KNOWLEDGE WORKER SUPPORT SYSTEM (KWSS) FOR PUBLIC SECTOR FRONTLINE STAFF USING CASE BASED REASONING (CBR)

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ABSTRACT
This paper describes the design of the Knowledge Worker Support System (KWSS) for public sector helpdesk using Case Based Reasoning (CBR). It is designed specifically to support public sector frontline staff for delivering solution to a public. In this paper, we proposed the use of a CBR technique to support the design of KWSS for solving the problems by adapting previously successful solutions to similar problems.

Keywords
Case Based Reasoning (CBR), Knowledge Worker, KWSS.

1. INTRODUCTION
In this paper, we suggest the use of a case based reasoning (CBR) technique. CBR solves new problems by adapting previously successful solutions to similar problems [1]. It is a cyclical process comprising: retrieving the most similar case, reusing the case to attempt to solve the problem, revising the proposed solution if necessary, and retaining the new solution as a part of a new case [2]. In the context of KWSS, CBR can be applied to assist the decision-making process. On the other hand, the CBR technique can serve for the effective reuses of public sector frontline staff to delivery the solution. Using the proposed framework and a CBR tool will help supporting knowledge transfer strategies between frontline staffs.

The KWSS is likely to become more common as an application of information retrieval. It is designed to provide an integrated set of support tools for a specific target problem group, who are characterized by the tasks they perform. The target users are all frontline staff engaged in public sector. The main aim of the KWSS is to provide a comprehensive set of functions for the support of the public sector frontline staff in a way that is easy to learn and use. The KWSS has been designed to run on high performance workstations, which have a large, a powerful CPU and several megabytes of RAM. This has made it feasible to design an ambitious, advanced system using powerful user interface techniques. It is also assumed that, at each user site, a local area network connects workstations to various servers, including a file server on which a shared database can be stored, and a gateway to a wide area network, which facilitates electronic mail and access to public databases.

The aim of our work within the KWSS is to design a common query language, query support facilities and browsing facilities that can be conveniently used to retrieve all the different kinds of data that will be available to problem that been asked. Our work has had a practical, concrete goal and was not aimed at tackling any specific research issue. In this paper, we describe the functionality of CBR to give solution for public using CBR technique.

This paper also describes the case-based reasoning and its cyclical process. It also state of the art of CBR or knowledge-based systems applied to KWSS. Finally, we will state conclusions and future research orientations.

2. RELATED WORK
2.1 Knowledge Worker
Knowledge workers are becoming an increasingly important segment of the workforce. We have evolved from an industrial economy to an information economy, which is based on intellectual capital and the knowledge worker. In today's world, knowledge workers play a major role in the success of an organization and the management of knowledge has become as important as the management of physical assets [3]. However, while key workers in organizations have become knowledge workers, very little is known about managing this group of workers.

The term "knowledge worker:, coined by management guru Peter Drucker, generally describes an employee whose job activities are associated with the refining, manipulating and trading of information. They possess specialized skills and training, which they have acquired by investing significant resources (time, money) towards their education [4]. Most importantly, knowledge workers are empowered and have the autonomy to make decisions that have far reaching consequences for the organization for which they work.

Another term associated with KWs is that of "service workers", wherein the product is produced and consumed simultaneously

(e.g. call center representatives), unlike manufactured products, which are produced at one time and consumed at another time [5].

An alternate technical dictionary definition of KW is "anyone who works for a living at the tasks of developing or using knowledge" [6]. By this definition, some of the tasks for which a KW could be in charge are: planning, acquiring, searching, analyzing, organizing, storing, programming, distributing, marketing, deciding, and numerous other tasks that require transformation of information from one form to another in order to produce the final "product". By this broader definition, examples of KWs may include: managers, engineers, accountants, lawyers, financial analysts, system analysts and programmers.

