Helpdesk Automation

Stefan Roelofs `stefan.roelofs@os3.nl`
Wouter van Dongen `wouter.vandongen@os3.nl`

March 30, 2009

UNIVERSITY OF AMSTERDAM

Abstract

This is the report of our study on "Helpdesk Automation". This study is performed during the course "Large Installation Administration" (LIA) for the study System and Network Engineering at the University of Amsterdam. Helpdesks serve as the front end of most IT departments and handle customer communication. We believe that the available resources for an IT helpdesk are crucial in their front end role to customers. This report covers the findings and recommendations we made during interviews with a number of educational institutions. During these interviews, we looked at the implementation of the five sub processes of incident management; registration, classification and initial support, matching, analysis and diagnosis and closing. A number of recommendations can be made when we consider the best implementation seen or possible enhancements.

We have seen that currently, most organisations have deployed static web environments and webforms to self service their customers. We believe that when these environments are dynamically linked to known solutions and equipped with standard request forms for service provisioning, this will enhance automated work flows and throttle down helpdesk load. When known solutions are maintained by helpdesk personnel, these are not only of good use to themselves but also to customers. Also, we have seen that resources that could be of help to quickly identify the customer request such as configuration or asset management, monitoring information and network management tools are used separately or are not correlated to incidents.

We believe that customer consultation and feedback when closing a call are most important because these provide a way to review the process and the communication during the turnaround time.

Contents

1 Introduction

Before you lies the report of our study on "Helpdesk Automation". This study is performed during the course "Large Installation Administration" (LIA) for the study System and Network Engineering at the University of Amsterdam. Helpdesks are a typical LIA topic because they serve as the front end of most IT departments and handle customer communication. We believe that the available resources for an IT helpdesk are crucial in their front end role to customers. In this report, we will discuss findings and recommendations we made during interviews with a number of educational institutions. The report will focus on the incident management process as devised by the Information Technology Infrastructure Library (ITIL).

1.1 Research questions

The main research question of this report is as follows:

- *What is the ideal combination of resources and tools on helpdesk automation for internal IT support?*

In order to answer this research question, we interviewed a number of educational institutions. With these interviews, we will try to answer the following sub research questions:

- *What is the current situation on technical and organisational perspective on helpdesk automation?*

- *What are possible improvements for these helpdesks?*

1.2 Document structure

In this document, recommendations are give on a number of case studies. A general introduction to the interviewed institution can be found in chapter 2. In chapter 3 through 7 the five sub processes of incident registration are discussed. In these chapters, an introduction of the sub process will be followed by a view on how each interviewed institution has embedded the sub process in its own organization. After this, recommendations on the sub process will follow. Chapter 8 will conclude the research questions.

1.3 Past research

This chapter will discuss past research on the topic of helpdesk automation.

1.3.1 Automated response systems

Automated response systems are mostly researched for automatic e-mail response. In the articles 'Corpus-based Generation of easy help-desk responses' [3] and 'A self improving helpdesk service system using case-based reasoning techniques' [4] a system that offers help to the incident response operator is discussed. By analysing the request and matching it to previous cases in the same category it makes sure that all questions are addressed in the response. This technique should limit the correspondence between customer and helpdesk. Text mining techniques in order to categorise and partially automate responses are discussed in [5]. This paper provides a categorisation of unsupervised responses (without human interaction) and supervised responses (with human interaction).

1.3.2 Initial support

In order to quickly provide initial support by helpdesk personnel, most systems are based on case-based reasoning (CBR). In the articles 'Knowledge engineering for an intelligent case-based system for help desk Operations' [6] and 'The development and utilization of the case-based help-desk support system HOMER' [7] such a CBR system is discussed. These type of systems mainly thrives on matching new cases with old cases. With this approach, helpdesk personnel are provided repair instructions that were conducted on the old case.

1.3.3 Support

Relieving the burden of system administration through support automation [8] depicts a system which automatically repairs issues for the user. The system works with a shared 'Master solutions' database which provides system administrators and vendors access to share their solutions. These solutions are then approved by system administrator and by code execution can be applied to user equipment. The report described that this way of working can provide solutions for 80% of the problems encountered by users.

1.4 ITIL

The Information Technology Infrastructure Library (ITIL) is a set of concepts and policies for managing information technology (IT) infrastructure, development and operations. ITIL gives a detailed description of a number of important IT practices with comprehensive checklists, tasks and procedures that can be tailored to any IT organization [1]. ITIL provides businesses with a customizable framework of best practices to achieve quality service and overcome difficulties associated with the growth of IT systems. Developed in the late 1980's, ITIL has become the worldwide de facto standard in service management.

Incident management is a part of the service support discipline of the ITILv2 framework. ITIL Incident Management aims to minimize disruption to the business by restoring service operation to agreed levels as quickly as possible. For that purpose incidents are registered, classified, assigned to the appropriate specialist, carefully guarded, solved and subsequently closed. The ITIL Service Desk provides a vital central point of contact between the customer and the IT organization. The Service Desk encompasses a range of services that reach beyond the typical Help Desk, including the ability to process incidents, problems, enquiries, change and service requests, and IT service management processes (e.g. Configuration Management) [2].

The ITIL Service Desk is often seen as the 'front door' into an organization where quality service is delivered. Its purpose is to ensure that customers are able to resume their work as quickly as possible following a disruption to an IT Service, minimizing the adverse impact on business operation.
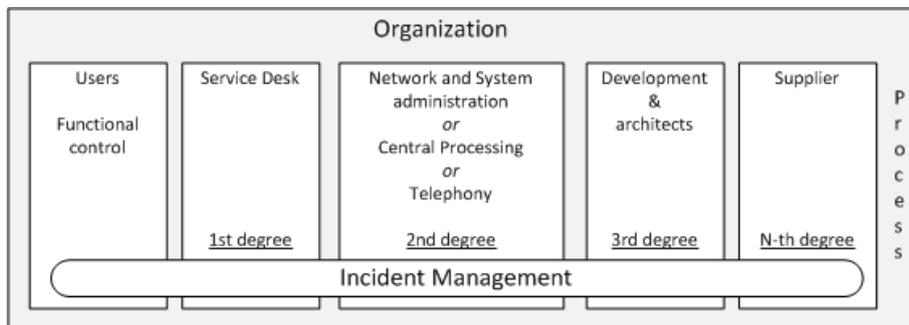

Figure 1: Relation incident management with the organization [9].

