DESIGN OF A KNOWLEDGE SHARING SYSTEM IN A NON-PROFIT ORGANISATION

Kuan Liung Tan, Paul Swatman, Aditya Pethe
School of Computer and Information Science,
University of South Australia, City West Campus
27-29 North Terrace, Adelaide, SA 5000, Australia.

ABSTRACT

Significant research has been performed on the planning and development of systems to facilitate knowledge sharing in organisations in general. However, there is a lack of empirical studies in knowledge sharing system design in non-profit organisations (NPOs). NPOs were often sidelined or treated similarly as for-profit organisations in the literature but in reality, there are a number of key characteristics that differentiates them from other organisations. This paper attempts to address this issue, by describing the design of a Knowledge Sharing System prototype in an NPO. We start by describing the design of system requirements, to the development and testing of the prototype and lastly, to the feedback we obtained from the implementation of the prototype. From the feedback, the team has successfully addressed all of the issues raised at the beginning of the design process.

KEYWORDS

Knowledge Sharing, Knowledge Management, Non-Profit Organisation, Soft Systems Methodology

1. BACKGROUND AND MOTIVATION

ICT has long been used to facilitate knowledge sharing in organisations. An ICT-based knowledge repository, for example, allows employees to access relevant information effectively in a short period of time (Walsham 2001; Riege 2005). Although significant research has been performed on the planning and development of such systems in organisations in general, there is, however, a distinct lack of empirical studies in knowledge sharing system design in non-profit organisations (NPOs). For example, Bhattacharjya and Venable (2006) emphasized that non-profit organisations were often sidelined or viewed at a similar level to for-profit organisations in many research articles.

There are a number of key defining characteristics of NPOs which makes designing systems in such organisations significantly different from for-profit organisations. Firstly, in Australia in particular, non-profit organisations traditionally have a non-sophisticated understanding of ICT. In recent years, however, these organisations face a number of challenges such as the increasing competition in a competitive government tendering process, extremely stringent reporting requirements and the increasing demand of a variety of services by the clients which they serve (Milligan 1998; Ryan 2002). These new challenges force NPOs to seek for more advanced, integrated information systems. Well-implemented information systems could help NPOs build more effective external relationships with their funders and clients, as well as enhance the intra-communication amongst their staff members (Klemz, Simon & Kumar 2003). However, due to their non-sophisticated view of technology, systems that were developed for NPOs have to be user-friendly and less-complex and intimidating than systems that were designed for the corporate world.

Secondly, as reported by Fowler, Swatman & Castleman (2004), funding bodies have huge influence in deciding the format of the programmes run in NPOs. This in turn leads to the situation where functional information systems are overwhelmingly based around funding programmes. As a result, NPOs find it difficult to gain an organisationally integrated view of its functional activities. Another problem that may occur is that if staff moves from one programme to another, he or she may have to contend with an entirely different information system.

Thirdly, people who work in NPOs tend to display high levels of intrinsic motivation (Yeung 2004; Benz 2005). Many researchers have demonstrated that staff in such organisations has more autonomy and greater control over their job positions (Benz 2005). Staff members are also concerned of building lasting working relationships with their fellow colleagues. Due to staff autonomy and the greater emphasis on human relations, solutions that are designed for NPOs should be people-centric, not only must they have sufficient flexibility, but they should also be seen as non-imposing.

The main objective of this paper is to describe the design of a Knowledge Sharing ICT prototype in an NPO, starting from the design of system requirements, to the development and testing of a prototype, and finally, to the initial drawing of feedback from the NPO. The approach used in this research is based on Soft Systems Methodology (SSM) (Checkland 1999). SSM not only allows us to gather a rich picture of what each stakeholder and service area in the NPO needs, it also provides us with sufficient leverage to obtain stakeholder requirements without being seen as imposing strict rules and systems onto the stakeholders themselves. The contribution of this paper is to add to existing knowledge of designing Knowledge Sharing Systems for NPOs.

2. LITERATURE REVIEW

2.1 Knowledge Management

According to Davenport et al (1999), knowledge is a combination of information coupled with experience, context, interpretation and reflections. Another commonly accepted definition of knowledge, which comes from the work of Nonaka (1994), is that is a justified belief that will increase an individual's capacity for effective action (Alavi & Leidner 2001). Knowledge can be seen as one of the key competitive advantages of an organisation (Quintas, Lefere & Jones 1997) – a successful knowledge management programme will not only help an organisation identify and leverage the collective knowledge of its employees, but also enhance its stature in a competitive marketplace (Alavi & Leidner 2001). A clear definition of Knowledge Management is that it is the process of capturing, storing, sharing, and using knowledge (Zhuge 2002).