Although KWs share some work characteristics, there are some distinct and potentially important differences. For instance, the path between manual workers and KWs is a continuum where many jobs contain elements of both task types. Drucker defines KWs that do both manual work and knowledge work as "technologists" and suggests that they may be the biggest and fastest growing single group of KWs [7]. [8], for example, groups KWs into three classes:

(1) Creation of knowledge work, based on innovation. These workers, such as engineers, managers and inventors, depend on innovation to do their work. They are not doing a pre-established task, but rather they define and perform their task for the very first time. They create tools that will be used by other KWs to do their jobs.

(2) Portable knowledge work, based on wide, immediate utility. These workers possess knowledge that they can apply in a general manner. They can use their knowledge in various scenarios or organizations. Examples of this class are graduating MBAs and software programmers. These workers use their general knowledge to run operations or use previously designed tools to do their job. In that regard, as opposed to the "Class 1" workers, they use their knowledge to perform a task that has been previously established.

(3) Specialty knowledge work, based on narrow but high utility. These workers have a specific knowledge that is needed to perform a task. They are considered experts at what they do, and possess knowledge in applications that are specific to the task they do and their knowledge is not easily transferable to other areas. An example of this type of worker may include programmers that write code in a proprietary language.

Some of the key technologies that can help organization facilitate knowledge workers must have these characteristics:

- It empowers employees to quickly and easily manage access, create, share and act on information any time, any place and on any device. Employees should have single access to analytical and collaborative tools; database and data analysis on desktop and mobile devices; and a unified tool for calendar and email, accessible from all devices.
- It can increase organizational knowledge through collaboration, by integrating content management, tracking and analysis systems. This involves easy to use and easy to manage development tools, integration with back-end and legacy systems, and high levels of security and authentication to protect organizational data.
- The technology itself facilitates culture change. People are more likely to look things up if information is easy to access. They are more likely to involve and use the experience of others if others are easy to contact. They are more likely to follow correct procedures if procedures are easy to follow.

2.2 Case Based Reasoning

CBR is a computer technique, which combines the knowledge-based support philosophy with a simulation of human reasoning when past experience is used, i.e. mentally searching for similar situations happened in the past and reusing the experience gained in those situations [9]. The concept of CBR is founded on the idea of using explicit, documented experiences to solve new problems. The decision-maker uses previous explicit experiences, called *cases*, to help him solve a present problem. He retrieves the appropriate cases from a larger set of cases. The similarities between a present problem and the retrieved case are the basis for the latter's selection [10].

Figure 1 show the process involved in CBR represented by a schematic cycle. In CBR, the knowledge cases are structured and stored in a case base, which the user queries when trying to solve a problem. Actually, a new problem is matched against historical cases in the case base using heuristically cased indexed retrieval methods with one or more similar cases being retrieved (in fact the system evaluates the similarity between each case in the case base and the problem. The most similar case(s) are presented to the user as possible scenarios for the problem at hand).

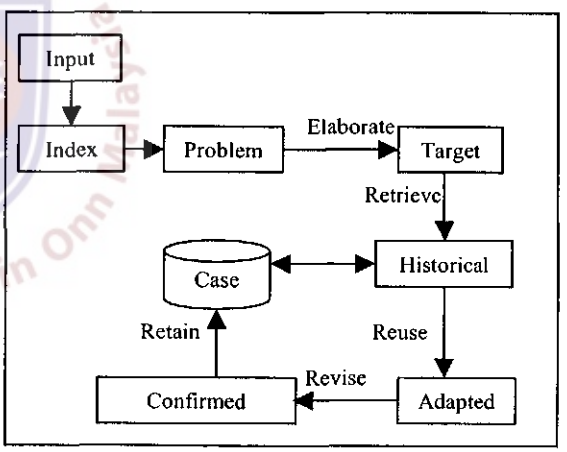

Figure 1: The CBR cycle, adapted from Choy et al. 2003.

