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INFORMATION TECHNOLOGY HELP DESK SURVEY: TO IDENTIFY THE CLASSIFICATION OF SIMPLE AND ROUTINE ENQUIRIES

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ABSTRACT

Information technology has changed the way organizations function. This has resulted in reliance of help desks to support users in dealing with a wide range of information technology-related problems such as hardware, software and telecommunication. The help desk generally has to cover a wide range of information technology products and services. However, due to resource constraint, in particular the lack of help desk staff, users often have to wait for a long time before their enquiries and problems are answered and solved. Literature has shown that the majority of incoming enquiries are considered to be "simple and routine", and do not require specialized knowledge. The aim of this paper is to present the results of a survey that identifies the classification of simple and routine technical enquiries in a help desk environment. This paper also discusses the development of help desks, ranging from support models to support structure.

Keywords: Help Desk, Simple and Routine Enquiries.

1. INTRODUCTION

Information Technology Help Desk (HD) support has been established in organizations to provide technical support to users. Over four decades, information technology (IT) has played an important role in reducing costs, improving operations, enhancing customer services, improving communications as well as gaining and sustaining competitive advantages in business environments [26,30]. However, the complexity of business systems, couple with a wide range of hardware, software and networking technologies has resulted in a wide and over-increasing number of technical and functional problems faced by the users, for example, critical network failures with impact on more than 30000 users happen every two days in the USA [1]. If the problems are not resolved in a timely manner, this can lead to loss of productivity by users and of organizations, As a result, the HD has gone from having a traditional role in a non-profit making capacity to playing a vital in ensuring organizational-wide information systems are working properly and efficiently. Unfortunately, the typical HD is now being overwhelmed with incoming enquiries. Very often a majority of enquiries can be classified as simple and routine, and do not require specialized knowledge. The aim of this paper is to present the results of a survey to identify queries that can be classified as simple and routine technical enquiries, and which can be dealt with in a way that takes the pressure off the HD.

The rest of paper is organized as follows. Section 2 describes the background of HD. Section 3 presents the findings of the survey conducted to identify the simple and routine enquiries. Finally, our conclusion is given in Section 4.

2. BACKGROUND OF HELP DESK

There is insufficient evidence to show when the first HD was established. However it is generally accepted that it was first established about twenty years ago [14]. Before the HD was formally established, users either called someone they knew or believed to be an expert in the IT area when they required technical support [22, 31]. However, this ad-hoc support system had, and still has, some shortcomings. Firstly, the IT staff may not be available for immediate assistance because they are engaged with other more important tasks or projects [28]. Secondly, an excess of support duty often leads to a high level of frustration and non-productivity within the IT department because personnel were not able to complete their own tasks and projects [22]. Thirdly, users can spend a lot of unproductive time calling the wrong person, workgroup or even department seeking assistance [27, 31]. This very often frustrates users before they can find the right person to help solve their problem. Moreover, such an approach not only delays the support process, it may also interrupt the development and deployment of new services and systems in the IT department. Thus the idea of the HD began to emerge with the aim of helping users to resolve technical problems promptly.

Basically the HD functions as an access point to provide IT-related advice. It also takes a proactive role in facilitating the collection and analysis of data and information, acting as first-line incident support in case of IT failure, providing day-to-day communication between the IT department and users, offering business systems support, undertaking service-quality report generation and conducting computer-related hardware or soft troubleshooting for the users [3, 21, 34]. In short, it is a first contact place for users in resolving any IT-related support issues as shown in Figure 1.

The support structure of the HD can be decentralized or centralized. The decentralized HD model was very popular in the

> Software / application / hardware / data communication device/ telecommunication device usage enquiry
> Software / hardware / data communication device / telecommunication device installation
> Repair, troubleshoot and configuration
> User account setup
> Security issue
> Internet / email support
> Service / product purchasing
> Inventory management
> Training

Figure 1: Supporting tasks of the HD

1980s. In this model, an organization often has more than one HD; with different HDs established by different departments, branches or even IT work groups [9]. For instance, there were nine different HDs at the Western Kentucky University and users choose which one to call, depending on the nature of their problem, when the problem occurred and where the problem was located [16]. The decentralized model is based on the belief that diverse support would best allow for timely response and action. This concept worked well at the very beginning because the computer systems were relatively simple and straight forward, usually consisting of dumb terminals, mainframes, printers and simple standalone application programs. As the IT infrastructure and organization-wide systems become more complex, with interconnected hardware and software, classifications of problem domains become less distinct. In such situations, users were often confused by multiple HDs and were forced to transfer from one HD to another before finding the most appropriate support to resolve their problems [23]. To overcome this confusion, the centralized HD model was proposed, based on the belief that merging different HDs into one meant that users only needed to remember one contact number for all IT-related enquiries, with the HD the first and single point of contact [23]. The advantage of this model is the consolidation of contact points as well as the standardization of diverse support policies and procedures, service level agreements as well as support tools [16, 23]. Other benefits inherent in this model include improved resource allocation, resolution rate and inter-division communication [10, 29].