2 Case Studies

We present a number of case studies on schools and universities which are described by interviewing an employee of their helpdesk. The case studies are not intended to be representative of the industry as a whole; a far larger study would be required for that. Instead, they provide insight into how helpdesks manage their processes to deliver the best support. This section provides an introduction of the participants of this study. The details of the case studies are described per ITIL process in sections 3 through 7.

2.1 Amsterdam Academy for Arts

The Academy support team delivers support for approximately 5000 users consisting of 2000 students and 2000 FTE employees. Support is delivered at working hours (8:30 - 18:00). The helpdesk exists of a total of 17 employees. 2 FTE are engaged at the front desk which is the first tier and the rest of the staff are system administrators which form the second tier. The third tier is formed by external expertise. The team delivers support for all IT equipment and software with exception of specialized graphical applications used by the movie academy.

The academy had utilized Topdesk Enterprise package for eight years. They make use of version 4 which is the most current. The incident management, configuration management, software license management and knowledge system modules are used. Problem en Change management are part of the package but are not used frequently. Because of this, both processes do not run smoothly. The interviewee tells us the cause for this is that understanding and concerns are absent, a study session should increase the usage and understanding. No asset management or project management modules are in use. No custom extensions are in use. The interviewee states a product should be used 'out of the box'. His experience has taught him that customizations cause problems and should therefore be avoided.
Stats:

Statistics or reports are rarely generated. The academy has started a project to increase the use to gain better insight of what they are doing. This request comes from both the operator and the management. Therefore the interviewee did not have stats available. The following stats are based on old stats remembered by the interviewee:

- 800 calls a month for both the first and second tier.
- 60-70% of the calls are escalated to the second tier. Basic calls suchs Information requests and calls such as account creation are immediately handled by the first tier.

2.2 Vrije University Amsterdam

The support team delivers support for 26.000 students and 1000 employees. Faculties have their own helpdesk which is only available for employees and thus not for students. They deliver support for all IT matters, such as purchasing of hardware and software, telecom and networking. In the near future they will establish one central service desk that will perform both activities. The team is not divided in different tiers and consists of 6 FTE. Calls are handled by the person whose expertise fits the best and can therefore handle the call the fastest.

The most recent version of Topdesk Professional is in use. The Enterprise edition will be used once new situation - the central service desk - has been established. Solely the incident management module is present and used. This will be extended once the Enterprise edition is used. No customizations to the package are made.
Stats:

Statistics are not monitored. The interviewee tells us that there is no demand for this by either the management nor the operators, but he would like to see this feature in place. The following stats are therefore an estimation:

- 3500 calls per month of which 1800 by e-mail.
- The majority of the calls are handled within three days.
- Max 10% of the calls are unknown problems of which most are escalated to an external specialist.

- 40% of the calls are escalated. These are mostly authority issues such as account creation.

2.3 UCI Nijmegen

The UCI support team fulfills different tasks. First of all, they form the second support tier for all students (approximately 18.500) and employees of the Radboud University. Besides this, they also form a second support tier for all organizations connected to SURFnet that mainly dispatches calls to operator groups. Furthermore, they also offer support for the Radboud hospital after office hours. Support is offered 24/7, two operators are present at all times. The team consists of a total of 15 FTE.

The UCI makes use of the open source package Remedy ARS version 5 (2002). The management of ARS has recently been outsourced and they are currently upgrading ARS. ARS contains an incident and problem management module and contains a separate module for CERT calls which are separated from incidents. The Incident management and CERT module are used. ARS has been customized by arranging and creating input fields.
Stats:

The interviewee could not tell us any detailed statistics about the University as he did not have approval to do so.

- Less than 200 calls a month for the SURFnet support

- 10 to 20 calls a day for the University.

- < 10% of the SURFnet calls can be handled immediately, these are mainly information requests.

2.4 University of Amsterdam

The University of Amsterdam offers support for 25.000 students and 5500 employees and all allied institutions. This is a total of 8000 workstations spread over 160 addresses on 80 locations. For the students there is a separate helpdesk phone number and service desk. The service desk consists of 15 FTE, this will soon be reduced to 12 FTE. The helpdesk is divided in three tiers: the service desk, operations and technical support. They deliver support for all IT matters and telecom. Services are specified in a service catalog.

The UvA makes use of HP OpenView version 4 which is not the most recent. They try to keep the package up to date, but this is costly and new interfaces are not always appreciated by the helpdesk operators. The incident, problem, change and asset management modules are used. No custom extensions are in use.
Stats:

Statistics are generated every month by service level management. All aspects of the report are studied. After the reorganization there were allot of complaints about the front office, therefore quality was important and reports were generated.

- 1200 calls a week by telephone

- 1200 calls a week by e-mail

- 60% of all calls can be handled immediately

- 2-5% are escalated

2.5 Tilburg University

The helpdesk of Tilburg University is separated in an intake desk and and incident management part. It delivers support for 12.000 students and 1100 employees. The total helpdesk comprises 20 FTE. Calls by phone, verbally (through desk) or e-mail are registered by the intake desk. If the request cannot be handled immediately it is forwarded to other incident management operators which are also on the first tier. If calls require certain expertise they can be escalated to the second tier.

