

# Knowledge Based Helpdesk System in Nuclear Malaysia

Mohamad Safuan Bin Sulaiman<sup>1</sup>, Abdul Muin Abdul Rahman<sup>2</sup>, Norzalina Bt. Nasirudin<sup>3</sup>,  
Khairiel Adyani B. Abd. Ghani<sup>4</sup>, Abd. Aziz B. Mhd. Ramli<sup>5</sup>, Mohd. Ashhar B. Hj. Khalid<sup>6</sup>

<sup>1</sup>Malaysian Nuclear Agency, Malaysia,

<sup>1</sup>[safuan@nuclearmalaysia.gov.my](mailto:safuan@nuclearmalaysia.gov.my), <sup>2</sup>[muin@nuclearmalaysia.gov.my](mailto:muin@nuclearmalaysia.gov.my), <sup>3</sup>[norzalina@nuclearmalaysia.gov.my](mailto:norzalina@nuclearmalaysia.gov.my),  
<sup>4</sup>[khairiel@nuclearmalaysia.gov.my](mailto:khairiel@nuclearmalaysia.gov.my), <sup>5</sup>[azizramli@nuclearmalaysia.gov.my](mailto:azizramli@nuclearmalaysia.gov.my), <sup>6</sup>[ashhar@nuclearmalaysia.gov.my](mailto:ashhar@nuclearmalaysia.gov.my)

## ABSTRACT

Knowledge based (K-based) Helpdesk system is a knowledge oriented web based system that provides support to business process of the technical service providers. It is a multi-centric system which focuses on end-users, technical workers and higher level management through utilization of knowledge which resides and grows within the system. The objectives of the system are to be a user-friendly, capture technical knowledge for efficient performance and educating users for self reliance. These were achieved through the improvement of the helpdesk business process and better management of technical knowledge. This system has been tested and implemented in Information Technology Center (IT), Engineering Division (BKJ) and Instrumentation and Automation Center (IAC) at the Malaysian Nuclear Agency (Nuclear Malaysia). Higher levels of user satisfaction and faster growth in technical knowledge repository have been recorded in the system. This paper describes the helpdesk system in the perspective of management of its technical knowledge contributing to strengthening organizational knowledge asset of Nuclear Malaysia as national nuclear research institution.

**Keywords:** Technical Service Support knowledge, Helpdesk system, Multi-centric, Knowledge utilization, User satisfaction.

## I INTRODUCTION

As a national nuclear research institution, it is a need to have excellent Information technology (IT) supports as well as technical knowledge to sustain nuclear research, development and operation. Due to these reasons, a knowledge based helpdesk (K-helpdesk) system is developed to improve the management of technical supports through helpdesk which at the same time capable of capturing and utilizing technical knowledge as

much as possible to provide better technical support for Malaysian Nuclear Agency.

This system has been tested in January 2010 and its full operation is on April 2010 at Information Technology Center (ITC). Due to its generic design, the system has been extended and installed for Engineering Division (BKJ) and Instrumentation and Automation Center (IAC). Although each of them has different nature of doing things, this system has successfully resolved the important part of their operations which is to improve the service performance through utilization of technical knowledge so that continuity and contingency of operations can be assured.

The objectives of the system are to be a user-friendly, capture technical knowledge for efficient performance and educating users for self reliance. These have been achieved by preventing the service providers from handling repetitive complaints which may have similarity in nature. Once a complaint has been resolved, the system captures the solution as an item in the knowledge database. The captured knowledge will then enable service requesters or users to get some ideas regarding their complaints from information or knowledge of other similar complaints besides providing relevant knowledge to the service provider such as the techniques used in solving problems and the performance among the technical support staffs. As for the management, this system helps in the decision making process in which the statistics features provide some knowledge on the number of equipment that frequently and consistently failed. This then leads to some understanding of the equipment that may create lost to the organization in terms of time and money.