Nowadays, a number of global corporations with offices located all over the world implement the distributed or virtual HD model. Although this model promotes multiple physical locations, the users are still able to contact the HD using one contact number through modern call-routing technology [32]. This allows operation twenty-four hours a day, seven days a week regardless of location. For example, Morgan Stanley, one of the largest investment banks in the world, consists of four HDs in different sites (USA, England, Japan and Hong Kong) to enable them to provide enterprise-wide twenty-four hours HD service. In addition, the HD can be further categorized as internal or external. The former only supports organization-wide users; the latter supports external customers and is usually established by software and hardware vendors or the Internet service providers [12].

One of the more recent trends is to outsource the function of the HD. Reasons that are commonly cited for this decision include: 1) in-house IT experts should focus on long-term strategic infrastructure planning instead of servicing routine troubleshooting duty, 2) outsourcers can do a better job than the in-house HD because they are equipped with the latest skills, knowledge and technology, 3) it can increase the HD productivity, efficiency and effectiveness, which will lead to cost reduction, and 4) human resource issues can be eliminated; including the recruitment of experienced HD staff, maintaining sufficient staff in peak hour and so on [5, 7, 8, 11, 15, 18, 24, 25, 35]. The senior management no longer debates whether to outsource the HD; their major concern is the degree of outsourcing - should it be full or partial, permanent or temporary, onshore or offshore, single or multiple vendors [19, 20].

Another innovative model in the HD industry is e-support, which is support action based on the Internet or Web as the primary communication channel. This model is gaining widespread use due to its ability to provide better, faster and cheaper service [2].

One of the key stimuli in promoting e-support is the emergence of web-based tools that allow users to make use of email or web-based forms to contact the HD regardless of its actual service hours. In addition, users can access online resources, such as a knowledge base and Frequent Asked Question lists (FAQ), to look for useful information that can help them to resolve their difficulties. Furthermore, the HD operator is able to conduct web-based training or to offer problem-solving through remote control technology.

Each HD is unique depending on the organization's strategic investments, support doctrine, which businesses it supports and customer expectations. Generally the HD can be divided into front line (first-level), second-level and third-level support [4] as shown in Figure 2. These three-level support structures can be further divided into six variants [13]. For example, instead of naming the support as first, second and third level, they can be labeled as Process, Product Support Process and Maintenance Execution Process respectively. Basically, the enquiries go to the front line (first level) operator from various sources such as telephone, web forms, email, fax or walk in. Most of the enquiries at this level are straightforward and simple, and can be easily handled by the first-level operator. For instance, close to 50 per cent of calls to the ITS HD at Deakin University in Australia are related to login name and password [6]. When the first-level operator cannot resolve a problem, it will be escalated to the second- or third-level HD staff. At this level, the HD staff often possesses more in-depth IT knowledge and they will undertake a process of research and testing to solve the problem. If it involves on-site support, such as hardware in-
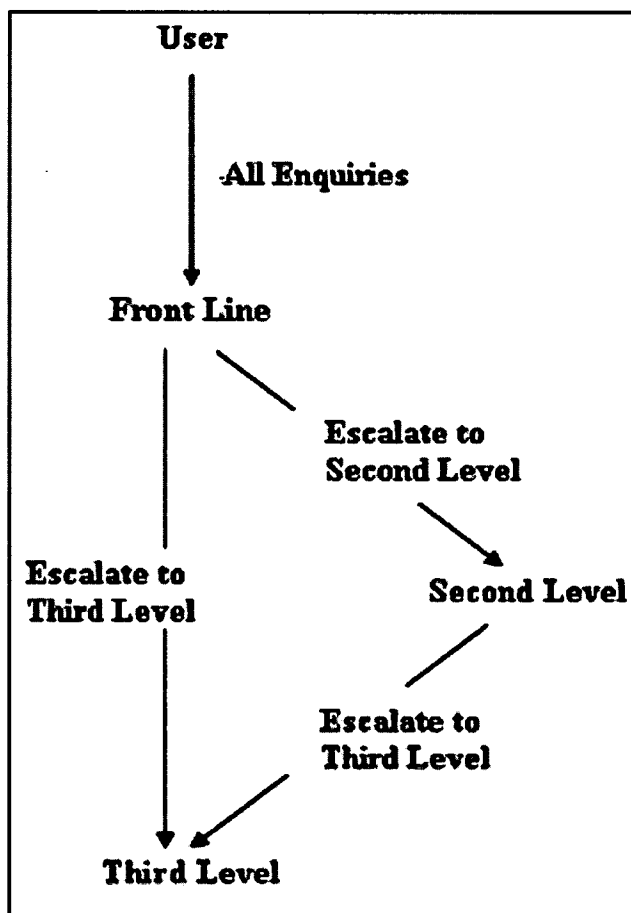

Figure 2 Three Levels Support Structure

stallation, the second-level engineer usually takes over the job. Similarly if the second-level operator is not able to solve the problem, then the case will be passed to the third-level specialist, such as the database administrator, website developer or vendors to resolve the problem.

The three-level support concept currently dominates a large segment in the HD support structure [13]. However some organizations choose to simplify it into two levels, for instance categorizing it into frontline/backline as shown in Figure 3 [33]. Fundamentally, the approach requires frontline staff to handle as many enquiries as possible. As long as the problem is out of frontline's ability and knowledge, it will be escalated to backline staff for additional investigation. In another variant, the "touch and hold" model, the frontline operator is the only communication channel to users, even though backline staff handles the problem.