Tilburg University uses Topdesk Enterprise. They make use of version 4 which is the most current version. Faculties now have different administrations within the software but these are consolidated in the near future. Currently, the incident management and reservations

management modules are used. There are plans to use problem and change management in the near future.

Stats:

Not all statistics are monitored. The following stats are therefore an estimation:

- Approximately 800 calls per month

- The intake desk may only process an incident if it takes up to 10 minutes maximum when the request is made by telephone. If it is made at the service desk this is 30 minutes.

- 60% of the calls can be handled immediatly, these are, for the most part, information requests.

- 25% to 30% is being forwarded to the incident management first tier.

2.6   Overview

See next page.

Table 1: Overview interviewees

Property	AHK	UCI	UvT	UvA	VU
Website	www.ahk.nl	www.ru.nl/uci/	www.uvt.nl/lis/	www.ic.uva.nl	www.few.vu.nl/onderwijs/voorzieningen/it.html
Size	2 FTE (1st tier), 15 FTE (2nd tier)	15 FTE (2nd tier)	20 FTE (1st tier)	15 FTE (1st tier)	6 FTE (1st tier)
Tiers	1. Intake & direct support, 2. System administrators	Only second tier	1. ITS, 2. Back-office	1. Service Desk, 2. Operations, 3. Technical	No tiers
Support for who	2000 students, 2000 FTE employees	18.500 students, 5000 employees, all organization connected to SURFnet	12.000 students, 1100 employees	25.000 students, 5500 employees	26.000 students, 1000 employees
Support for what	Everything related to IT. No specialized software support movie department	A. Radboud University all central services, B. SURFnet dispatching	Everyting related to IT and AV, not support for infrastructure (cables etc.)	Everything related to IT, telecom and infrastructure	Everything related to IT and telecom
Service catalog	No	Yes	No	Yes	No
Package	Topdesk Enterprise 4	Remedy ARS 2002	Topdesk Enterprise 4	HP OpenView 4	Topdesk Professional 4
Modules in use	Incident, configuration and license management, knowledge database	Incident management and CERT	Incident management and reservations	Incident, problem, change and asset management and CMDB	Incident management
customized	No	Input fields	No	No	No
Automatic statistic	No	Statistics are generated by hand (SQL queries) and exported to Microsoft Excel.	Yes, monthly. Reports are not saved.	Yes, monthly.	No
Calls a month	800	450 for the University, 200 for SURFnet	800	2.400	3.500
Remarks	No	No	Currently rearranging the helpdesk infrastructure, Library and IT & AV service desk are merged. The modules problem and change management will then be added to to package.	No	No

3 Incident registration

ITIL differs three types of incidents when it comes to registration: [9]

- Incident an event that leads to the interruption or decrease in quality of the offered service.
- Service Request a request by the user for support, delivery, information, advice or documentation.
- Request for Change a formal request to carry out a change on one or more specified Configuration Items (CIs).

In some circumstances, mostly dependable on the staffing of the organization, these types of incidents are performed by different departments in IT support organizations. (cite boek practice sna). If these types of incident are not registered in different databases, it is common practice to register the type as an information field on every incident. Registration can happen in a number of ways, notably:

- Helpdesk personne after the incident has been reported by the user verbally or by phone.
- E-mail the incident is imported from an IT support email box manually, or automatically.
- By self-service a self service desk is a tool by which the user can submit the incident her/himself. Sometimes this is coupled with e-mail traffic by using forms.

Other information that is generally administered during the registration of incidents are:

- The caller this information can usually be derived from a customer information database for ease of registration.
- Impact, urgency and priority determined by helpdesk personnel in order to provide an objective view on the incident. More on classification & initial support in chapter 4.
- Involved CI's this information can usually be derived from an asset or configuration management database and can be linked with the caller information.
- Categorization this information is used to match the incident to known incident or case based reasoning (CBR) to solutions of previous similar incidents. It is also used to provide better statistics and to define specialism of the operator.
- Problem description the incident information as received from the user.
- Solution description actions carried out by operators in order to correct the incident.
- Time frame time indications (possibly derived from an SLA) when the incident is to be corrected, when it is corrected and time spend by operators on the incident.
- Operator operator(groups) who have the incident in exertion.

3.1 Practical findings

Amsterdam Academy for Arts

The academy for arts does not divide incoming calls into the categories of "service request", "request for change" and "incident". Due to the small scale of the IT department, it is believed that splitting the incoming calls to these categories provides no improvement to the service delivery flow. The academy does not have a separation of incident management and service provisioning services. Calls are handled through e-mail (automatic import), telephone and verbally. A policy is in place that every call should be registered. When creating the incident in the registration system, information of the caller is automatically filled in through a link with a students and teachers information database. Configuration management is linked to this information. The caller is manually identified through telephone, mainly through his or her surname. E-mail import is done automatically and unsupervised. Helpdesk operators do not actively audit and change incident information at import. The import provides raw data so the helpdesk employees must categorize and prioritize the call.

Vrije University Amsterdam

The Vrije University Amsterdam divides its incoming calls in the "service request", "request for change" and "incident" categories. Every helpdesk employee has its own technical expertise and may handle any call. Therefore these categories are not mapped against operator groups which have knowledge on the specific sub area. Some parts of service provisioning (notably software provisioning) are separated from the incident management group. Calls are handled through e-mail (automatic import), by telephone and verbally. Besides this, a web form is available where the user may enter his or her call. The contents of this web form are then e-mailed and also automatically imported. The web form provides a way to let the user categories his or her call. When imported, no further automatic analyses are performed on the contents of the call. Calls that can be handled immediately are often not registered except when this is necessary to trace back changes. When creating the incident in the registration system, information of the caller is automatically filled in through a link with the students and teachers information database. A link with configuration management is not present because there is no asset management or configuration management in place. Configurations can be read from network management tools although these have their limitations. The caller is manually identified through telephone, but automatically through e-mail import. E-mail import is unsupervised. Helpdesk employees must review categorization information entered by the user (through the web form) and prioritize the call.

