ABSTRACT

Like any other company, staff at SAS Institute sometimes need assistance using computing resources. The Information Systems Division (ISD) is charged with the task of delivering this assistance. Within ISD, the Information Center (Help Desk) is the entry point and communication pipeline for users requiring assistance.

This paper discusses the procedures followed by ISD for the management of user computing problems and requests and the use of our problem/request management tracking application written using SAS software. The general programming techniques used to develop the application and the importance of creating an application with functions that mirror the actual procedures used to manage computing problems and requests are addressed.

IT'S A CHALLENGING JOB, BUT SOMEBODY'S GOT TO DO IT — AND DO IT WELL!

In support of SAS Institute's commitment to providing quality software on multiple platforms, the Information Systems Division is challenged with supporting the technology on which our software runs. The platforms supported by ISD include our IBM mainframes running MVS/ESA® and VM/ESA® operating systems, OpenVMS®, HP-UX®, all Macintosh® and personal computer-based operating systems, as well as the underlying network structure.

With the exception of some service support staff, virtually all SAS Institute employees have access to at least one operating system on their desktop and with the explosion of distributed systems, many employees do their daily work on multiple platforms concurrently. With so much computing access, it is easy to see that there is a broad range of proficiency among the customers, or users, that ISD supports.

Information Systems provides primary support for all North American offices, with employees numbering over 2,400 in 29 offices. ISD also supplements local technology support in subsidiary offices throughout the world including more than 1,200 additional employees.

SAS Institute

SAS Institute promotes an environment for its staff supporting the pursuit of quality service. This stated commitment can be found in this brief excerpt from the Institute's Quality Overview: Mission and Philosophy.

"Our primary goal is to help the organizations we serve — in business, industry, education, and government — become the beneficiaries of advanced technology by providing software and services to help them meet their organizational goals."

Information Systems Division

To contribute to the success of SAS Institute's mission, ISD closely parallels the company's commitment by making service a top priority in supporting ISD's customers, SAS Institute employees. The mission of ISD is stated as follows:

"The mission of the Information Systems Division is to provide timely and cost-effective support of the computing and communications needs for all of SAS Institute. We will design and support our information systems to continually improve employee productivity.

"We will meet the challenge of matching rapidly evolving technology in hardware, software and networking with the ever changing needs of the Institute, to keep it at the forefront of the computer software industry.

"We acknowledge that our people are the most important element in our success. Their needs and professional development serve to guide this division in the direction it must take to achieve excellence."

Charged with purchasing, installing, and maintaining the technology required for developing the SAS software system, ISD is composed of many departments to meet these requirements. These include:

- various system programming groups who support all operating system platforms mentioned above.
- network engineers who design and support the local and wide area networks.
- operations staff responsible for the day-to-day operating and monitoring of all technology supported by ISD.
- telecommunications technicians and engineers responsible for supporting voice and data telephone systems.
- purchasing staff responsible for procuring computing software and hardware.
- administrative staff who support the various ISD departments, and also includes the Institute's library and information research services.
- applications programming staff (MIS Department) who develop and maintain the applications SAS Institute uses to manage our business. Members of the Management Information Systems (MIS) Department, the Help Desk is the primary entry point for customers to most of these ISD departments.

Help Desk

The Help Desk is currently composed of eight staff members who provide technology assistance to all end-users of computing systems supported by ISD. While our primary customers are North American employees, the Help Desk also provides supplemental support to subsidiary employees. The Help Desk is open from 8:30 to 5:30 Eastern time on normal business days. While this means that the Help Desk is closed for the last 2.5 hours our west coast offices are open, there has not yet been enough demand for services to justify the cost of extending the hours.

Our phone configuration supports a variety of communication methods between customers and Help Desk staff. We can record and program our phones to play pre-recorded messages.
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describing ongoing computing problems or directing customers to use the phone for further assistance. In the event of busy lines, customers may
  • transfer to an emergency number.
  • wait for a consultant.
  • leave voice mail.

In addition, we can distribute a customized, pre-recorded message to designated department contacts throughout the Institute.

As well as providing hotline support, the Help Desk strongly encourages customers with non-emergency problems to report them via email. Because email sent to the Help Desk automatically opens a problem entry in our tracking system, we have seen problems reported via email rise to 40% of all reported problems. The automated opening of a tracking entry and its subsequent automated email back to the user confirming its receipt have raised the confidence level of our customers that these problems will be managed equally as well as speaking to a consultant on the phone, thus accounting for its strong popularity as a method for reporting problems. This high use of email frees more time for consultants to be available to answer the phone for problems which do require immediate assistance. In addition, the accuracy and level of detail tends to be much better in email-reported problems since users can easily include error messages, logs, and so forth.