Figure 3
Two-level Support Structure

Figure 4
One-level Support Structure

Other support approaches include a one-level support structure, as shown in Figure 4, which combines all three support levels into a single layer. This structure is rarely used by organizations.

The continuous expansion of user base and the fact that the HD has to cover more and more software, hardware, network and other IT-related areas means it is not unusual for a single HD to cover hundreds of thousands of IT-related products. Due to budgeting constraints, the HD is also faced with downsizing. This not only reduces the number of experienced HD staff, it has also results in loss of priceless knowledge, which is crucial for daily operation within the HD industry. When the HD is expected to provide more service with less staff, the outcome is quite obvious: users have to wait a comparatively longer time before their problem can be resolved. As 2002 survey reveals that the HD industry has reported an increase in call volume every year for the past ten years [2]. Users often cite "help unavailable when needed" as one of the major service delivery failures [12]. However, Knapp and Woch [17] have found that 80% of enquiries made to the HD often require no specialized IT knowledge. In another instance, Dawson and Lewis [6] explain that close to 50 per cent of enquiries to the HD at Deakin University are related to login name and password. Both researches indicate that a majority of technical enquiries and difficulties can be classified as "simple and routine". As a result, the HD staff is overwhelmed by the increasing workload and is no longer available for high level and proactive support activity or training because their time is mainly occupied by resolving these simple and routine enquiries.

3. IDENTIFICATION OF SIMPLE AND ROUTINE ENQUIRIES

3.1 Method

This research aims to identify IT-related enquiries faced by the HD that can be considered as "simple and routine". An online questionnaire consisting of 18 questions (see Appendix A) has been designed for this purpose. An email was sent to the help desks of thirty-six universit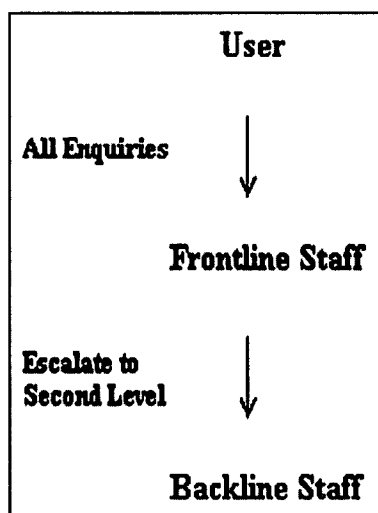ies in Australia and email subscribers of the ISWorld, (http://www.isworld.org), inviting th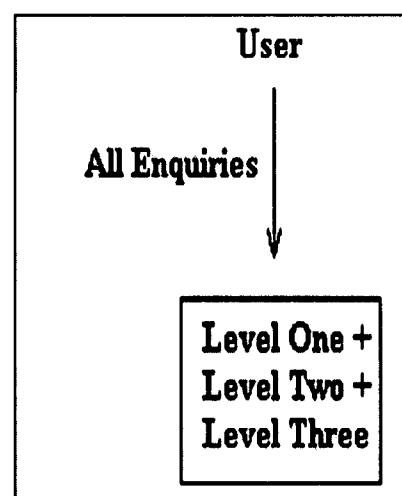em to participate in this survey. The questionnaire can be broadly divided into three sections. Questions 1 to 6 were designed to collect data relating to general information relating to the user base, model, structure and the technology employed by the HD. Questions 7 to 11 aim to identify technical enquiries or problems that can be classified as "simple and routine". In this research we consider an enquiry as "simple and routine" if a problem can be resolved by the user, given sufficient information is provided. Here "sufficient information" refers to information available to users from easily accessible sources such as the website. Finally, questions 12 to 18 collect information on incoming enquiry patterns of the HD.

3.2 Limitation of research

There were 192 logins, though only 24 usable responses. Despite the low number of responses, the data collected is still useful and the result significant because it allows us to identify "simple and routine" enquiries. Due to the small sample size, statistical analysis has not been conducted; only results from descriptive statistical analysis are presented.

3.3 Profile of Respondents

Tables 1 to 8 depict the profile of the respondents participating in the survey. Almost half of the respondents (58%) serve less than 5000 users; more than 20% of the respondents have a user base of more than 20000. The majority of the respondents (75%) employ less than 15 staff; about a third of the respondents (37.5%) hire less than 5 staff. In terms of ratio of HD staff to users, only 16.7% of the respondents have a ratio of 1 to less-than-100 users per HD staff and half of the respondents (51%) have a ratio of 1 to 300-or-more users per HD staff. Out of the total staff employed by the respondents, only 62.5% are full time. Approximately two-thirds of the respondents (62.5%) are operational for less than 60 hours a week. Similarly, approximately two-thirds of the respondents (62%) use more than one level in their support structure. Close to 80% of the respondents think "single point of contact" is the best term to describe their support model, but only 3 respondents reported that they adopt e-support as their support model. The HD management system and the Internet and web interface are the most common tools used in the HD.