## II HELPDESK SYSTEM

**Helpdesk** is information and assistance resource that troubleshoots problems related with computers or similar products (Wiki\_Helpdesk, 2012). While, Helpdesk system is information system that facilitate helpdesk processes in managing users' complaint. This system is also sometimes referred as ticketing system (Xie, M.

et al, 2004) (Conlon, M., 2007) which the system will log user complaint by issuing ticket. In general, the ticket becomes the proof that the complaint has been committed which the status of the ticket is “open”. Status of the complaint will be updated by the helpdesk officer or technical group in the system once the some commitment has been executed, so that users can know the progress of their complaint.

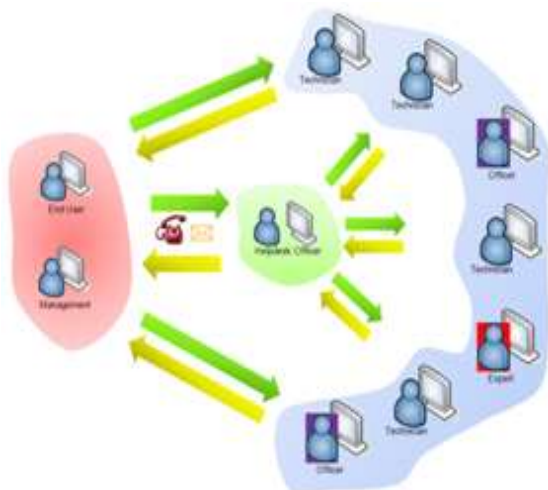


Figure 1. Helpdesk Process

From Figure 1, we can see the helpdesk internal process. If a complaint can be resolved at helpdesk officer level, it may strictly change the status of the complaint into “closed”. However if the complaint cannot be resolved at that stage, it may proceed to technician or officer or experts level which depends on the severity of the solution for a particular complaint. Once the complaints resolved, its status will be updated to “closed” by those who had attended it. In Nuclear Malaysia, conventional helpdesk system has faced several issues and challenges at various levels of users. Table 1 shows issues pertaining to IT helpdesk service in Nuclear Malaysia.

Table 1. Issues of IT Helpdesk Service in Nuclear Malaysia

Type of Users	Issues and Problems
End Users	1) Complaints through informal conversation and phone may be lost and not traceable. 2) Difficult to know status of complaints. 3) Difficult to remember the technician’s contact information. 4) Difficult to fill in service form 5) No FAQ or DIY mechanism.
Middle and Higher Management	1) Difficult to monitor the IT Service performance. 2) Difficult to report IT Service to higher management. 3) Difficult to prepare ad-hoc reports. 4) Inadequate information leads to bad decision making process.

IT Technicians, Officers and Experts	1) Every service form should be written on paper, need time and efforts to fill, sort and put in file and then in folder. 2) Hard to learn from other technical workers experience. 3) Difficult to share knowledge with other technical workers and other end users. 4) Unproductive and less efficient works in producing routine and ad-hoc reports 5) Inadequate information leads to bad decision making process. 6) Difficult to monitor IT workers performance.
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### III METHODOLOGY

K-based Helpdesk system has been developed using software engineering approach. As limited resources were concerned, such as manpower and ICT infrastructure, combination two types of rapid application development (Wiki\_RAD, 2012), 1) iterative (Wiki\_IID, 2012) and prototyping approach (Wiki\_SP, 2012) have been used during the development of this system. This helpdesk system has evolved from previous helpdesk systems which had been turned off because of malfunction due to major technology updates such as changing of browser, operating system (OS) and database technology. Embracing the rapid software development approach, this system has reused and improved some source code from other several existing systems in the agency.

This system is developed using web programming with combination of two different technologies 1) Open source and 2) Microsoft technologies. This combination can be seen through its source code specifically in server-side and client-side scripting. Strategically, both ASP (W3Sc ASP, 2012) (Wiki ASP, 2012) and PHP (Wiki PHP, 2012) codes have been used in this system to speed up the development process that would save time, cost and manpower. As web based system, an IIS (Wiki\_IIS, 2012) as a web server (Wiki\_Webserver, 2012) with capability to translate PHP codes has been configured to support the system environment. It is also important to adapt the software development trends in which scalability, security and reliability are the major elements in the system. As a web based system, Mozilla Firefox version 3.6.18 is used as well tested and best viewed browser for this system. This browser is chosen due to free license and has been most likely a standard browser used for testing Nuclear Malaysia web based system. Instead, this browser has recorded the growing number of its usage among Nuclear Malaysia’s staff.