Within the Help Desk, there are four levels of Information Systems consultants. All the consultants have phone duty to varying degrees, with the entry level staff naturally having more phone duty than senior staff members. As Help Desk staff members gain experience, they begin developing an area of expertise in one or more operating systems supported by ISD. The Help Desk experts provide second level support in their area of specialty to resolve higher level problems, thus reducing the number of calls which require the assistance of systems or network support staff.

To further develop their expertise, Help Desk staff members act as liaison to system support staff to help properly implement changes in service.

Currently, the Help Desk is handling approximately 3000 incidents per month with distributed systems (PC and Unix) accounting for almost half of the incidents. A typical distribution of incidents is shown in the table below, as well as the percentage of incidents solved within the group and routed externally for resolution.

<table>
<thead>
<tr>
<th>SYSTEM AFFECTED</th>
<th>RESOLVED IN GROUP</th>
<th>ROUTED EXTERNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVS</td>
<td>89%</td>
<td>11%</td>
</tr>
<tr>
<td>VM</td>
<td>94%</td>
<td>6%</td>
</tr>
<tr>
<td>VMS</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>NETWORK</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>PC &amp; MAC</td>
<td>54%</td>
<td>46%</td>
</tr>
<tr>
<td>UNIX</td>
<td>66%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Table 1 One Month Problem Count by System Affected and In Group Resolution

A SERVICE IMAGINED IS A SERVICE URGENTLY NEEDED

As you can imagine, a user community composed of the broad range of technical expertise levels mentioned earlier poses a nearly limitless range of questions, problems, and needs. Sometimes it seems that users must sit in their offices just dreaming up new things to try that require assistance or innovative ways to cause failures in normally functioning routines. But of course the majority of communications with the Help Desk are legitimate reports of malfunctioning software and hardware and inquiries about techniques that will genuinely contribute to user’s productivity.

What are the Needs for Service?

Our requests for service vary from quickly answered questions to projects requiring months of planning, design, testing, and implementation. They may need resolution immediately or may be scheduled for the future. They may have a high level of impact on a large number of staff or be of limited impact to a single customer. The service need may concern existing computing functionality or it may be related to providing new or enhanced computing functionality. Typical requests for service include
  • creation or modification of user accounts.
  • assistance using application software or operating system commands.
  • installation of new hardware and software.
  • investigation into reduced computing performance

All of the factors described above combine to determine the priority and scheduling assigned to the service need.

ARE WE COUNTING BEANS OR ARE WE SOLVING PROBLEMS?

It takes time and effort to use a problem tracking application. The tradeoff for the expenditure of that time and effort must be a return on that investment to us. It must help us do our jobs, not be a job in itself to use the application. If it doesn’t help accomplish our tasks, it will fail to be used. To design a tracking application that will return a benefit to us, we had to analyze and understand our need to track services.

Why Track Services?

An organized record of the services we provide as a division helps us identify problem areas. It points out recurring situations so that they can be addressed and globally resolved instead of repeated local resolutions.

A central repository for all outstanding service needs provides more assurance that the needs will be met and met in the most efficient manner. If the tracking application serves us more than a list of jobs to be done, it still provides some help toward making sure that no task is forgotten. If you add functions for review by management, you can reduce the likelihood that multiple staff members are working at cross purposes, identify optimal projects for collaboration between staff members, and enhance prioritization based on needs throughout the company.

The information we collect in the tracking application helps us identify mistakes we have made in the past and aids in identifying ways we can improve. The data also paint a clear picture of training needs, both for ISD staff and our customers. Review can show what issues are repeatedly being raised by customers that can be addressed via further documentation or inhouse training. In addition, training all consultants on those same topics results in reduced resolution time and effort. Again, the information we gather shows trends that can be useful in staffing planning. As we see increases on a particular topic, management can use the information to shift work loads among staff members.

Many service requests require coordination of effort of multiple staff members. Sharing data simultaneously in a tracking application makes this coordination simple. A jointly shared record
of progress (ideas, testing, results) enhances communication among participants.

Once resolution for a particular service need is found, we want to eliminate duplicating the effort to reproduce that resolution. Availability of tracking data concerning how to resolve service requests reduces staff time and effort for repeat questions.

Either as summary or in detail, the data we collect keep management aware of the level of need for service and staff activities. Our tracking application can easily provide the information generally submitted as periodic progress reports to management, reducing administrative time and effort for staff.