	Number of Respondents	Percentage
Less than 5000 users	14	58.3%
5000-9000 users	3	12.5%
10000-19999 users	1	4.2%
20000 users or more	5	20.8%
Unspecified	1	4.2%
Total	24	100%

Table 1: The HD user base

	Number of Respondents	Percentage
Less than 5 staff	9	37.5%
5-9 staff	6	25.0%
10-14 staff	3	12.5%
15-19 staff	2	8.3%
20-24 staff	1	4.2%
25 staff or more	2	8.3%
Unspecified	1	4.2%
Total	24	100%

Table 2: Number of HD staff employed

	Number of Respondents	Percentage
Less than 1 help desk staff to 100 users	4	16.7%
1 help desk staff to 100-199 users	4	16.7%
1 help desk staff to 200-299 users	1	4.2%
1 help desk staff to 300-399 users	4	16.7%
1 help desk staff to 400-499 users	1	4.2%
1 help desk staff to 500-599 users	3	12.5%
1 help desk staff to 600 users or more	4	16.7%
Unspecified	3	12.5%
Total	24	100%

Table 3: Ratio of one HD staff to user base (the ratio is calculated by dividing the number of individuals in the user base with the number of HD staff)

	Number of Staff	Percentage
Full time staff	135	62.5%
Part time staff	81	37.5%
Total	216	100%

Table 4: Distribution of part-time and full-time staff

	Number of Respondents	Percentage
Less than 40 hours	1	4.2%
40-49 hours	11	45.8%
50-59 hours	3	12.5%
60-69 hours	4	16.7%
70 hours or more	3	12.5%
Unspecified	2	8.3%
Total	24	100%

Table 5: Number of operational hours per week

	Number of Respondents	Percentage
Decentralized help desk	4/24	16.7%
Single point of contact	19/24	79.2%
Distributed help desk	3/24	12.5%
Outsourcing	2/24	8.3%
e-support	3/24	12.5%

Table 6: The HD support model (*respondents can select more than one answer)

	Number of Respondents	Percentage
One level support	6	25%
Two levels Support	9	37.5%
Three levels Support	6	25%
Other	1	4.2%
Unspecified	2	8.3%
Total	24	100%

Table 7: The HD support structure

	Number. of Help Desks	Percentage
Automatic call distributor system	3/24	12.5%
Interactive voice response system	1/24	4.2%
Help desk management system	10/24	41.7%
Expert System	1/24	4.2%
Remote Control System	6/24	25.0%
Knowledge Management System	4/24	16.7%
Internet / Web Interface	10/24	41.7%

Table 8: The technology used by the HD (*respondents can select more than one answer)

	Number of Respondents Agreed	Percentage
Account setup	12	50.0%
Account termination	6	25.0%
Account maintenance	13	54.2%
Account login problem	15	62.5%
Account suspension	20	83.3%
Password retrieval	5	20.8%
Password reset	14	58.3%
Password syntax information	7	29.2%
Password invalid	9	37.5%

Table 9: Administrative issues that can be resolved by user (*respondents can select more than one answer)

	Number of Respondents Agreed	Percentage
Hardware installation	7	29.2%
Software installation	18	75.0%
Software purchasing	15	62.5%
Hardware purchasing	13	54.2%
Service purchasing	8	33.3%
Other	2	8.3%

Table 10: Guidelines to be provided to users (*respondents can select more than one answer)

	Number of Respondents Agreed	Percentage
CD / DVD ROM	6/24	25.0%
Scanner	7/24	29.2%
Printer	12/24	50.0%
Hard drive tower	3/24	12.5%
Monitor	8/24	33.3%
Phone headset	6/24	25.0%
Mouse	10/24	41.7%
Phone handset	4/24	16.7%
Keyboard	10/24	41.7%
Other	1/24	4.2%

Table 11: Hardware problems that users should attempt to solve before calling the HD (*respondents can select more than one answer)

	Number of Respondents Agreed	Percentage
Software Performance	7	29.2%
Software Functionality	16	66.7%
Software can't start	14	58.3%

Table 12: Software problems that users should attempt to solve before using the HD (*respondents can select more than one answer)

	Number of Respondents Agreed	Percentage
Website too slow	7	29.2%
Server too slow	5	20.8%
Website Unreachable	9	37.5%
Server Unreachable	4	16.7%
File Missing	10	41.7%
File Corruption	6	25.0%

Table 13: "Other" problems that the users should attempt to solve before using the HD (*respondents can select more than one answer)

3.4 Simple and Routine Enquiries

Tables 9 to 13 show the results of identifying queries that can be considered as "simple and routine". As discussed previously, in this research we define "simple and routine" enquiries as problems that can be resolved by the users if sufficient information is provided to the users via easily available sources such as the website. In each question, the respondents are allowed to choose more than one item in each of the survey questions 7 to 11, which deal with administrative issues, guidelines and policies, hardware, and software problems. The majority of respondents believe that if sufficient information is provided, a user has the capability to resolve IT administrative issues such as password reset (58.3%), account suspension (83.3%), account login problem (62.5%), account maintenance (54.2%) and account setup (50%). The respondents also think that only hardware purchasing (54.2%), software purchasing (62.5%) and software installation (75%) guidelines should be provided to the users. However, nearly all respondents think that users are not capable of resolving any hardware problem. Within the software problem categories, the respondents believe that users should first attempt to solve problems that include "software cannot start" (58.3%) and functionality (66.7%) before

contacting the HD. The majority of respondents disagree that the users should attempt to solve server performance (20.8%) and unreachable (16.7%) problems, website performance (29.2%) and unreachable (37.5%) problems, as well as file corruption (25%) and missing problems (41.7%).