In an organisational context, Quintas et al. (1997) described Knowledge Management as a process of continually managing different kinds of knowledge; it requires a company-wide strategy which comprises of policy-setting, implementation, monitoring and evaluation.

2.2 Towards a Knowledge Sharing Culture in Organisations

Knowledge Sharing is an important activity within the Knowledge Management process. It provides the vital link between the individual knowledge keepers (knowledge-bearers) and the level of the organisation, where the knowledge gains its economic and competitive value (Hendriks 1999; Cabrera & Cabrera 2002). According to Davenport and Prusak (1998), there are numerous factors which hinder knowledge sharing in an organisation, i.e. the lack of trust, cultural and geographic barriers, lack of motivation, not enough grasping done by recipients.

To ensure the success of Knowledge Sharing amongst employees, the organisation's culture has to be a "knowledge-friendly" (Davenport, De Long & Beers 1999). McDermott and O'Dell (2001) argued that for overcoming the cultural barriers organisations have to build their whole Knowledge Management approach to fit their culture, as culture is often rooted in the core values and assumptions. Making direct correlation between knowledge sharing and the organisational business goals, results or problems leads to successful implementation of knowledge management in an organisation.

One of the key challenges for knowledge-sharing is to motivate members to participate and contribute knowledge to the organisations benefit (Hendriks 1999). The best way to motivate knowledge sharing is if the people understand that it will help in the overall development of the organisation and have personal benefits like awards and recognition. As Gurteen (1999) mentioned, knowledge sharing is about improving the way things are currently done by sharing the small things.

2.3 The Impact of ICT on the Knowledge Sharing Culture

There is little doubt that ICT can help reduce some of these barriers as it is a key component of establishing a knowledge-sharing culture (Pan & Leidner 2003). ICT helps facilitate the flow of knowledge (Hendriks 1999), by improving access and speeding up business processes. Specifically, ICT facilitates the creation of knowledge repositories that provide employees with access to relevant information in a short time period (Walsham 2001; Riege 2005). Such information may include directory lists, organisational and personnel policies, organisational records and also external information in the form of news websites which keeps employees up to date with the business environment (Stoddart 2001). Another benefit of ICT is that it helps enhance long-distance collaboration between employees and teams (Walsham 2001; Riege 2005).

Many researchers, however, cautioned against the usage of ICT as a "silver bullet" to foster a knowledge sharing culture in an organisation. Technology only provides the means to an end – people have to be motivated to share knowledge (Stoddart 2001). More importantly, Riege (2005) stressed that ICT must provide a close fit between the organisation and its employees; otherwise this may cause new ICT-related barriers to appear instead. Therefore, effort has to be made to understand the organisations culture and context in which the knowledge is used for successful use of ICT (De Long & Davenport 2003).

Corporate leaders have long realized that by inculcating the knowledge sharing culture within their organisation, and by using an ICT-based infrastructure to sustain it, they could attain a competitive edge in the marketplace. For example, Buckman Labs' Knowledge Management System (KMS) allows organisational and technical solutions to be shared amongst their employees worldwide. Pan and Leidner (2003) gave an interesting account of a manager who asked for help through the KMS during a sales pitch for a USD 6 million dollar project. Employees from 6 other countries in the world responded to the request with helpful hints and suggestions, allowing the manager to secure the deal.

Davenport and Volpel (2001) reported that Hewlett Packard (HP) launched several ICT knowledge sharing projects within the organisation. The initial project allowed employees to share sales and services information with their dealers. Subsequent projects made it possible for employees to share product development information, locate expertise and learn about educational offerings from HP's training community.

Another case discussed by Davenport and Volpel (2001) involved the electronics and electrical engineering powerhouse, Siemens. Siemens' middle managers from diverse business units started the knowledge sharing initiative by creating repositories and building communities of practice that facilitate the sharing of important information within those business units. A centralized corporate group was later set up by senior executives to facilitate and enhance these efforts.