A solution suggested by the matching cases is the user decides if the solution retrieved is applicable to the problem. At this stage, if the best-retrieved case is the best match, then the system has achieved its goal and finishes. However, it is more usual that the retrieved case matches the problem case only to a certain degree. In this situation, the closest retrieved case may be revised using some predefined adaptation formulae or rules. Many of the most successful CBR systems however do not perform adaptation. They either simply reuse the solution suggested by the best matching case or they leave adaptation to people. When the user finds a solution (automatically or manually), and its validity has been

determined, it is retained with the problem as a new case in the case base for future reuse [11].

From a technical point of view, there are many arguments supporting using CBR against other knowledge-based methodologies [12]. Researchers have claimed that CBR provides the potential for developing knowledge-based systems (KBS) more easily than with rule- or model-based approaches. They argue that the concrete examples provided by cases are easier for users to understand and apply in various problem solving contexts than complex chains of reasoning generated by rules or models and that record-like representations of cases used in some CBR systems allow for straightforward storage in relational databases and entry and update by end users. As a result it combines the efficiency of data management and retrieval of database systems with the intelligence and the power of inference engine of KBS. Another benefit is that the presence of the validation and update steps provides a framework for learning from experience, thus incorporating knowledge acquisition as part of the day-to-day use of a CBR application [13]. However CBR may not be as effective as rule- or model-based approaches for applications where theory, not experience, is the primary guide to problem solving, and where solutions are unique to a specific problem instance and not easily reusable [13].

3. RESEARCH MODEL

Research model that we choose is knowledgeable officer who serves at front help desk in government's department. Public people will meet them and explain the problem that they have to be solved by that knowledgeable officer. There are many kind of problem can be discussed either problems, questions, just to know and so on. The knowledgeable officer must solve that kind of problems. Perhaps that officer can give a solution, idea, information, knowledge to the people who ask. Figure 2 show the flow of action at public help desk. There are many situation can disturb this serving process.

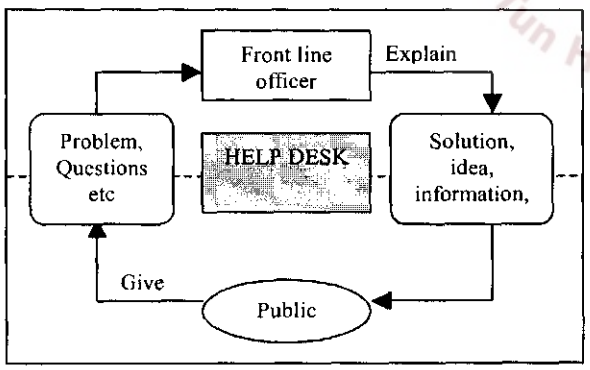

Figure 2: Flow of action.

Situation 1: Problem Repetition

This situation explains when problem A (*Pa*) that rise is a repetition problem. That means this *Pa* have been rise by other people before this. The questions to be discussed are:

a) Is that officer still remembering about the solution to *Pa* that rises before this?
b) Is a Pa need similarity solution?

Situation 2: Officer Changing or Transferring

These situations explain if any have transferred an officer B (*Ob*) to another unit. These means officer C (Oc) will replace *Ob*. *Oc* needs to give a training by attend the some courses how to interact with client, communication and so on. He/She also need to know who the responsible officer is, if the problem can not be solving by *Oc*. The questions to be discussed are:

a) How problems that solve before this by *Ob* can be inform to *Oc*?
b) If responsible officer has transferred to other department, how *Oc* can refer to solve a problem?

Situation 3: New Problem

These situations explain if a problem rise is a new problem (*Pn*). Of course an officer will forward this *Pn* to responsible officer to be solved. The questions to be discussed are:

a) How do *Pn* to be store for future reference?
b) Is that *Pn* having relevance with problem before that?

From those situations above, it can effect to delivery process to public and it will be not efficient. Hence, give rise to assumption delivery process at frontline helpdesk will trough many of bureaucracy processes.

4. RESEARCH OUTCOME

Figure 3 show the process delivery a solution at frontline helpdesk using CBR technique. This technique enables an officer access the problem that happens before through case base. If the problem has been solve before, an officer just to access the case base and retrieve that problem and reused the solution. If the problem that rises is a new problem, officers need to store that problem and it solution into case base.