Minimum hardware requirements of the client are 1) Any operating system that can well support Mozilla Firefox version 3.6.18, 2) at least 1 GB RAM and 3) at least 2 GHz CPU. Minimum requirements of the server are 1) Ms Windows Server 2003 with Service Pack 2(using 64 bit OS), 2) Intel Xeon with at least 2.53 GHz CPU and 3) at least 16 GB RAM. These requirements are important to ensure the performance of the system

In the perspective of management of technical knowledge, three (3) important components were addressed and used as the major part of system’s knowledge-base. These components are the main structure of the IT technical knowledge; they are 1) Users, 2) Complaints and 3) IT Workers. The components as illustrated in Figure 2 below:



Figure 2. Components of IT Technical Knowledge Description of every component as in Table 2.

Table 2. Helpdesk Knowledge Components

Component	Description
Users	The users that need IT Helpdesk service which includes the end users as well as the middle and higher level management. This component contains users’ demographic information for future reference by the system as well as other users. This component is important because they are the stimulator of the knowledge triggered
Complaints	Important component which is considered as the body of knowledge in this system. This component contains problem and solution of a complaint. It becomes the challenge for every IT workers to resolve it. This is the main area where the focus of the system tries to resolve, in which the body of IT knowledge is stored and utilized
IT Workers	IT technicians as well as officers and experts, who are the knowledge contributor that resolve the problem based on their knowledge acquired from experience as well as other source of IT knowledge-base. This component contains IT workers, officers and experts’ information for future reference by the system as well as other users

#### IV IMPLEMENTATION

This system has been implemented in Malaysian Nuclear Agency in January 2010 and its full implementation was in April 2010.

Implementation of this system at server level considering several configurations and connections to several servers using components and server-side scripting as illustrated in Figure 3. The configurations are made to meet the several technical objectives of the system in which it can authenticate user logon with active directory, store data in a centralized database as well as communicate using email for user and administrator notification. These configurations are important to ensure the friendliness of the system to users and for its performance.

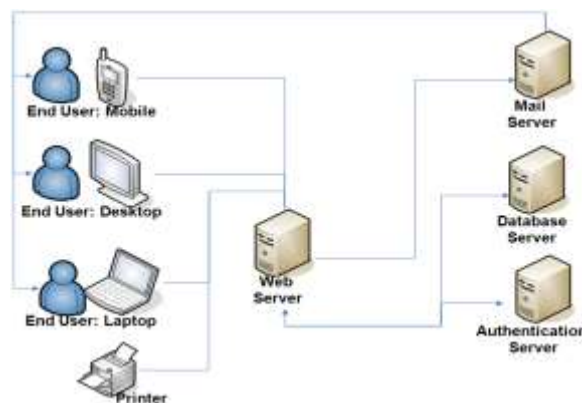


Figure 3. K-based Helpdesk System Environment

In helpdesk operational point of view, this system has replaced normal conventional way in handling helpdesk activities in Nuclear Malaysia. The role of the system can be seen in Figure 4 that shows how the system replaces the telephone and email within the communication between users and helpdesk, management as well as among technical group.



Figure 4. K-based Helpdesk System’s roles

Figure 5 shows the overall framework of the system which consists of four main components. They are LDAP, Helpdesk, Messaging and Knowledge-based components.

## V RESULT

As a result, system called technical helpdesk system has been successfully developed and implemented. The first screen interface of system (after logged in) as in Figure 6.