3.5 Incoming Enquiry Patterns

Tables 14 to 23 show incoming enquiry patterns in the HD. The respondents could answer these questions based on management reports or using estimation. More than 66% of the respondents indicated that the answers provided for these questions were based on estimation. Approximately 29% of the respondents receive less than 1500 incoming calls per month. About 38% of the respondents have experienced an increase in the incoming enquiries over the past twelve months, but only two respondents claim a decrease in the enquiries. The reason for such an increase is summarized into "user awareness", "staff increment" and "innovative technology". While telephone calls (36.4%) are still the major source of contact between the HD and users, the second major source of contact comes from the Internet and email (20.2%). Among the three support levels in HD, incoming enqui-

	Number of Respondents	Percentage
Management Report	4	16.7%
Estimation	16	66.7%
Unspecified	4	16.7%
Total	24	100%

Table 14: Basis of information provided for questions 13 to 18

	Number of Respondents	Percentage
Less than 500 calls	2	8.3%
500-999 calls	2	8.3%
1000-1499 calls	3	12.5%
1500-1999 calls	0	0%
2000-2499 calls	1	4.2%
2500 calls or more	3	12.5%
Unspecified	13	54.2%
Total	24	100%

Table 15: Total number of incoming calls logged per month

	Number of Respondents	Percentage
Less than 500 enquiries	2	8.3%
500-999 enquiries	3	12.5%
1000-1499 enquiries	1	4.2%
1500-1999 enquiries	1	4.2%
2000-2499 enquiries	1	4.2%
2500 enquiries or more	1	4.2%
Unspecified	15	62.5%
Total	24	100%

Table 16: Average number of incoming enquiries logged

	Number of Respondents	Percentage
An increase	9	37.5%
A decrease	2	8.3%
No change	6	25%
Unspecified	7	29.2%
Total	24	100%

Table 17: Trend of incoming enquiries in the past 12 months

Reasons
More awareness that help desk is available to assist
Confidence in help desk support
Greater user dependency
Greater user expectations
New hires
More users
Insufficient training to guide users to operate the systems
Greater technical complexity
Mass application / operation system update
More software, hardware and applications to support
Provision of more services
Introduction of new technology

Table 18: Reasons cited for the increase in incoming enquiries

Reasons
Better information provided on-line
Provided more training to increase user's general IT knowledge
Provided information guidelines and technical documentations
Enhanced hardware, software and network performance

Table 19: Reasons cited for the decrease in incoming enquiries

Reasons
No major change in IT

Table 20: Reason cited for no change in incoming enquiries

	Percentage
By telephone	36.4%
Walk-in	9.9%
By fax	0.2%
By Internet / Email	20.2%
Other	4.2%
Unspecified	29.2%
Total	100%

Table 21: Major sources of user contact

	Percentage
Resolved by first level support	46.9%
Resolved by second level support	13.5%
Resolved by third level support	3.8%
Resolved by vendor	2.1%
Resolved by other	0.4%
Unspecified	33.3%
Total	100%

Table 22: Incoming enquiries resolved by various level of support

	Percentage
Hardware / Software Installation	15.4%
Other Hardware Problem	8.3%
Other Software Problem	13.3%
Data Communication	6.1%
Voice Communication	2.5%
Account / Password	12.8%
Other	4.3%
Unspecified	37.5%
Total	100%

Table 23: Composition mix of incoming enquiries 3.6 Discussion

ries are mainly resolved by first-level support (46.9%), whereas second-level and third-level support only resolve approximately 13.5% and 3.8% of the incoming enquiries, respectively. The majority of incoming enquiries consist of hardware/software installation (15.4%), software problem (13.3%) and account/password enquiries (12.8%).

3.6 Discussion

The results show that 17 respondents have a high ratio of 1 to more-than-100 users per HD staff (see Table 3). One of the respondents has indicated that the HD hired only 17 staff but has a user base of 42000 individuals. This means a single staff member has to service 2471 users in this particular HD. Out of the 17 staff, only 5 are full-time while the rest are part-time. One can easily imagine the predicament of this HD if there should be a sudden outage on one of the essential systems: more than 40,000 users might call at the same time but only a few HD operators would be available to answer the enquiries. This example illustrates a possible source of service delivery failure and user dissatisfaction in the HD [12]. The result also offers an example of unrealistic demand on the workload of the HD when there is only a handful of staff to deal with a large number of users, and the staff is expected to simultaneously handle high level support, participate in proactive support activities and attend regular training sessions.

The results from this survey also show that most of the HDs have experienced an increase in incoming enquiries over the past twelve months (see Table 17). This finding is similar to results of the survey conducted by the Help Desk Institute [2]. Although only 8.3% of the respondents claim a decrease in incoming enquiries, the reasons for this decrease are worthwhile discussing here. The results from Table 19 show that the reasons for the decrease in the incoming enquiries are: availability of online information, training, information guidelines and technical documentations, enhancement of hardware, software and network performance. The first three reasons are closely related to the term "self-support". This means it is possible to decrease the volume of incoming enquiries to the HD if users are given sufficient information through training, online documentation or written guidance. On the other hand, results from Table 22 show that the first-level support staff handles close to half of the incoming enquiries (46.9%). As mentioned in the previous section, most of the incoming enquiries resolved by the first-level support operators are simple, routine and straightforward. Thus by providing users with sufficient information on hardware and software installation, "other" software problems and account and password enquiries that currently dominate incoming enquiries (see Table 23), it is possible to reduce by almost half the total incoming enquiries within the HD because of the capability of users to resolve these simple and routine enquiries by themselves. Table 7 also shows that only 12.5% of the respondents have adopted e-support as their support models. By making use of modern Internet and data communication technologies, such as online knowledge-based systems and remote control software, it is possible that the adoption of e-sup-

port can be used to relieve a significant amount of the workload faced by the HD.