These issues were identified as goals to be achieved via a tracking application during the design phase of our current application. To develop and implement a tracking application that addresses your tracking needs, evaluate your goals prior to application design. In addition, while the tracking system must be flexible and have a wide variety of functions, it is more important that the functions it has fit in the framework of procedures you follow to report, manage, and resolve service needs. An early step in designing your tracking application is to establish and articulate those procedures. For example,

☐ How will customers communicate with you?
☐ How will service needs be assigned ownership?
☐ What are the procedures for escalation of severity?
☐ What are the expectations for response to the service need?

The procedures you develop or have in place should be codified into a set of guidelines of which both your staff and your customers are aware.

THE ISD TRACKING APPLICATION

Keeping in mind the need to provide both immediate response to problems and handle projects requiring long term planning and implementation, ISD defined two classes of service needs: problems and requests. Problems are primarily identified as situations where existing computing functionality has been impaired or eliminated. Requests are characterized as situations asking for new or enhanced computing functionality. Divisional policy mandates that problems receive a higher priority for attention than requests.

Each class of service has established standards for actions such as reporting, approval, follow-up, updating, and resolution. These standards are known to all ISD staff and features of our tracking system assist in meeting the required actions for the service. In addition, all of the policies regarding service response are publicized to our customers. As a service oriented support team, we find that appropriately setting customer expectations is a major contributor to customer satisfaction. Of course once the expectation is set, it is important to meet that expectation and if any deviation from the expectation occurs, it is critical to communicate that change to the customer.

Besides appropriate expectations and communication, we understand and allow for emergency situations. Customers are more willing to abide by normal standards regarding priority and response time if they know that real emergency or exceptional situations can be accommodated. Again, functions to handle emergency situations are provided for in our tracking system.

Because of our diligent efforts to educate our customers on how best to access the services offered by ISD, most of our customers choose the most appropriate method we have provided for the communication of their particular service need (problem or request). However, as a service oriented approach, our tracking system provides methods for accommodating either type of service need regardless of the communication method used. The specific problem and request management methods used by ISD are described next.

Problem Management

The reporting methods recommended for communicating problems are variations of phone, email, and on-line problem report applications. Customers are directed to report urgent problems via phone, non-urgent problems via email, and specific user account needs using an on-line problem report application. While problem reports will be accepted whether they are reported in the recommended way, customers are repeatedly encouraged to use the best method for their problem. Since customers have recognized that their service improves overall using these methods, the majority follow the recommendations.

Default response time and severity assignment are associated with the reporting method used. However, these times and severities can be modified at the discretion of the consultant and with the knowledge of the customer. The table below shows the reporting method and estimated time to initial response.

<table>
<thead>
<tr>
<th>METHOD</th>
<th>ESTIMATED INITIAL RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>dial through to emergency number</td>
<td>immediate</td>
</tr>
<tr>
<td>queue for next available consultant</td>
<td>up to 15 minutes</td>
</tr>
<tr>
<td>leave voice mail</td>
<td>up to 30 minutes</td>
</tr>
<tr>
<td>email</td>
<td>up to 3 hours</td>
</tr>
<tr>
<td>online problem report applications</td>
<td>up to 1 business day</td>
</tr>
</tbody>
</table>

Table 2 Reporting Method and Initial Response Time

Our severity scale and required response time is shown in the next table.

<table>
<thead>
<tr>
<th>SEVERITY</th>
<th>RESPONSE TIME DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Component down; no circumvention; hourly update</td>
</tr>
<tr>
<td>2</td>
<td>Component degraded; circumvention available; daily update</td>
</tr>
<tr>
<td>3</td>
<td>Component degraded; some operational impact; weekly update</td>
</tr>
<tr>
<td>4</td>
<td>Component usable; circumvention possible; weekly update</td>
</tr>
<tr>
<td>5</td>
<td>Component enhancement; future project; monthly update</td>
</tr>
</tbody>
</table>

Table 3 Severity and Response Time

If the report is generated by a phone call, the Help Desk consultant opens an incident in the tracking system, recording pertinent information concerning the problem. If possible, the problem is resolved during the phone conversation. If the problem cannot be resolved at the time of the report, the consultant decides whether he or she can resolve the problem with further research or whether it will require expertise from another consultant. Since every technical area is assigned to one or more consultants, if the decision is made to assign the problem for resolution by another person, it is first routed within the group to the consultant with the appropriate technical expertise.

If the report is generated by email or an online problem report application, a tracking entry is automatically opened and assigned to a generic Help Desk ownership. These entries are reviewed by
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a consultant and assigned to the appropriate consultant for resolution, including the reviewing consultant.