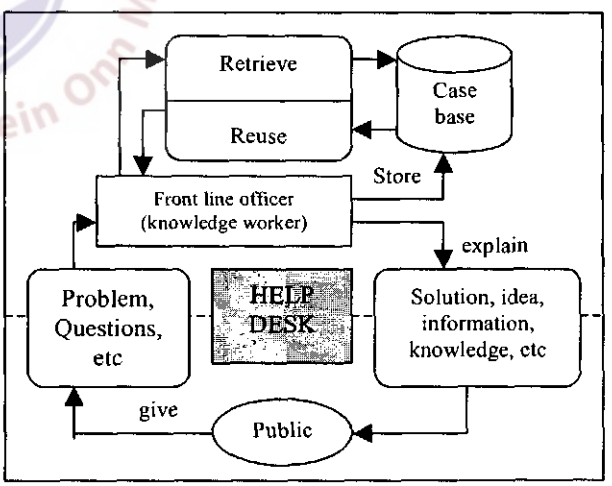

Figure 3: Flow of action at a public help desk using CBR technique.

Illustrates a CBR scenario where a system user is retrieved with the task of finding a solution for a query problem or case. Suppose that for the Query Case, a certain number of base cases (Base Case 1 to Base Case n) have been retrieved from the case

base. The system users job then is to evaluate the problem-solving potential of these cases and to apply (if necessary adapt) the solutions provided by these cases to the query case.

As conclusion, this technique will be easy to deliver the solution if that problem that rise in the future. Three situations the mention in section 3.0 can be solve.

5. KWSS IMPLEMENTATION

To undertake a CBR project it is important to set up a clear development procedure. The steps for developing a KWSS are usually as follows:

Step 1: Knowledge Acquisition:

In this step, every effort is made in order to understand the problem domain and the symptoms. Information about the diagnostic of the problem and the solutions adopted are also collected in this step. For KWSS implementation, this means (a) conceptually defining a business process that needs to be redesigned, (b) identifying the goals and targets behind the redesign effort, (c) defining the rules to apply to redesign the process and (d) the technical or organizational solutions adopted as a result of the redesign. A complete study should also include interviews with experts and consultants and a collection of some initial cases.

Step 2: Case Representation:

In this step, the software to be used for knowledge representation should be selected. The next step is to describe the case.

Step 3: System Implementation:

This describes the final system including the database of cases and the indexing and retrieval process within the chosen software.

Step 4: Verification and Validation:

In this step, some informal verification and validation should be conducted [14]. Verification aims at "demonstrating the consistency, completeness and correctness of the software" [15], that is, it aims at "building the system right" [16]. Hence, the question posed in verification is: "do the cases correctly represent the experience and knowledge we obtained?" Validation is the "determination of the correctness of the final program or software produced from a development project with respect to the user needs and requirements" [16]. This implies showing the system to practitioners not involved in the development of the system and see whether they are satisfied of the tool or not.

6. CONCLUSION AND FUTURE WORK

According to a study conducted with front line helpdesk at public organizations, the practice of delivery service starts by acceptance of asking then give the solution. Then if they do not know they refer to officer who responsible. In this paper we have discussed the use of CBR for the reuse of previous problem or case to solve future similar problem. This includes collecting the problem or case and storing it into the CBR case base and making it available so that case can be shared, adapted and applied to new situations at future. We have demonstrated the three situations through current process of service delivery at frontline helpdesk that applying CBR is possible for highly increase in service delivery in the following way: knowing the problems those need to be addressed, similar problems might be retrieved to find out which best practices have been applied and which technical and solutions were adopted. CBR can help in finding a problem or case, with a similar problem before and similar applied rules. We have also explained how the CBR tool can support knowledge worker by collecting, storing and making the information available to practitioners to be used.

For future work, our orientation is to develop the integrated yet workable mechanism in ensuring the valuable information and knowledge of the frontline staff can be shared and control across organizations where it can contribute to the conciseness of a particular solution.

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