Although only a minority of the respondents agreed to provide users with purchasing and hardware installation guidelines (see Table 10), in our view doing so is still a worthwhile effort because such an action can reduce the workload for the HD. For instance if users wish to purchase a dial-up Internet service so that they can access the Internet when they are away from the office, it is not uncommon for them to first contact the HD for advice and action. In most cases, the HD requires written approval from the department manager for purchasing the dial-up service. Therefore, if a purchasing guideline is provided, the user will not contact the HD until they get written approval from the individual department manager.

Most of the respondents do not think users are capable of solving all hardware problems (see Table 11). The users are not expected to have the ability and knowledge to repair an unworkable monitor, for example, but if there is a monitor troubleshooting guideline available, the users can first follow the guidelines to make sure the power point is switched on or the power cable and the monitor cable are connected properly. Thus, this troubleshooting guideline can save a significant amount of the HD's resources. The results show that the respondents generally believe that it is beyond users' capability to resolve problems relating to the server, websites or files (see Table 13). Nevertheless, it would be useful if users were provided guidance in first checking that they have not made any typographical error and spelling mistake in the URL or to clean up the cache before contacting the HD. A simple guideline can provide a walk-through to performing this basic troubleshooting action before the user contacts the HD.

4. CONCLUSION

The emergence of IT has resulted in an increasingly important role for the HD in ensuring optimal productivity of organizational systems. An increasing number of incoming enquiries from the users has resulted in an increase of workload for the HD. Although, HD experts and researchers have continued to develop support models and structures to relieve the workload of the HD, the results from this current research show that the HD staff are still under enormous pressure, especially those who are working at the frontline (first-level) support, because incoming enquiries continue to increase while available manpower remains insufficient to deal with the user base. Research results have suggested that it is possible to decrease the volume of incoming enquiries to the HD through provision of online information, training, information guidelines ands simple technical documentations offered to the users. Examples include written or on-line documentation on topics such as account setup, account maintenance, account login, account suspension, password reset, hardware purchasing, printer problem, software installation, software purchasing, software performance, software functionality and software startup.

REFERENCES

[1] Bayrak, T. and Brabowski, M. R., "Critical Infrastructure Network Structure," *Journal of Computer Information Systems*, (46:3), 2006, pp.67-86.

[2] Broome, C. and Streitwieser, J., "What is E-support," *Service and Support Handbook*, Help Desk Institute, Colorado, USA, 2002, pp.31-40.

[3] Central Computer and Telecommunications Agency, *IT Infrastructure Library: Help Desk*, HMSO Publication Centre, 1989, pp.1-4.

[4] Czegel, B., *Help Desk Practitioner's Handbook*, Wiley, 1999.

[5] Dash, J., "Help Desk Outsourcing Rises," *ComputerWorld*, 2000.

[6] Dawson, E. and Lewis T., "Deakin University ITS Help Desk: Co-operative Partnership as the Solution," Presented at the 2001 Australasia Educause Conference on the Power of 3, Gold Coast, Australia, 20-23 May, 2001.

[7] Faulks, J., "Outsource This! Broaden Support and Reduce Staff Burnout," Proceedings of the 32nd Annual ACM SIGUCCS Conference on User Services, Baltimore, USA, 10-13 Oct, 2004.

[8] Fish, K. E. and Seydel, J., "Where IT Outsourcing is and Where IT is Going: a Study across Functions and Department Sizes," *Journal of Computer Information Systems*, (46:3), 2006, pp.96-103.

[9] Grajek, S., Dannheim, G., Euben, J., Paolillo, J. and Stagg, D., "Telecom and IT: Moving toward Unified Support," Proceedings of the 30th Annual ACM SIGUCCS Conference on User Services, Rhode Island, USA, 20-23 Nov, 2002.

[10] Greenberg, R., "Help on Help," *CIO Magazine*, 15 May, 1998.

[11] Gurbaxani, V., "The New World of Information Technology Outsourcing," *Communications of the ACM*, (39:7), July, 1996, pp.45-46.

[12] Heckman, R. and Guskey, A., "Sources of Customer Satisfaction and Dissatisfaction with Information Technology Help Desks," *Journal of Market Focused Management*, (3), 1998, pp.59-89.

[13] Kajiko-Mattsson, M., "Infrastructures of Virtual IT Enterprises," Proceeding of the 2003 IEEE International Conference on Software Maintenance, Los Alamitos, USA, 22-26 Sept, 2003.

[14] Kendall, H., "Prehistoric Help Desk!!" *Support World*, Help Desk Institute, (Oct-Nov), 2002, pp.6-8.