UCI Nijmegen

The UCI does not divide its incoming calls in different categories. This is due to the nature of the team which is solely incident management. Requests for information, mainly concerning incidents often occur, but are not registered. Calls are handled by telephone and e-mail. The registration provides a way to create master tickets and slave tickets. Through this linking of calls, correlation between incidents can be performed. Caller information can and must be subtracted from a linked customer information database. Since the helpdesk functions at a high level of trust, callers must be in this database before their call can be processed. There is no link between caller information and configuration management. E-mail is imported by hand which also provides categorisation and prioritization of the call. The registration system provides no analyses on the contents of the call.

University of Amsterdam

The University of Amsterdam divides its calls in service requests, request for changes and incidents. Service requests such as account creation are handled through a service provisioning system. Registration is generally performed for all calls, but may be skipped by estimation of the helpdesk employee (e.g. for mass calls). Calls are handled by telephone, e-mail and verbally at service centre points. There is also a web form available at the intranet site of which the content is imported through e-mail messages. E-mail import is performed manually due the amounts of spam received. When the registration is performed, a link with student and employee information and configuration management makes it possible to automatically fill in this information. Also when performing e-mail import (including web form based) it is possible to recognize the caller with his or her UvAnet-ID. The registration system provides no analyses on the contents of the call.

Tilburg University

The Tilburg University does not divide its incoming calls in different categories. User account creation requests are handled through human resource departments and are technically performed automatically. Mutations and hard or software installations are performed through the intake desk. This intake desk is a separate desk within the helpdesk. Registration is performed on all requests, but may be skipped when the request can be handled within 2 minutes and there have been made no imported changes. Calls are handles by telephone, e-mail, verbally and through a web form. The contents of this web form are mailed to the helpdesk mailbox. Information on callers are automatically imported from a linked database. Currently, there is no configuration management in place. Callers can be

recognised by manually filling in the information visible on the (VoIP) display of telephones when the caller is recognised from the central telephone library. E-mail import is performed manually due to the amounts of spam messages and automatic reports of monitoring systems. Although the registration system performs no analyses on the contents of the call at register time, a separate system built in Microsoft Sharepoint is used to manually perform matching. More on this in chapter 5.

Overview

Table 2: Overview interviewees registration process.

Property	AHK	UCI	UvT	UvA	VU
Devides incoming calls	No	No	No	Yes	Yes
Incident/provisioning seperation	No	No	Partly	Partly	Partly
Registration small requests	Employee estimation	No	Below 2 minutes no registration	Employee estimation	Employee estimation
Automatic mail import	Yes	No	Manual	Manual	Yes
Caller recognition	No	No	Through phone display (VoIP)	Through phone display (VoIP)	No
Configuration management linked to caller	Yes	No	No	No	No
Self service desk	No	No	Webform	Webform	Webform

3.2 Recommendations

This section provides improvements on the incident registration process observed at the different cases

Separation of request

Only two of the interviewed institutions perform a separation of service request, request for change a incident and a request for information. We believe that this categorization is necessary to register at call entrance. Without this information, it is impossible to analyze trends from call statistics, as the only filtering possibilities are mostly the categorization of the call. An example is a request for information on a specific topic. This separation should also provide a custom call registration which depends on the type. For example, a request for service registration could be expanded with fields that clearly specify the service request. Also, when a request for information is registered, the call information can be very basic as it mostly encompasses a question and an answer.

Registration of small requests

Most of the interviewed organizations have a policy to register every request. Nonetheless they admit that this depends on an estimation of helpdesk employee based on time. This practically means that short request will not be registered. The Tilburg University has a formal policy that requests that take longer then two minutes to answer must be registered plus if a change is made during these two minutes (in order to trace back changes). We believe that these formal policies are necessary in order to get an accurate view on the reported incidents. A two minute boundary should suffice.

Self service registration

User based registration, letting the user register his or her call can provide great enhancements in the registration process. This could be implemented using a "self-service" desk (an extension to the registration system) or web based form, which could be imported through

e-mail. These methods do not save time to the helpdesk, but are also a way to acquire all information the first time (mostly not the case when an incident is reported through e-mail). Also, by letting the user specify and categorize his or her incident, it is possible to provide known solutions in direct relation to the incident. Currently, most interviewed institutions work with static web forms that do not provide any level of flexibility or self service to the end user.

Recognition of caller

None of the interviewed organizations used automatic recognition of the caller by telephone. Although this option comes as a standard with most of the registration systems, integration with the telephony system requires time and effort. When implemented for educational organizations, private numbers must be linked in order to get high benefits from the system. E-mail sender recognition at automatic import is becoming more and more standard, nonetheless 3 interviewed organizations do not have it in place. E-mail sender recognition should be handled with care because it is highly susceptible to spoofed e-mails. When the incident has security or privacy implications, the caller should be contacted (preferably through an other medium) to verify the incident.

Linking caller with configuration management

Although some of the interviewed institutions have linked their configuration or asset management with the incident registration system, none have linked configurations or assets to callers. We believe that configurations can always be linked to persons. Because configurations should be user dependable (e.g. profiles) an integration with the registration system should accelerate the solution time for helpdesk employees. When only assets are registered, or configurations are linked to assets, linking can only be done on employees who often work with the same asset. Flex workers and students can work everywhere. Because of this, linking assets to persons may be time consuming and keeps having numerous exceptions. We therefore do not advice this link.

4   Classification & initial support

Effective incident classification helps in routing the incident to the correct support team with the right priority. By classifying the incident the right amount of resources can be gathered/reserved.

Classification is based on two issues:

- Category incidents should first be divided in a category and subcategory, for example by the supposed cause of the incident:
  - **Network:** router, switch, hub, IP-address
  - **Workstation:** monitor, network card, disk drive, keyboard, etc.
  - **Service request:** a request for support, supply, information etc. For this different procedures may apply.
- Priority the priority is put together by the impact and the urgency of the problem.