Finally, Nielsen and Michailova (2007) reported several case studies of ICT-based knowledge sharing projects in their study. The most prominent would be the case on Skanska, a multinational corporation (MNC) involved in the construction sector. Skanska has developed a system which contains a knowledge repository of projects that they have undertaken and a network which facilitates the sharing of this information. This is achieved via a back-end database and a front-end retrieval system similar to a Yellow Pages directory. The second case study involved CSC Global, an MNC involved in systems design which has developed a web-based portal to facilitate knowledge sharing. The portal gradually became the focal point where employees gain access to both internal and external information. Internal content is comprised of knowledge of best practices, solution to problems and industry insight and is shared between employees and their clients. External information is sourced from the web, newspapers, Reuters etc.

As for the non-profit sector, one of the success stories of a knowledge sharing project is Community Exchange in Ireland. Community Exchange is an online community information network platform launched with the initial purpose to encourage Irish non-profit organisations (NPO) to increase their IT capacity and Internet usage. The project was so successful that the number of subscribers increased from 50 people in late 1999 to more than 3600 people in 2004. Subscribers consist of people associated with the NPOs (i.e. staff of NPOs and government departments, volunteers). Gradually, it became a portal which allows subscribers to share information. To date, Community Exchange has an online subscription service, an information submission form, a simple content management system and a directory of Irish NPOs. It also has an email bulletin which circulates news and items of interest to subscribers (O'Donnell & Ramaioli 2004).

3. RESEARCH DESIGN

3.1 Organisation Background

The Research & Development manager of an NPO approached us, the research team, to undertake a pilot study, leading to a working prototype, on one of its service area, which functions as a provider of social services to adults. Due to confidentiality reasons, the names of the organisation and its service area shall remain anonymous in this paper. From here onwards, we'll refer to the non-profit organisation as "the NPO" and the service area involved as "AS". The NPO was funded by several different bodies. At the end of each funding cycle, the NPO is required to present a report to every funder on how it uses the allocated funds. Further, the report has to be in an acceptable format to each funder – this becomes a major issue because each funder has its own unique reporting system.

The ultimate objective of the NPO was to have an effective knowledge sharing system – what they need to do to achieve this target is still poorly defined. What is made clear to the researchers from the outset was that the NPO wanted the solution to be people-centric – they wanted to retain an empowered workforce, whereby the solution must not be seen to be imposed on, but rather to be embraced by the workforce.

3.2 Identification of the Underlying Issues

Because of the ill-defined project issues, coupled with the need for flexible solutions which would accommodate the needs of the workforce, we adopt the Soft Systems Methodology (SSM) in problem investigation and solution design (Checkland 1999; Mingers 2000; Jackson 2003). SSM explicitly acknowledges that actors within an organisational situation validly see that situation from differing perspectives.

Using SSM will allow the research team to identify the real issues that need to be tackled from the key stakeholders' point of view, with the aim of being able to recommend the desirable changes and organisational learning that will enhance the NPOs services to its clients. The methodology is also important to enable the researchers to develop a well-tailored system with as little implications as possible for all stakeholders. As research team members collect information, they priortise the main problems that need addressing, with feedback from the stakeholders as they progress through the different stages of the project. SSM is a proven methodological approach to solving real world problems such as the one being faced by the NPO (Shalhoub & Qasimi 2005; Bhattacharjya & Venable 2006). The result of the approach is shown in the form of a rich picture.

Due to the unstructured nature of the issues faced in the AS service area, the research team first set out to define the requirements of the project. They conducted informal group and individual conversations, semi-structured interviews, document analysis and finally, observed the daily operations of the service area. All semi-structured interviews were voice recorded and information gathered during the preliminary survey interviews was compiled. While conducting the data collection, the research team ensured that the NPO's core concern about their workforce was addressed. During communication with the NPO's staff members, the research team clarified that the purpose of pilot information collection, storage and reporting system is to support the workforce and should not to be seen to be imposed on current work processes. The data collection was conducted in a timeframe of 2 months and included interviews with 16 stakeholders from various areas/units.