[15] Ketler, K. and Willems, J., "A Study of the Outsourcing Decision: Preliminary Results," Proceedings of the 1999 ACM SIGCPR Conference on Computer Personnel Research, New Orleans, USA, 1999, pp.182-189.

[16] Kirchmeyer, R., "The Consolidated Help Desk," Proceedings of the 30th Annual ACM SIGUCCS Conference on User services, Rhode Island, USA, 20-23 Nov, 2002.

[17] Knapp, M. and Woch, J., "Towards a Natural Language Driven Automated Help Desk," Proceedings of the Third International Conference on Computational Linguistics and Intelligent Text Processing, 2002, pp.96-105.

[18] Kolawa, A., "Outsourcing Devising a Game Plan," *ACM Queue*, (2:8), 2004.

[19] Krishna, S., Sahay, S. and Walsham, G., "Managing Cross-Culture Issues in Global Software Outsourcing," *Communications of the ACM*, (47: 4), 2004, pp.62-66.

[20] Lee, J., Huynh, M., Kwok, R. and Pi, S., "IT Outsourcing Evolution – Past, Present and Future," *Communications of the ACM*, (46:5), 2003, pp.84-89.

[21] Marcella, R. and Middleton, I., "The Role of the Help Desk in the Strategic Management of Information Systems," *OCLC Systems and Services*, (12:4), 1996, pp.4-19.

[22] McKoen, P., "Creating a Help Center from Scratch: A Recipe for Success," Proceedings of the 28th Annual ACM SI-

GUCCS Conference on User Services: Building the Future, Richmond, USA, 29 Oct.-1 Nov, 2000.

[23] Middleton, I., *The Evolution of the IT Help Desk: From Crisis Centre to Business Manager in the Public and Private Sectors*, School of Information and Media, Faculty of Management, The Robert Gordon University, Faculty of Management, Aberdeen, UK, 1999.

[24] Nam, K., Rajagopalan, S., Rao, H. R. and Chaudhury, A., "A Two Level Investigation of Information System Outsourcing," *Communications of the ACM*, (39:7), 1996, pp.27-28.

[25] Oza, N., Hall, T., Rainer, A. and Grey, S., "Critical Factors in Software Outsourcing – A Pilot Study," Proceedings of the 2004 ACM Workshop on Interdisciplinary Software Engineering Research, Newport Beach, USA, 5 Nov, 2004, pp.67-71.

[26] Peslak, A. R., "The Importance of Information Technology: An Empirical and Longitudinal Study of the Annual Reports of the 50 Largest Companies in the United States," *Journal of Computer Information Systems*, (45:3), 2005, pp.32-42.

[27] Peters, S. L., "Expanding the Help Desk to Simplify Customer Access to CIT Services: The Integration of Services across Platforms, Applications and Units," Proceedings of the 21st Annual ACM SIGUCCS Conference on User Services, New York, NY, USA, Nov 1993.

[28] Prescott, J., Franklin, G., Lovgren, T., Kilty, T., Cleary, A. and Mai, A., "Technical Session: Evolution of Three Help Desks," Proceedings of the 29th Annual ACM SIGUCCS Conference on User Services, Portland, USA, 17-20 Oct, 2001.

[29] Scullen, J., "Re-engineering Desktop Support at Griffith University," Presented at the 2001 Australasia Educause Conference on the Power of 3, Gold Coast, Australia, 20-23 May, 2001.

[30] Siau K., "Interorganizational Systems and Competitive Advantages – Lessons from History," *Journal of Computer Information Systems*, (44:1), pp.33-39.

[31] Smith, C. L., "Building a Help Desk from Scratch, with No Staff, No Equipment and No Money: Moulding Novice Student Consultants into Seasoned Help Desk Operators," Proceedings of the 24th Annual ACM SIGUCCS Conference on User Services, Chicago, USA, Sept, 1996.

[32] Tischler, F and Trachtenberg, D., "The Emergency of the Distributed Help Desk," *Telemarketing and Call Center Solutions*, (June), 1998.

[33] Tourniaire, F. and Farrell, R., *The Art of Software Support*, Prentice Hall, 1998.

[34] Workman, M. and Bommer, W., "Redesigning Computer Call Center Work: a Longitudinal Field Experiment," *Journal of Organizational Behaviour*, (25:3), 2004, pp.317-337.

[35] Xue, Y., Sankar, C. S. and Mbarika, V. W. A., "Information Technology Outsourcing and Virtual Team," *Journal of Computer Information Systems*, (45:2), 2004/5, pp.9-16.

APPENDIX A — INFORMATION TECHNOLOGY HELP DESK SURVEY
Re-designing Help Desk's Support Process using
Knowledge Management Framework
Research Questionnaire

Introduction

The purpose of this survey is to examine current Help Desks' support processes and to investigate processes that allow the Help Desk to provide support services in effective and efficient manners.

This survey should take approximately 10-15 minutes to complete. Your participation is voluntary and it does not report to me any personally identifiable tracking information. You may withdraw and cease participation in the study at any time without negative consequences. The final published results of the research will be aggregated measures and there will be no features that could identify individual participants.

The completion of the questionnaire indicates your consent to participate in the research entitled "Re-designing Help Desk's Support Process using Knowledge Management Framework", conducted by Nelson K. Y. Leung as it has been described to you in the information sheet and in discussion with Nelson K. Y. Leung. You understand that the data collected from your participation will be used for of master thesis, conference paper as well as journal paper publications, and you consent for it to be used in that manner.

