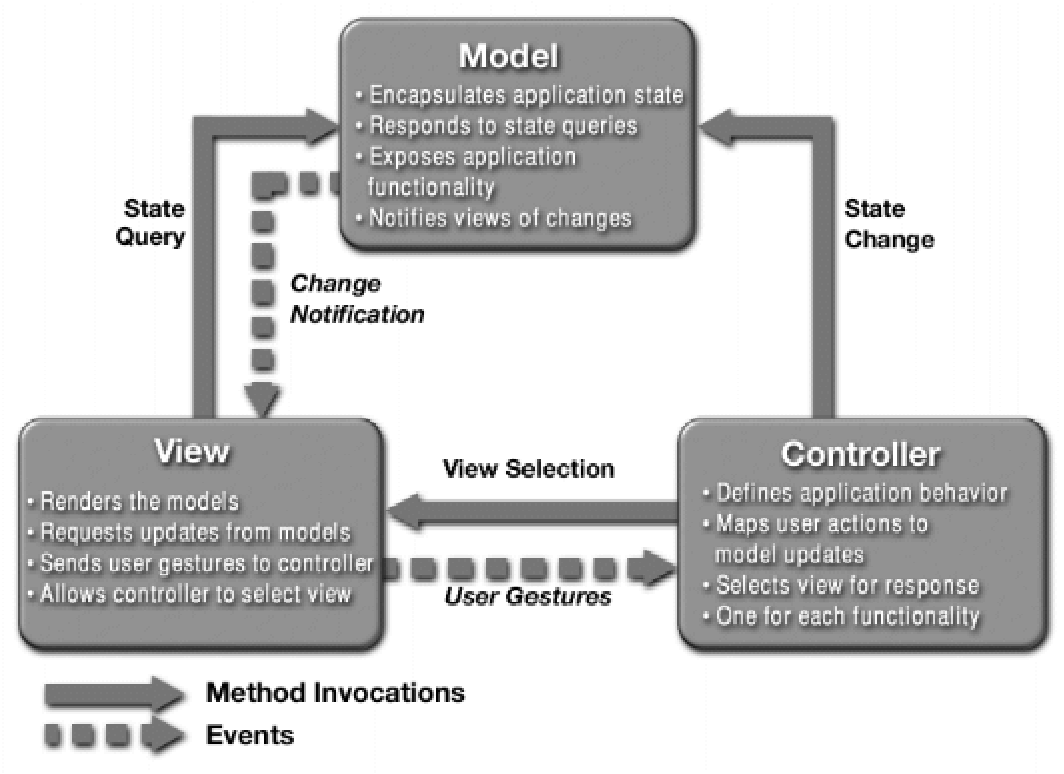

Figure 2: The Model-View-Controller (MVC) Design Pattern (Source: Sun Microsystems. http://java.sun.com/blueprints/patterns/MVC-detailed.html)

pKADS presents the user with a Java Swing interface for data entry, and also accepts input in the form of XML data (individual KA files), XML Schemas (used for validation) and XSLT Stylesheets (used to control output). The pKADS system has three main forms of output, the individual KA files (XML), a web-ready view of the KA (HTML and CSS), and a zip archive containing both the XML file and the web-ready view (see Figure 3).