The classification can start in a very moderate degree by the caller itself by specifying a global category, for example a printer problem or mail problem. The support team should not attach much value to the caller's classification as he/she isn't trained for this and has no insight in other, possible concurrent incidents. The actual classification is done best by the service desk management as they can keep an overview of all incidents. Therefore they are able to assign the right priority for an incident and gather the right amount of resources. On the other hand, classification could also be entirely done by the operator handling the call. It also possible to let the operator categorize the call and subsequently letting the management assign the priority. Automating the classification process is very difficult as it is essential that this is done precisely to avoid that available resources are not unnecessarily put into action. It could be catastrophic when a truly high priority call comes in and no resources are available.

After a call has been classified initial support can be offered. If the priority is high, the call should be immediately forwarded/escalated to the right person/group. If the priority is low, the operator might offer the caller some useful tips which might be sufficient enough to help the caller.

4.1   Practical findings

Amsterdam Academy for Arts

The helpdesk operators classify calls by themselves. The interviewee tells us the priority of a call is rarely classified as high and estimates that 60-70% of the calls are escalated to the second tier. Escalation/handling by the first tier takes place by the operator's own estimation. The Academy for Arts does not know how long an average first tier calls takes. The first tier has the tendency to hold calls too long because they consider their own expertise level to be high. The first tier mostly helps with basic troubleshoot scenarios and information requests. Calls are escalated to support groups. This prevents that a single person is responsible for the call which could negatively influence the support time when unforeseen events take place.

Vrije University Amsterdam

The helpdesk operators classify calls by themselves. There are no rules for escalation, handling or classification, this takes place by the first tier operator's own estimation. Calls that can be immediately handled are not registered and classified. Because the helpdesk is not divided in different tiers, only calls that require certain administrative right are being 'escalated' (about 40%) and unknown problems (< 10%) which are often escalated to external specialists. Call duration is very variable and can take from 5 minutes to 3 months. Most calls are solved within three days.

UCI Nijmegen

The UCI does not classify calls because of their dispatch service. The problem managing partners classify the calls themselves. Only strict arrangements are set in relation to network

connectivity, no connectivity results in a high priority classification. For other services this is not clearly defined. Less than 10

University of Amsterdam

The helpdesk operators classify calls by themselves. Classification of the incident takes place by the impact and urgency which is specified in the SLA. First tier calls take 10-15 minutes, no maximum time has been specified. 60% of the calls can be handled immediately. These are easily solved calls which frequently occur, for example, 'my monitor does not work'. 2-5

Tilburg University

The helpdesk operators classify calls by themselves. Classification takes place by 'severity categories', for example, one person can't continue, a group can't continue etc. An incident manager guards the incidents so calls are properly classified. The first tier is only allowed to handle calls if they take less than 10 minutes to resolve. This limit is set to 30 minutes at the service desk. 60% of the calls are resolved immediately which are mostly information requests.

Overview

See next page.

Table 3: Overview interviewees classification & initial support process.

Property	AHK	UCI	UvT	UvA	VU
Classification person	1st tier helpdesk operator	Support managing partner	1st tier helpdesk operator	1st tier helpdesk operator	1st tier helpdesk operator
Incident manager	No	No	Yes	No	No
Classification by	Operator's own estimation	n/a	based on severity categories, operator's own judge	SLA	Operator's own estimation
First tier call duration set	No	No	Yes	No	No
Duration time calls on first tier	Unknown	for University 10 min - several days	Max. 10 minutes by phone and 30 minutes at service desk.	3-15 minutes	5 minutes - 3 months
% calls handled first tier	30-40%	< 10%	60%	85%	60%, only calls that niet certain administrative priveliges are escalated

4.2 Recommendations

Only the UvA classifies calls by using the SLA. The rest of the interviewed organizations classifies by using informal rules and estimating the impact. We think the best method for call classification is by using the SLAs. This way calls have lesser chance of not being properly classified as the classifications are already specified. In addition, calls can be quickly and uniformly classified and the classification is clear and in agreement with the caller. Besides this, we feel that the classification should be actively supervised by an incident manager who is able to keep a good overview of all incidents. Helpdesk operators may not be aware of other calls handled by other operators and therefore he/she isn't able to assign the right priority. By appointing an incident manger this is easily avoided.

Only the Tilburg University has clearly defined how long first tier support can take. We believe that the initial support phase should only last a couple of minutes, after which the call should be forwarded to the next tier. A limited initial support phase prevents a first tier operator to keep a call for which he/she is not capable of handling. This would unnecessarily increase the support time and will likely result in a less satisfied caller. Therefore, a clear policy should be available that states what calls may be handled by the first tier operator, and how long the initial support phase takes.

5 Matching

A lot of time can be saved when incident can be properly matched with a known errors database or a known problem database. These databases typically comprise a common knowledge base utilized by the service desk in addition to what individual service desk operators may already know. If the incident matches either a known error or known problem, it is matched to a known solution or workaround, respectively. Known errors and known problems in de database should be carefully documented in order to be matched to future incidents. Besides this, it is very important that these databases are kept up to date. If the databases are not kept up to date, trying to match an incident is practically useless as all information is outdated. This may result in a considerable amount of extra work for the service desk operators as they might start troubleshooting problems for which a colleague might already have the solution. The service desk should enforce a clear policy that states how and by whom the know errors and known solutions databases should be kept up to date and how errors/solutions are inserted.

5.1 Practical findings

Amsterdam Academy for Arts

The incident package in use (TOPdesk) supports the use of a known solutions database, but it is not actively used. Currently the academy for arts only has a few out dated solutions stored in the database. The known solutions database holds links to an external document tree. The known solutions database is managed by the functional operator, the solutions are added in consultation with a helpdesk employee.

