

Developing a help-desk system for a multi-purpose ICT platform in a marginalised setting

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Abstract

Attempts to bridge the digital divide have led to the deployment of ICT platforms in remote marginalized rural areas. However, with the increase in the distribution of information technology platforms, the requirement for end user support within the rural ICT platform infrastructure has increased. In order to provide essential, effective and continuous support to such rural environments, which have few or non-existent ICT skilled people, an intelligent help-desk system needs to be developed, implemented and tested. This paper describes conceptual design of Case Based Reasoning methods to develop an intelligent help desk support system for a geographically distributed multi-purpose ICT centre in Dwesa, a rural remote area in the Transkei region, Eastern Cape Province, South Africa.

Keywords: Case-based Reasoning; Knowledge Management, Expert Systems, Help-desk systems

I. INTRODUCTION

The Dwesa distributed multi-purpose ICT application centre is currently at incubator stage with technical and financial support being provided by the Telkom Centre of Excellence in Developmental E-Commerce at the university of Fort Hare in collaboration with Rhodes University. Services currently available to the community include applications such as e-Government, e-commerce (a virtual shopping mall allowing users to sell their products online), e-health, a police reporting portal, computer literacy training-learning, printing services and soft telephony services via VOIP phones. This service platform is provided through an infrastructure of wireless networking (VSAT for internet backhaul and WiMAX for local loop backbone) technologies across four points of presence implemented at schools.

The ICT centre is operating with positive participation from the local community and researchers from the above mentioned universities, however local users sometimes face problems ranging from hardware to software related issues. Under such a set up, responding timely to the problems faced becomes an issue since the network administrators are university academics located more than 300km away. Local community users are forced to resort to making phone calls to report the problems and get instructions on how to solve them. This tends to be time consuming and costly considering the location and the high unemployment rate within the

community. In order to provide consistent and reliable support to such a rural setup, an intelligent help-desk system needs to be developed, implemented and tested. This in turn will foster sustenance and optimum utilisation of the ICT centre resources by the community after release from the incubator stage.

II. BACKGROUND AND RELATED WORK

Although there are a number of commercial case-based help-desk applications available, they are costly, tailor-made (to a specific type of application) and are less adapted to multi-purpose ICT application centres where user requirements are essential in the formulation of the cases.

Most help desk systems are based on Knowledge Engineering (KE) principles; KE is a field within artificial intelligence that develops knowledge-based systems through efficient capturing and validation of an expert's knowledge [2]. The resultant is called knowledge-management systems which contain large amounts of knowledge, rules and reasoning mechanisms to provide solutions to real-world problems.

Common problem-solving approaches in knowledge engineering are rule-based reasoning, model-based reasoning, and case-based reasoning [7]. Knowledge engineering is an ongoing process and research has shown that Case Based Reasoning (CBR) is suitable for developing help desk systems for domains with commonly occurring problems due to its capability to map old solutions to new cases [5]. The diagram below shows the Case Based Reasoning Cycle.

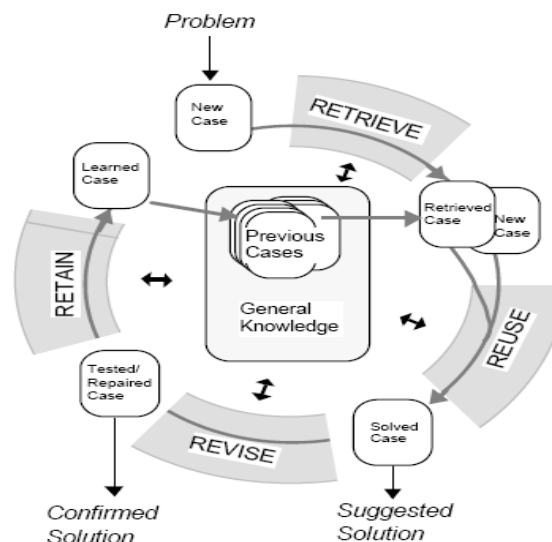


Figure 1: The CBR Cycle, adapted from Aamodt & Plaza, [4]

Figure 1 is summarized as a series of the following steps.

1. **RETRIEVE**-retrieval of similar cases.
2. **REUSE**-reusing the legacy case database to attempt to solve the current problems.
3. **REVISE**-revise the proposed solution.
4. **RETAIN**-retain the new solution as a part of a new case.

The following section outlines the System development process in creating a Case Based Reasoning system. The sections are categorized as: Knowledge acquisition, Knowledge representation, System Implementation and Verification and Validation [5].

III. SYSTEM DEVELOPMENT

Knowledge acquisition

Research tools such as questionnaires, interviews and observations will be used to collect data for our initial case base. This will be an ongoing process with new questionnaires being structured on a regular basis to take note of the common problems and new problems which might arise. The above mentioned techniques will be applied on internal (Dwesa research team) and external experts (ICT trainers and telecentres operators) as well as on local users. An analysis of the problems faced by the various users is done in order to determine the range and limits of our case base and related solutions applicable to our study area [1]. Solutions found in operating system based built in help desk software for desktop applications will also be considered.

Knowledge Representation

A Case based reasoning system relies heavily on the structure and content of the collected cases; hence good knowledge representation methods are critical to the accuracy and openness of proposed solutions. Indexing is one technique used for efficient organization of the memory when storing the cases. The indices used should be predictive, specific and abstract enough to allow for later matching of similar cases as well updating the case base in the future [3]. Various indexing, retrieval algorithms will be tested to determine the best indexing for efficient searching and retrieval of cases.

System Implementation

The Open Source based **LAMP** [6] solution stack of software is used to implement the Case-Based Help Desk System. The solution stack is freely available, flexible and has extensive support from the developer community.

Verification and Validation

Rapid prototyping as an action research approach will be carried out in order to test the overall usability and reliability of the Help desk system. At least three prototypes should be developed with the first one being expected to be up and running by September 2008.

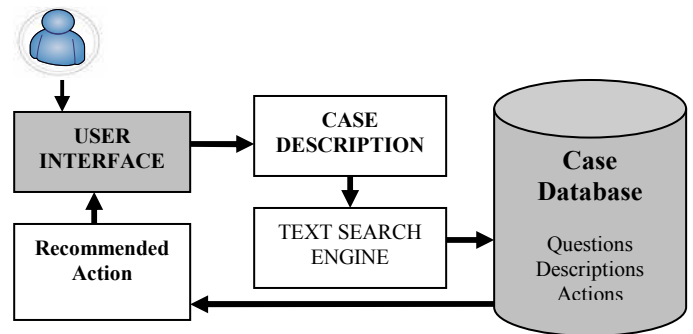


Figure 2: Overall architecture of the Help desk System, adapted from Chan C.W et al, [3]

IV. CONCLUSION AND FUTURE WORK

At present, knowledge acquisition is underway while system implementation, validation and verification are future work. We intend that the help desk system should help unskilled and semi-skilled rural users to benefit from the computer services by offering consistent, essential and reliable assistance. Main emphasis should be on the user interface with features such as a virtual navigation tool which helps users position themselves at a particular stage when solving the problem. Such a feature will assist a user to roll back when stuck during problem solving. We recommend that our Case based system design should take advantage of common built-in help-desk solutions provided in desktop computer applications. The case based system should also be flexible enough to adapt in any telecentre or similar ICT facility which developing countries are striving to develop within communities. Once the proposed text base help desk prototype becomes a success, it would help in the development of a conversational based help desk for the semi-illiterate rural folk.

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