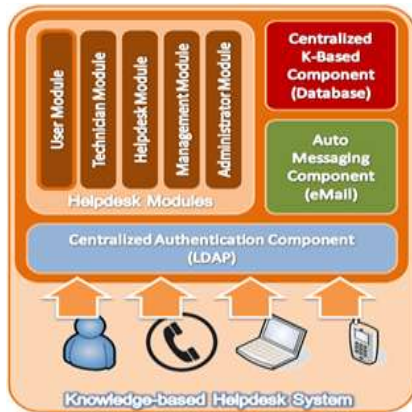


Figure 5. K-Based Helpdesk Framework

Table 3. K-Based Helpdesk Components

Components	Description
LDAP	Lightweight Directory Access Protocol (LDAP) (Webo_LDAP, 2012) (Wiki_LDAP, 2012) is used to centralized user authentication so that management of the user accounts and profile can be done at single point of reference. Only extended profile is kept in K-based helpdesk system. This is to ensure users only know single user name and password to enter the system which the same that is being used for existing email system.
Helpdesk	Helpdesk component is the core component which manages the helpdesk activities. It includes several modules namely user, technician, helpdesk, management and administrator modules. Every module has different role and levels of access in the system.
Messaging	Messaging components is the email system that used by the helpdesk component to send email for status notification.
Knowledge-based	Knowledge-based component is the important component where the knowledge is stored

Table 4 shows the size of knowledge base to the respective technical service centers that used the k-based helpdesk system framework as of 5<sup>th</sup> of May 2011. Figure 7 shows the number of cases progresses in IT Helpdesk System. The chart is automatically generated by the system as one of

the knowledge utilization elements to facilitate decision making. More reports in the form of charts and well presented detailed information to support decision making has been made automatically by the system which related to performance and knowledge of the technical group as well as the IT, BKJ and IAC services and devices.



Figure 6. K-based Helpdesk System Interface

Table 4: Resolved Cases Using K-based Helpdesk Framework

No	Service Providers	Years		
		2010	2011	2012 (as of 5th April)
1	IT Center	1235	1345	344
2	BKJ (Engineering)	193	326	150
3	IAC	0	0	231
<b>Total:</b>		<b>1428</b>	<b>1671</b>	<b>725</b>

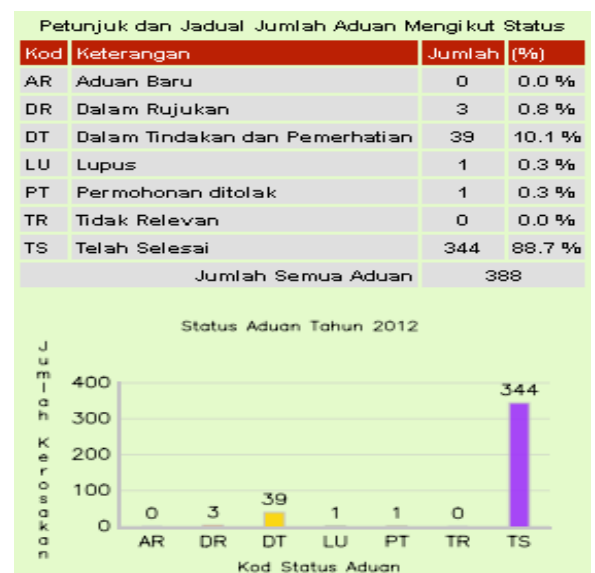


Figure 7. Status of IT Helpdesk Complaints

## VI DISCUSSION

Several significant views of the system such as user friendly system, technical knowledge capture and knowledge utilization are further discussed to achieve the objectives of this system.

In this perspective, user friendly of this system is focusing on the three main elements which related to reliability, security and extensibility. Instead, friendliness in this scope is also defined as the easiness of the interaction between system and end users. Several User-Friendly features in K-based Helpdesk system have been developed as In Table 5.

**Table 5 : User-friendly features in K-Based Helpdesk System**

No	User Friendly Features in K-based Helpdesk System
1	Online Complaints Form ensures that no complaints and requests will be missed; reduce the use of paper and easy to be filled since most of personal information is already retrieved from integrated system. (Reliability)
2	Email Notification and Helpdesk Monitoring ensure complaints/ Request is handled in a very fast and efficient manner and every complaint is traceable. (Reliability)
3	System trigger and Email Notification ensure immediately notification will be sent once the complaint/ request has been recorded in the system. (Reliability)
4	System trigger and Email Notification ensure immediate notification and explanation once the complaints/ request has been resolved or fulfilled. (Reliability)
5	Online Report ensures Pre-defined report can be generated/prepared at a single click, anytime, anywhere (in Nuclear Malaysia NET). (Reliability)
6	Knowledge-base Search ensures that solution of resolved complaint/request/problem can be shared among users and also IT Workers. (Reliability)
7	System Authentication ensures that information posted and managed in helpdesk system is secure and reliable. (Security)

From Table 5, we can see several features have been equipped in the system to improve the reliability issues as well as security issues. System authentication has been equipped with such important security element through username and password authentication mechanism at domain Microsoft active directory via LDAP. This authentication mechanism is perceived to be significant to end users in order to support single sign-on and secure access to the system codes and data. By using this technique, it simplifies the management of the user account; and it protects the application codes from being penetrated by uninvited guests.