3.3 Design Context

The findings of the data gathering (interviews, document analysis, observations, survey and focus groups) reveal severe shortcomings in terms of information collection, storage, sharing and report generation in the AS service area. The research team developed a Rich Picture of the current situation of the AS service area, which provided the foundation for the requirements of the prototype Knowledge Sharing System. SSM assists the research team in identifying the key perspectives of the problem. What we found was not unlike the problems faced by NPOs discussed in Section 1 of this paper. From the analysis of the rich picture, there are 2 core issues that the research team must address:

1. **Firstly, there is a need for multiple staff of different service areas of the organisation to have their own unique interface of the system, and each interface has to be user-friendly, ideally suited for computer beginners.** This issue stems from 2 difficulties identified from the rich picture – each service area must to effectively report their usage of funds in the prescribed format of each funder. Funder provided databases (multiple exist) are inadequate in capturing the required information for internal reporting, could not export information from or into these databases, requiring multiple entry in some instances of information. Secondly, a broad range of computer literacy skills exists with the organisation, from beginners at one end to expert level users at the other end.
2. **Next, top-level management of the NPO demanded a consistent, unified view of activities of each service area. There is a lack of consistency of filing (electronic and hardcopy) systems across the whole organisation making document searching and retrieval very difficult.** Multiple network drives exist across multiple servers throughout the organisation. People in each area of the NPO did not identify as working for the organisation as a whole, or for a particular service area for that matter. Members (paid or voluntary) believed they worked for a particular programme, rather than working for service area or the NPO as a whole. This has proven to be problematic for top and middle managers and staff when staff needs to be moved to another area within the organisation. It has also created problems for clients and other organisations, particularly funders, dealing with the NPO.

Delving deeper into these core issues, the research team then designed the requirements for the Knowledge Sharing System. The research team had to build a consistent and user-friendly Knowledge Sharing System for the entire organisation. The system must also be easily accessible and built on top of the existing ICT infrastructure in the NPO. Therefore, the following features were identified:

1. Support of an easy-to-use, web-based user interface;
2. Job position specific user interface;
3. Accessible from any PC with an Internet/Intranet connection and Internet Explorer 6+;
4. Centralised data storage by utilising a database within the system.
5. Provision of system functionalities to collect, store and access information electronically;
6. Tailored to the existing processes and comply with the existing ICT infrastructure of the NPO
7. An easy and simple user interface to accommodate the varying computer skills of the NPO's staff members;
8. Detailed search functionalities for specific client information;
9. Automated statistics and report generation to different funders.

To validate these requirements, the research team developed some preliminary user interface screens for one specific job position and proceeded to collect preliminary feedback from the staff members for the prototype through follow-up interviews. The interviews reaffirmed that there were inconsistencies in information collection, storage and retrieval, which impairs staff members' ability to share knowledge. There was also an intense desire amongst the staff members interviewed to have a common user interface for information entry and retrieval across these systems.

4. DESIGN OF A KNOWLEDGE SHARING SYSTEM PROTOTYPE

The Knowledge Sharing System provides a web-based user interface which NPO staff members can access through a PC with Internet Explorer 6+ and Internet/Intranet connection. The system utilises a web server and database for the information collection, storage and retrieval functionalities, as shown in Figure 1.