Although the helpdesk package does support sharing the known solutions database with a self service desk, it is not being used. They currently make use of a portal where everybody is able to see general IT documentation, how-to documents etc. The interviewee remarks that these documents are tailored for the end-user.

The Academy for Arts does not make use of Case Based Reasoning (CBR). The interviewee does find this functionality handy. They used to have a CBR like functionality, but they could not find this functionality in recent versions of the package. The interviewee told us he did not actively searched for this functionality.

Vrije University Amsterdam

The VU manages known solutions within their helpdesk package (TOPdesk professional). Known solutions are found by using the category classification and not by the contents of the call. The solutions are being managed by a single person, other operators are allowed to contribute to the database.

Known solutions are not coupled with a self service desk and are only available for helpdesk employees. The interviewee states that the extra benefit of making known solutions available for students is minimal as for many operations special privileges are required.

The VU does not make use of CBR. However, they find it an interesting feature.

UCI Nijmegen

The UCI neither makes use of a known solutions database nor a CBR. The problem managing partners have their own systems with administrative control.

University of Amsterdam

The UvA puts known solution on a WiKi website, the WiKi is not coupled with helpdesk package (HP open view). The interviewee tells us she does not see extra benefit of a coupling the WiKi with the helpdesk package as this costly and time consuming. The WiKi is kept up to date by all helpdesk employees.

The WiKi page is not available for students. The interviewee does not expect any benefit when the WiKi is made available for students because the WiKi page holds information for which special privileges are required.

The UvA does not make us of CBR. De interviewee does not miss this feature in their helpdesk package as she does not see a surplus value.

Tilburg University

The Tilburg University used to put known solutions along with the incident registration details. This was a time-consuming task as one central person had to manage this. Known solutions are now placed in Microsoft SharePoint which is not coupled with their helpdesk package (TOPdesk Enterprise). Solutions are now copied from SharePoint and pasted into TOPdesk. By using an administrative structure all employees have the ability to work with the known solutions.

SharePoint is currently only available for helpdesk employees. The interviewee would like SharePoint to be accessible (only readable) to the rest of the university in the near future.

The interviewee tells us that CBR is not supported in their helpdesk package and he is currently orientating if CBR is possible with SharePoint.

Overview

Table 4: Overview interviewees matching process.

Property	AHK	UCI	UvT	UvA	VU
Known solutions database in use?	No	No	Yes, Share-Point	Yes, WiKi page	Yes, internal functionality of TOPdesk
Known solutions coupled with helpdeskpackage?	n/a	n/a	No	No	Yes
Known solution available for others?	n/a	n/a	No	No	No
Case Based Reasoning in use?	No	No	No	No	No

5.2 Recommendations

We strongly belief that organization can benefit from a good and up to date known solutions database, it simply prevents employees from finding the solution multiple times. We think that all operators should have the ability to contribute and that one operator should be appointed to be the 'known solutions supervisor' who actively monitors the 'correctness' of all the solutions. A template should be available and used for inserting new solutions. Ideally the database should be coupled with the helpdesk package to increase the consistency.

None of the interviewed organizations has made the known solutions database available for other employees and students, because they feel not all information is suited for others outside the helpdesk. By using an administrative structure for the database we think that suited information can reasonably easy be made available and less suited information can be kept shielded. This way information is kept consistent as only on database has to be maintained.

Although research has shown that CBR system can be very beneficial [4], none of the interviewed organizations had Case Base Reasoning in use. This is probably due to the facts that none of the used helpdesk packages has support CBR. We believe that a known solutions database is the more beneficial than CBR as it deals with the most occurring incidents. Therefore we think that if the known solutions database is not in an optimal state, this should be the organizations top priority. CBR should be (an ambitious) future goal. However, if the known solutions database is in a perfect state we think an organization should consider using CBR for matching those other -less- occurring incidents.

6 Analysis & diagnosis

It is possible that an incident cannot be solved by the current operator or that there is no solution available. For this reason, an incident can be dispatched to an operator group which has more expertise on the area where the problem occurs or has more dedicated time to investigate the cause of the incident. Root cause investigations are normally handled in the problem management process. The operator group will take care of analyses and diagnosis of the incident and often also takes care of solving it. This group will have relations with external parties such as vendors or support contract groups. During the analysis and diagnosis stage, the incident record should be updated with information on the status and which tasks have been performed on the incident. Often it is possible to "trace" the incident which operators have worked on it (and on what timeframe). Tools that can be used during the analysis & diagnosis process are:

- Monitoring systems and log files
- Debugging systems
- Network Management Systems (NMS)
- Information resources such as configuration and asset management.

6.1 Practical findings

Amsterdam Academy for Arts

The academy for arts actively maintains a configuration management database. This database is part of the incident management system. In the database, hardware and software configurations are coupled and stored. Installed software is automatically inventoried with host scanning tools like WMI [10]. The configurations are linked to possible users (callers) of the configuration. Other sources of information such as access management systems and network management systems are used if needed on a manual base. There is no service provisioning system in use, although there are plans to use one.

Vrije University Amsterdam

At the Vrije University, there is no asset or configuration management in place. Configurations are manually read out by network management tools if needed (requires that the equipment is online). There is no service provisioning system in use although there is a separate IT division for it, mainly for software provisioning. Service requests are passed through local contacts who authorizes and prepares the request to be send to the service provisioning division. This procedure is supported by e-mail and paper templates.

UCI Nijmegen

At the UCI, configuration management is in place but is not linked to any caller. Incidents are manually correlated to monitoring systems, although some network monitoring is not accessible for the helpdesk. System management tools are accessed manually. Service provisioning request are processed manually except for a pilot project for dynamic optical networks.