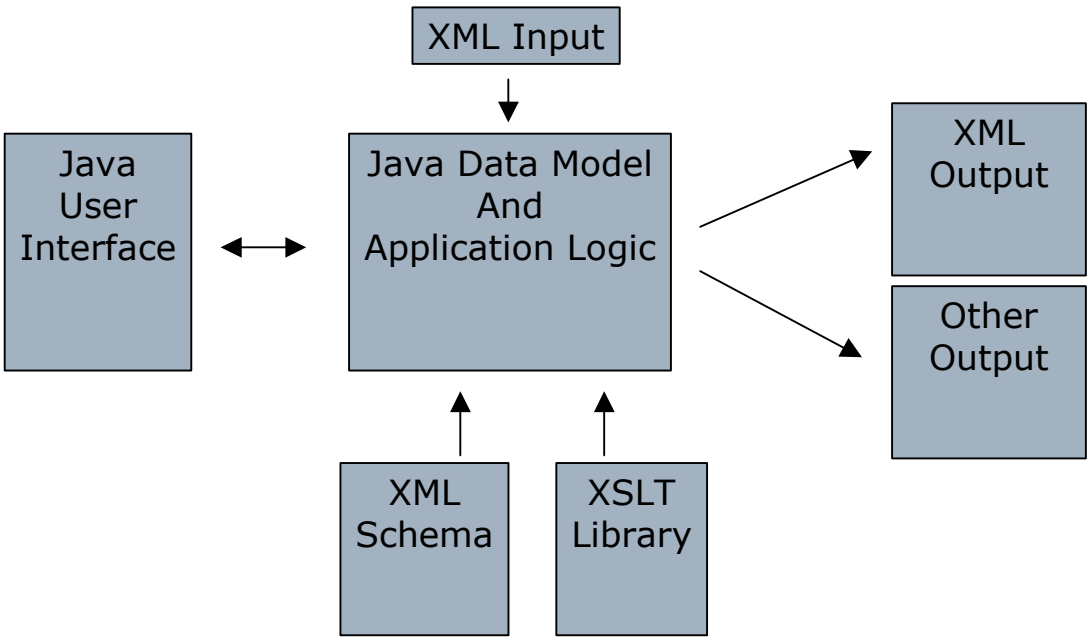

Figure 3: pKADS inputs and outputs

5. Conclusions

Since its launch at *WSIS 2003*, pKADS continues to attract attention from a variety of organisations (government, non-government and private sector) across the globe. Over 1,400 downloads of the application have been recorded from the pKADS website; server log analysis indicates that these downloads were made by individuals from various private and public institutions from all parts of the globe, including developing nations. Interest in pKADS from those attending the summit was likewise considerable. This level of attention is indicative of the need for such an application and its potential for use in organisations, particularly government and non-government institutions.

Significantly, the Knowledge Sharing Branch of UNFPA leveraged the pKADS experience and the launch at *WSIS* to get top management commitment to the full deployment of KADS. Subsequently, UNFPA Knowledge Sharing executives employed pKADS as a training platform and promotional tool in the full implementation of KADS. They also used it as a tool to promote knowledge sharing for development by getting other NGOs and UN agencies interested in adopting the tool.

The major limitation of pKADS is that it is a single-user application, notwithstanding that it can import and export knowledge assets. On the other hand, UNFPAs' original KADS system, while multi-user, is proprietary and limited in other ways as described in this paper. The UNFPA and researchers at Business Information Systems expect that, in time, pKADS will be improved upon by the global user-developer community, both in terms of additional features and the evolution of its architecture to accommodate multi-user collaboration (as either a peer-to-peer or client/server application—or, perhaps, both). The future evolution and improvement of the software is important, as BIS researchers found that users reported problems with pKADS when it was deployed on a pilot basis in one division of the Department of the Communications, Marine, and Natural Resources. The application's limitations did not, however, detract from its utility as a knowledge sharing tool. Users were unanimous in their praise for the underlying concept and its implementation. Such was the enthusiasm within this Government Department for an IT-based solution for knowledge capture, storage and sharing, that researchers at BIS are currently undertaking the research and development of a Web-based KMS called the *e*Government Knowledge Platform (*e*GovKP). This R&D project is being funded by Irish Government, who has indicated their intention to deploy the system on a pilot basis in the Department of Communications, Marine and Natural Resources. The UNFPA also plans to undertake the research and development of an enterprise-wide KADS (eKADS) for use in their organisation. Research and development into *e*GovKP system is expected to conclude by April 2005, with the release and deployment of a full-featured version. Neither of these developments would have been possible without pKADS.

In conclusion, this action research case study makes several important contributions to research in the information systems field and other disciplines. First, it describes one organisation's (UNFPA) success in implementing its Knowledge Sharing Strategy and developing its Knowledge Asset concept. Second, it illustrates the relevance and importance of knowledge management in the context of multi-national, citizen-facing NGOs, as indicated to the research team by delegates to the *World Summit on the Information Society 2003*. Third, the architecture of pKADS has been described in detail, with emphasis on the importance of open source software and open standards in government and NGO environments. Fourth, the study presents an analysis of interest in, and the uptake of, the pKADS application by commercial, government and non-government organisations to promote knowledge sharing. Finally, contrary to points made by Alavi and Leidner (2001), it highlights how a single knowledge management tool can provide IT support for knowledge creation, storage/retrieval, transfer, and application. Indeed the subsequent development of a Web-based KMS through a government-funded R&D is tangible evidence of the ability of IT to

deliver on the promise of knowledge management.

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