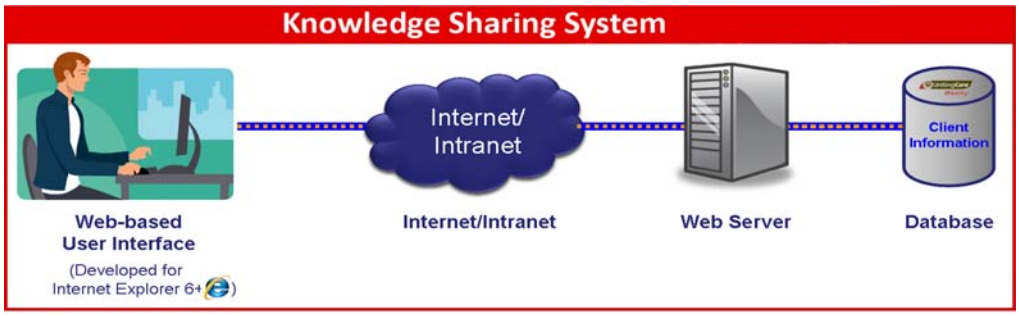

Figure 1. Knowledge Sharing System Overview

4.1 Systems Development

System development started from May to September 2008. The prototype was developed using PHP as scripting language and MySQL as database since the team was experienced with these technologies. The project team utilised the available technical infrastructure of the lab at this stage of the prototype development. This enabled a fast development process so the project team could discuss the systems logic and user interface with the target users early in the project timeline. At the end of June, the AS staff was given the opportunity to utilise the system for two weeks, in order to get a first impression of how the system will reflect their daily work. At this stage, the prototype was ported to the virtual server which was set up at the NPO for this project. The feedback received from this testing was incorporated in the development of the prototype. The prototype was ported from PHP to ASP.NET in terms of utilised scripting language and from MySQL to MS SQL 2005 as the database to comply with the requirements from the NPO since these technologies are used. Once the prototype stability was established, the port was carried out over four weeks. At the end of August the prototype was running under ASP.NET and used a MS SQL 2005 database. The first two weeks in September 2008 were used to test the prototype with real client data. Any feedback from this trial was either incorporated into the prototype or noted down as a requirement for the final product.

4.2 Systems Architecture

This section describes the architecture of the prototype, beginning with the system requirements as established in the first phase of this project. The Client/Server Architecture of the system is then discussed.

4.2.1 Client/Server Architecture

The client information management system community is based on a multilateral client/server architecture, providing information collection, storage and access to the Kuitpo Community Programmes. The client/server architecture is illustrated in Figure 2.

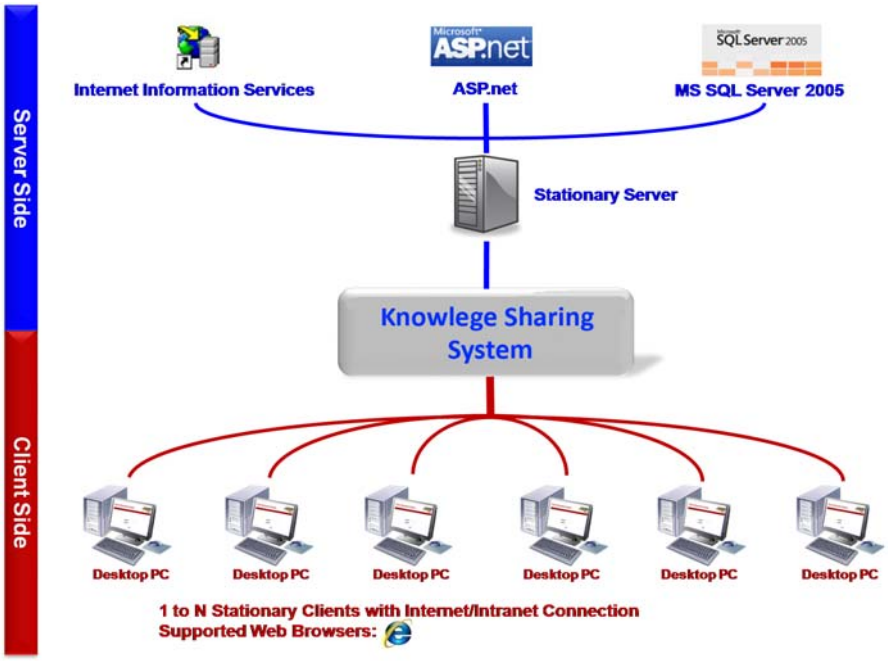

Figure 2. Client/Server Architecture of the Prototype

The project team used a virtual server for the prototype which was set up within the NPO's infrastructure. The application handling and data processing of the client information management system is handled by the virtual server using:

- ASP.NET Framework;
- Integrated Information Services (IIS);
- ASP Version 1.0 and higher; and
- MS SQL 2005 as database server for user and content management.

The prototype can be accessed via stationary computers with an Internet/Intranet connection using Internet Explorer 6+.

4.2.2 Prototype - Server Side

The prototype provides web-based applications for the client information management using a HTTP web server installed on the virtual server. The popular scripting language VBScript was used to provide a high degree of interactivity and flexibility within the prototype. VBScript enables the development of dynamic web pages, whereas 'plain' HTML can only provide static web pages. In addition, database interactions can be coded in a VBScript thereby enabling the dynamic generation of a web page using the content of the database in response to a client request.