If you have any enquiries about the research, you can contact Nelson K. Y. Leung on email: knl164@uow.edu.au (Telephone number: 04-22217737) and Dr. Sim Kim Lau on email: simlau@uow.edu.au (Telephone number: 02-42214132). If you have any concerns or complaints regarding the way in which the research is or has been conducted, you should contact the Ethics Officer on (02) 4221 4457.

Thank you very much in anticipation of your willingness to participate in this study.

QUESTIONNAIRE

1) How many individual users does your Help Desk support?

_____

2) How many staff does your Help Desk employ?
Full time _____
Part time _____

3) What are your Help Desk operational hours?
Monday-Friday: From _____ to _____
Saturday: From _____ to _____
Sunday: From _____ to _____
Public Holiday: From _____ to _____

4) Which one(s) is/are the best to describe your Help Desk support model?
(CHECK ALL THAT APPLY)
☐ Decentralized Help Desk
☐ Single Point of Contact
☐ Distributed Help Desk
☐ Outsourcing
☐ e-support
☐ Other (please specify)

_____

_____

5) Which one is the best to describe your Help Desk support structure?

(CHECK ONLY ONE ANSWER)

☐ One Level Support
☐ Two Levels Support
☐ Three Levels Support
☐ Other (please specify)

_____
_____

6) Does your Help Desk currently use the following system or software?

(CHECK ALL THAT APPLY)

☐ Automatic Call Distributor (ACD) System
☐ Interactive Voice Response (IVR) System
☐ Help Desk Management System
☐ Expert System
☐ Remote Control System
☐ Knowledge Management System
☐ Internet / Web Interface
☐ Other (please specify)

_____
_____

7) Which of the following Administrative Issue(s) can be resolved by user if sufficient information is provided:

(CHECK ALL THAT APPLY)

☐ Account Setup	☐ Password Retrieval
☐ Account Termination	☐ Password Reset
☐ Account Maintenance	☐ Password Syntax information
☐ Account Login Problem	☐ Password Invalid
☐ Account Suspension	☐ Other (please specify)

_____
_____

8) Which of the following Guideline(s) (in electronic format) should be provided to user if needed:

(CHECK ALL THAT APPLY)

☐ Hardware Installation	☐ Software Installation
☐ Software Purchasing	☐ Hardware Purchasing
☐ Service Purchasing	☐ Other (please specify)

_____
_____
_____

9) Assuming the user has sufficient guidelines, which of the following Hardware Problem(s) should the user attempt to solve before using the Help Desk:

(CHECK ALL THAT APPLY)

Hardware:

☐ CD / DVD ROM	☐ Scanner
☐ Printer	☐ Hard Drive Tower
☐ Monitor	☐ Phone Headset
☐ Mouse	☐ Phone Handset
☐ Keyboard	☐ Other (please specify)

_____
_____
_____

10) Assuming the user has sufficient guidelines, which of the following Software Problem(s) should the user attempt to solve before using the Help Desk:

(CHECK ALL THAT APPLY)

Software:

☐ Software Performance	☐ Software Functionality
☐ Software "Can't Start"	☐ Other (please specify)

_____
_____
_____

11) Assuming the user has sufficient guidelines, which of the following "Other" Problem(s) should the user attempt to solve before using the Help Desk:

(CHECK ALL THAT APPLY)

Other:

☐ Website "Too Slow"	☐ Server "Too Slow"
☐ Website "Unreachable"	☐ Server "Unreachable"
☐ File "Missing"	☐ File "Corruption"
☐ Other (please specify)	

_____
_____
_____

12) ***Please specify that your information provided for Question 13 to Question 18 is based on:

(CHECK ONLY ONE ANSWER)

☐ Management Report   ☐ Estimation

13) What is the total number of incoming telephone calls logged per month for the past three calendar months?

Month	Number of Calls
_____	_____
_____	_____
_____	_____

14) What is the average number of enquiries logged by the Help Desk Management System per month for the past three calendar months?

Month	Number of Calls
_____	_____
_____	_____
_____	_____

15) Over the past 12 months, has your Help Desk experienced _____ in the total amount of incoming enquiries?

(CHECK ONLY ONE ANSWER)

☐ An Increase
☐ A Decrease
☐ No Change
What are the three main reasons for the above selection?
a) _____
b) _____
c) _____

16) Of your total user contact, what percentage is via:

   a) Telephone   _____%
   b) Walk-in   _____%
   c) Fax   _____%
   d) Internet/Email   _____%
   e) Other (please specify)   _____%

   _____

   _____

   _____

17) Of your total enquiries received by the Help Desk, what percentage is:

   a) Resolved by first level support   _____%
   b) Resolved by second level support   _____%
   c) Resolved by third level support   _____%
   d) Resolved by vendors   _____%
   e) Resolved by other   _____%

18) What mix of enquiries does your Help Desk get in each of the following area:

   a) Hardware / Software Installation   _____%
   b) Other Hardware Problem   _____%
   c) Other Software Problem   _____%
   d) Data Communications   _____%
   e) Voice Communications   _____%
   f) Account / Password   _____%
   g) Other (please specify)   _____%

   _____

   _____

   _____