University of Amsterdam

At the University of Amsterdam, asset management and configuration management are in place but are not linked to any caller. Service disruption are manually reported through a webpage that is periodically checked by helpdesk employees. The current network management system is to be replaced in the near future, but is not integrated in the registration system. Service provisioning such as account creation is performed automatically through SAP systems. Request and changes to accounts are performed through request forms which are digitally available. These forms are handled by a separate helpdesk division.

Tilburg University

The Tilburg University has asset management in place. Assets are coupled to the budget holder of the division the employee is member of. Configurations are checked manually on the demand using a separate network management tool. Monitoring of crucial services are performed by other divisions and are communicated to the helpdesk through mail. Service provisioning such as account creation is performed automatically. Request and changes to accounts are handled by the intake desk. In order have uniformity in the requests, templates are available to users and helpdesk personnel.

Overview

Table 5: Overview interviewees analysis & diagnosis process.

Property	AHK	UCI	UvT	UvA	VU
Monitoring correlation	No	No	No	No	No
NMS Integration	No	No	No	No	No
Asset management or configuration management	Yes, both in place and linked in incident management	Not accesible by this helpdesk	Future plans for use	Both in place, not linked to caller	Both not in place
Provisioning requests	No templates	Not handled	Templates	Templates and by webforms	Templates

6.2 Recommendations

Configuration and/or asset management

As earlier discussed in the registration chapter of this report 3 we think that it is crucial to have configuration management and asset management in place. We have seen in the case studies that the institutions who do not have asset management in place also do not make service level agreements (SLA's). Although some have intentions to, without asset management it is impossible to agree on service levels on equipment where the institutions are not responsible for.

Next to this, some institutions do not have configuration management in use. Often, network management systems (NMS) are used to discover configuration information. Although these tools provide an immediate interface to solve the problem, they often do not trace back earlier changed configurations. Without such historical data, it is impossible to trace back the root cause of a problem or why the configuration is in the state it is now.

Monitoring information

Monitoring information is passively used among all interviewed institutions. We believe that this information should be actively part of the incident registration system. This functionality is best implemented when monitoring happens on a service level. Because most categorization in incident registration is performed on services, when choosing the category, the system could display monitoring information on services in the category.

Integration with network management tools

When configurations are linked to persons 3.2 the incident management system could be easily equipped with links to network management tools. None of the interviewed institutions had such links in place. When this integration is performed, time spend on copying information between the tools and searching for the right information could be saved.

Provisioning

A couple of interviewed organizations have an automatic service provisioning system in place. None also utilize this system to perform mutations and extra requests after the initial setup. While such modifications require extra back end software, we believe that there is also much improvement to make on the front end of the provisioning. Automatic request forms can automate the provisioning request procedure. By expanding the self service environment 3.2 with such forms, a user could do the request on his or her own. Also the authorization of the request, often through a responsible manager, could then be handled by the system. This mini chain of events is now carried out manually (i.e. through e-mail messages) by helpdesk personnel making it susceptible to miss communication or the skipping of steps.

7 Closing

After executing a solution for the incident, it should be verified that the incident is solved. This is usually done by contacting the caller, a short explanation what is done to solve the problem and verification if the incident is indeed solved. If the caller concurs that the incident is solved, the incident can be closed. If the caller does not concur, the incident should be re investigated. Often, this is done by routing the call to the last operator group in order to investigate why the fix of the incident did not work. When closing the call, the integrity of the incident registration should be verified. Information such as category, priority and involved users should be updated. This is to support future matching to the call and for accurate management statistics. Also during the process, the quality and satisfaction on the incident management service from the callers perspective can be measured. When the incident solution is verified with the customer and the incident is indeed solved, this is a good moment to ask for feedback. This measurement could be done on the following categories:

- Acceptable solution
- Acceptable turnaround of the incident
- Communication and information on status
- Customer care and friendliness of the operators and service desk

7.1 Practical findings

Amsterdam Academy for Arts

The Academy for Arts close calls in consultation with the caller. Calls that are entered through telephone are also closed through telephone, while e-mails are manually (not through system notifications) sent. During this caller contact, the activities carried out for the call are enumerated. When consulting, the helpdesk employee informally asks the caller if the call is handled with satisfaction. This feedback information is not recorded. Turnaround is monitored by the employees themselves. There is a general aim for an acceptable turnaround time and open incidents, but these are not formally noted. There are no reports on the time spend per call or the work load per operator.

Vrije University Amsterdam

At the Vrije University, not every closed call is consulted with the caller. This consultation is mostly done by estimation of the helpdesk employee. When a call is closed, the caller is automatically notified through mail of the performed operations on his/her request. Feedback on the call is not actively asked, but callers have the option of replying on this closure mail. User satisfaction is measured through separate surveys. The incident manager supervises the turnaround. Time registrations are not performed.

UCI Nijmegen

At the UCI, calls are always closed in consultation with the caller. This is first done by telephone, when not available, through e-mail. These contacts are performed manually. Feedback is asked using a standard list of questions on satisfactory and are noted in the incident. Turnaround is monitored by the employees themselves. No time registration is performed, mainly due to the fact that the system is not equipped for such a registration.

University of Amsterdam

At the University of Amsterdam, when closing the call, the caller receives a notification mail with the performed operations on his/her request. The caller has 5 days to respond to the closure after which the call is automatically closed. Feedback of the caller is not asked during this process but can be entered in a reply mail. Weekly (external) surveys, linked to reported incidents, measure customer satisfaction. These are a samples on the total amount of calls. Turnaround times are monitored by helpdesk supervisors and time registration is performed.

Tilburg University

At the Tilburg University, when closing the call, the caller receives a notification mail with the performed operations on his/her request. The call remains open for 5 days for which it is possible for the caller to respond to these operations, verify the solution and provide feedback. When no verification is received after 5 days, another notification is send. When there is still no verification, the call is closed after 2 more days. Currently, helpdesk management is developing a user feedback form that will be included in these notification e-mails. The user can judge the speeds, quality of the solution and communication and can leave some notes. This information is saved with the call in the registration system. Turnaround times are supervised by an incident manager. Time registration is performed by employees but is not used in statistics.