A database management system is used to ensure data integrity and consistency and dynamic content generation within the prototype. MS SQL 2005 was used as the database server since it is part of the NPO's technical infrastructure. It supports multiple users and can easily be integrated with VBScript. Installed on the virtual server, MS SQL 2005 is used in this developed prototype to store and manage data such as user profiles, administrative and client information. The prototype's database contains tables for user profile, client information and administrative data. The prototype uses a Two Tier Architecture, consisting of two layers: an application and a data layer. This kind of architecture was chosen because it provides a simple and clear way of separating the client side (user interface/application logic) from the server side (database management system). This approach is commonly used in non-complex and non time-critical information systems. The applications of the prototype are provided through web pages including embedded VBScripts. All information is handled and stored by the MS SQL 2005 database management system in the second tier: the data layer.

4.3.3 Prototype – Client Side

The client side of the prototype is designed to provide the user a high degree of flexibility, clarity and ease of use. Multiple users can access the prototype simultaneously to enter or retrieve client information. The prototype is tailored for use with Internet Explorer 6+ but is also accessible with other common web browsers such as Firefox, Opera or Safari. Users can access the prototype through a specific URL in Internet Explorer.

4.3 Prototype Implementation and Testing

The Knowledge Sharing System prototype was developed to improve the current processes in collecting, storing and accessing information and generation of reports and statistics. The prototype allows users to enter and store client information into a central database using a web user interface. Once entered, client information can be retrieved through a broad range of search functions and filters. The prototype provides functions to generate statistics and reports.. During the prototype design, the project team considered the requirements of a simple and easy-to-use system, as voiced by various NPO staff members. Testing the system was conducted in two phases. The first phase allowed staff members to accommodate themselves with the new system without having to enter real client data and was conducted from the end of July to mid-August. The purpose of this phase was to receive feedback from the user including feedback on user interface, usability, completeness and readability of the system. The first test phase lead to some minor bug fixing, added forms and some small adjustments of the Knowledge Sharing System.

The second test phase, the systems test trial, was conducted in the first two weeks of September 2008. The staff members were instructed to enter the current client data into the system, starting with client information from the Evaluation Officer over to the Counsellors and After Care Worker. The trial helped to identify existing errors in the logic of the system and delivered insights into the current working processe—s o in terms of who needs access to what kind of data and who is collecting what kind of data. All reported bugs and some additional features of the systems have been addressed during the test phases. Any recommendations for additional features of the system which were beyond the scope of the project have been documented and are compiled in the section of requirements for a final product.

4.4 Post-Implementation Feedback

The research team conducted post-implementation interviews with all of the stakeholders within the NPO. Initial results of the interviews were encouraging – the implementation and deployment of a Knowledge Sharing System addressed the core issues identified through the SSM in the preliminary stages of the project. In addressing Core Issue 1, staff in the AS service area was happy to gain access to a customised user interface which displays only job position specific functions, and yet has the capacity to generate automatic statistics and reports to various funders.

With regards to Core Issue 2, the manager of the AS delivery area has expressed his appreciation that he had access to a unified electronic information storage and access, which enabled him to retrieve consistent and complete client files, reducing redundant and unnecessary work processes such as repeated gathering of the same client information. In addition, the system provided staff members with a greater transparency of clients across multiple service areas, leading to improved knowledge sharing. Staff members had better knowledge of the NPO as a whole, and also started to learn more about other service areas within the NPO. This improvement ensures easier transition of staff members from one service area to another within the NPO.

Apart from addressing the core issues, further benefits were reported. Because there is a unified system architecture from the server-end, each service area will have higher agility to respond to new information requirements from funders. All that is required are modifications to the reporting format on the client-end of the Knowledge Sharing System and the information is automatically laid out to fulfill the new reporting format.

5. CONCLUSION

We have reported the design of a Knowledge Sharing System prototype in an NPO. Using SSM as a starting point, the research team formulated a set of system requirements and followed it up with the development, implementation and testing of a prototype. Based on the feedback obtained from the post implementation interviews, the research team appeared to have successfully addressed all of the issues raised from the beginning of the process. The stakeholders found that the prototype helped them effectively obtain client feedback and reviews, report to multiple funders and coordinate inter-employee responses to storing and archiving knowledge.

Another interesting fact that we would like to point out is that the use of SSM as an underlying approach to this research benefited not only the researchers, but also the stakeholders of the organisation. With this approach, stakeholders were able to understand each other much better and could achieve consensus to progress towards the successful implementation of the Knowledge Sharing System. In that sense, the methodology used assisted in the process of consensus building, and resulted in a prototype which was widely accepted across the AS service area of the NPO.

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