Extensibility of the system can be seen in which three technical service support providers in Nuclear Malaysia have used the same framework of k-based helpdesk system to handle their complaints and another two units are currently looking for this system which are still in the stage of user requirement study.

These have proved that the IT helpdesk framework is extensible to other domains. Instead of that, the system interface has been designed which critically consider user familiarization. Therefore, in the very initial stage of system evaluation, no training has been conducted to formally educate end users to use the system, but surprisingly, many users can learn by themselves.

**Table 6. IT Helpdesk System Usage**

IT Helpdesk			
Users	Case Receiver	Technician 1	Technician 2
590	22	23	24

Table 6 has shown that 590 users which are approximately more than 50% from total Nuclear Malaysia population had used the system without training. This somehow proved that the system provide friendly system interfaces to end users.

These user-friendly features are important to the system as the main factor in determining on how much knowledge could be captured, stored and utilized. As we know, without active usage among various level of users; capturing, storing and utilizing knowledge is remain as a dream to the system.

Figure 7 shows that 344 IT complaints have been resolved which are also considered as IT technical knowledge, have been captured in the system. On the other hand, Table 4 shows the size of technical support knowledge in k-based helpdesk system has increased from 2010 till 2012 for every technical support centers. This is such a huge number of knowledge that we should be proud of, where it has been retained in the system and ready to be utilized at anytime.

Learning from previous system acceptance experience, 'less IT savvy' users normally do not want to use the system because they use to report their complaints using conventional way via phone and verbal communication. This would invite knowledge loss and should be resolved in this system. One feature called "On Behalf Of" (OBO) has been introduced to resolve this problem. This feature allows technical group to input such complaints from 'less IT savvy' so that every complaints and knowledge can be retained in the system. This feature also has contributed to the huge size of knowledge captured.

In addition, significant knowledge capture process in this system happens within the internal communication among technical group which consist of technicians, officers and experts during the process of preparing technical solution. Knowledge is captured in the technical report which exists in the electronic complaint forms. This communication also refers the update of technical reports among the technical group on how complaint or problem is being resolved. The knowledge capture process in k-based helpdesk system is represented by orange arrow as in Figure 8.



Figure 8. Knowledge Capture Process in K-Based Helpdesk System

### Knowledge Utilization

Knowledge utilization in this system can be seen in two ways 1) Knowledge Search and 2) Self-generated Technical Reports. Both are the example where the knowledge is made available for utilization. In knowledge search, all types of users can search previous complaints which have been successfully resolved. By doing this, it helps end users to overcome their problems by themselves which is faster than just waiting for technician's assistance. At the same time, technical group will be more effective and efficient by only focus their workload to discover solution only for new problems. In addition, knowledge among technical group can be easily retrieved and shared without face to face meeting which may need more commitments from one another and less efficient and effective.

Self-generated technical report is one of the features that extract knowledge into the form that can facilitate decision making for higher management. In this feature, knowledge is utilized and presented in the chart that extracted from detail information captured in every helpdesk data transaction. Without capturing all these knowledge, not a single graph could be made as precise and faster as this system can do. In addition, this feature also facilitating knowledge utilization that eventually nurtures the end users with technical knowledge related to their personal competencies.

## VII CONCLUSION

In conclusion, this system has achieved its objectives by offering user friendly system, successfully capturing technical knowledge and providing mechanism in nurturing users through knowledge utilization activities. This system has transformed the existing technical group work culture to be more effective and efficient through multi-centric approach focusing on better management of technical knowledge. Instead of that, it has benefited organization by saving cost, time and manpower. At the same time, it offers high technical knowledge preservation and improved system user satisfaction for efficient, effective and productive work culture in Nuclear Malaysia.

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