Overview

Table 6: Overview interviewees closing process.

Property	AHK	UCI	UvT	UvA	VU
Caller Consultation	Yes, manual	By estimation of employee manual	Automatically within a specified amount of time plus reminder	Automatically within a specified amount of time	No, notification only
Caller Feedback	No	Yes	Yes	External sample survey	Seperate surveys
Turnaround Time Supervised	By employees	By employees	By incident manager	By employees	By incident manager

7.2 Recommendations

Closure in consultation with the caller

We believe that, in order to verify that the request has been handled with care, it is necessary to ask the caller to agree. By agreeing, it is also possible to verify the whole chain of communication that led to the eventual handling of the request. In order to verify the accurate closure, we believe that the solution by the Tilburg University should be followed. At first closure the user is notified with the performed operations on his/her request after which he/she gets 5 days to agree with it. If no agreement has been received, a reminder notification is send giving the user another 2 days to concur, or the incident will be closed automatically. These notifications and replies could be automatically send and received by the incident registration system. When the caller does not concur, the incident can be directed to be re-processed. We believe that this procedure provides optimum customer feedback but does not delay the process too much by setting maximum response times.

Feedback

When constantly improving the service desk, customer feedback is most important. We believe that customer feedback should be asked during the closure process described in the previous section. The easiest way to implement this is to equip the earlier described automatic closure notifications with a small enquiry. The customer should be able to grade the following aspects:

- Acceptable solution
- Acceptable turnaround time
- Customer care

These grades should be stored with the incident in order to trace back incidents when reports are made from these statistics. An extra free text field could also be equipped on this enquiry, as long as there is some sort of report on these texts so that (possible) proper measures can be taken.

Monitoring of the turnaround

At the interviewed institutions, monitoring of the turnaround time is done by employees or by an incident manager. We believe that this monitoring should be done by an incident manager (notably the one classifying the call). By assigning this task to a dedicated person, incidents that have no easy solution are not endlessly delayed because helpdesk employees keep shuffling them around, a phenomenon seen at some of the interviewed institutions.

8 Conclusion

Reviewing our research question from section 1:

> *What is the ideal combination of resources and tools on helpdesk automation for internal IT support?*

During the chapter we have discussed the sub research questions:

> *What is the current situation on technical and organisational perspective on helpdesk automation?*

> *What are possible improvements for these helpdesks?*

By looking at the different processes of incident management, we have seen that it all boils down to the following recommendations: self service automation, maintaining known solutions, integrating informational resources and keeping customer contact.

When the customer is able to do certain actions him or herself this saves time for helpdesk employees. We have seen that currently, most organisations have deployed static web environments and webforms to self service their customers. We believe that when these environments are dynamically linked to known solutions and equipped with standard request forms for service provisioning this will enhance automated work flows and throttle down helpdesk load. When known solutions are maintained by helpdesk personnel, these are not only of good use to themselves but also to the customers. Also, we have seen that resources that could be of help to quickly identify the customer request such as configuration or asset management, monitoring information and network management tools are used separately or are not correlated to incidents.

We believe that customer consultation and feedback when closing a call are most important because these provide a way to review the process and the communication during the turnaround time.

8.1 Future research

Customer perspective

The interviews of this report mainly focus on the incident management and helpdesk employee side of helpdesk automation. It would be interesting to also involve the end user (customer) in the research question. By asking him/her what possible setbacks are on the current service level of his/her helpdesk, there may be other improvements to make. In the end, the helpdesk is in place for the customer.

Open standards

During the interviews, many interviewees told us they were unable to integrate their helpdesk system with other tools (such as network management tools) because of a lack of interconnections and open standards. An interesting development would be to openly standardize this kind of integration. This could, for example, be done using URL steering as most of the tools are web based.

References

[1] Wikipedia.org, Information Technology Infrastructure Library. *Website*, `http://en.wikipedia.org/wiki/Information_Technology_Infrastructure_Library`, 2009.

[2] EMC Infra, ITIL Solutions: ITIL Based Service Management. *Website*, `http://www.infra-corp.com/ITIL/ITIL-incident-management.asp`, 2009.

[3] Yuval Marom and Ingrid Zukerman. Corpus-based Generation of Easy Help-desk Responses. School of Computer Science and Software Engineering, Monash University, 2006. *Article*

[4] Kai H. Chang et al. A self-improving helpdesk service system using case-based reasoning techniques. Department of Computer Science and Engineering, Auburn Uniuersity, 2006. *Article*

[5] Nils Einar Eide, et al. DIGIMIMIR: A Tool for Rapid Situation Analysis of Helpdesk and Support E-mail. Oslo University College, LISA XVIII 2004. *Website*, `http://www.usenix.org/events/lisa04/tech/full_papers/eide/eide.pdf`

[6] Christine W. Chan, Lin-Li Chen, Liqiang Geng. Knowledge engineering for an intelligent case-based system for help desk operations. Department of Computer Science/Energy Informatics Laboratory, University of Regina, 2000. *Article*

[7] Mehmet H. Goker, Thomas Roth-Berghofer. The development and utilization of the case-based help-desk support system HOMER. DaimlerChrysler Research and Technology, Kaiserslautern, 1999. *Article*

[8] Allan Miller & Alex Donnini. Relieving the Burden of System Administration through Support Automation. HandsFree Networks, USENIX LISA, 2000. *Article* `http://www.usenix.org/events/lisa2000/full_papers/miller/miller_html/index.html`

[9] IT Service Management een introductie, ITSMF Nederland, derde druk, 2002. *Book*

[10] Microsoft. About WMI, 2009. *Website* `http://msdn.microsoft.com/en-us/library/aa384642(VS.85).aspx`