If sufficient expertise to resolve the problem is not available within the Help Desk, problems are reassigned ownership (routed) to appropriate systems staff, management, or sometimes even staff in other Institute divisions. Most of the second level support groups maintain an oncall rotation so routing is done by assigning ownership to the group's generic designation.

If the report is urgent (severity 1 or 2) all communication concerning reassignment of responsibility for the problem (whether internal to the group or outside) must be done by human to human contact. Reassignment of reports with severity 3 or lower may be communicated via email or voice mail.

Sometimes it is appropriate to assign ownership to multiple staff members. This can be done by assigning secondary owners for problems that cross operating system domains or when multiple actions are required. In addition, sometimes it is desirable to keep multiple customers or ISD staff informed about the progress on a problem. This can be done by defining additional interested parties.

Each time a significant action is taken via the tracking system (opening, reassignment, changing severity, or closing) automatic email is generated to each person who has been defined as an owner or interested party. Depending on the severity, periodic updates on progress are required. Flags are used to mark problems scheduled for update and email reminders are generated nightly to owners notifying of the needed update.

Upon resolution, the problem is closed. A required action for closing a problem is providing an explanation of the methods for resolution. This can be done by entering text comments or using an answer from the tracking system answer data base.

Request Management

The reporting methods recommended for communicating requests are primarily email, online request applications, and hard copy service request forms. Like problems, customers are encouraged to use the method appropriate for their request. However, as mentioned earlier, in the event of an emergency, customers may opt for another method. For example, an emergency request may be phoned to the Help Desk. In such a situation, the Help Desk again opens an incident, but follow procedures for a request.

Email and online request applications automatically open an incident assigned to a generic ISD administrative staff ownership. If generated by the online request application, prior to initiation of a tracking entry, the request is routed to the manager of the customer making the request for approval. Manager approval of email generated requests are currently done manually. The administrative staff member assigns ownership to an appropriate ISD department manager with a goal date for review of the request. Managers reassign ownership to ISD staff. Like problems, requests may have multiple owners and interested parties. Also, like problems, automatic email is generated when any significant tracking action (open, reassign, modify goal date, close) takes place. After request review, a final goal date is assigned.

Tracking Application Data

To meet all the goals enumerated earlier, we must collect appropriate data. However, we were judicious in our data collection design. Too much can be a data entry burden and too little can limit the usefulness from a historical perspective. It is important to allow for both categorical data fields to allow for summarization of the information and for free format text to include in-depth detail when needed.

From the separate accounts of problem management and request management above, you can tell that data maintained for the two service classes are not exactly alike (for example, goal dates for requests, severity for problems). To reduce redundancy, from this point in the paper, we will refer to an entry in the tracking system as an incident and only distinguish whether the incident is a problem or request if it is relevant to the discussion. Treating both problems and requests in discussion also demonstrates the object oriented techniques that were used in designing and implementing the tracking system discussed later.

Whether you define your service need as an observation, a record, an entry, an incident, an outage, or a trouble ticket, you still have a user with a situation that needs attention. To a tracking system user, each incident appears as an observation in a SAS data set. In reality it is the joining of several SAS data sets. The use of multiple data sets in a normalized data structure was primarily chosen to allow an infinite number of many of the data elements such as interested parties, owners, answers, comments, hours, etc.

As is explained later, users can choose from a selection of screen layouts to view the data. The two examples below show the favorite Help Desk configuration for a problem and a request. Some of the significant data fields are described in the table following the displays.

Display 1 Help Desk Problem Screen
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Display 2  Help Desk Request Screen

<table>
<thead>
<tr>
<th>DATA FIELDS</th>
<th>CONTENTS DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>caller</td>
<td>customer reporting incident</td>
</tr>
<tr>
<td>for</td>
<td>customer affected</td>
</tr>
<tr>
<td>title</td>
<td>free format text description of incident</td>
</tr>
<tr>
<td>inv</td>
<td>equipment asset (inventory) identifier</td>
</tr>
<tr>
<td>hostname</td>
<td>node name or machine identifier</td>
</tr>
<tr>
<td>system</td>
<td>operating system</td>
</tr>
<tr>
<td>status</td>
<td>open or closed</td>
</tr>
<tr>
<td>severity</td>
<td>impact rating (1-5)</td>
</tr>
<tr>
<td>comments</td>
<td>whether further comments (details) exist</td>
</tr>
<tr>
<td>services</td>
<td>categories for component affected</td>
</tr>
<tr>
<td>owner</td>
<td>primary staff member responsible for resolution</td>
</tr>
<tr>
<td>hours</td>
<td>total hours to resolve incident</td>
</tr>
<tr>
<td>answer</td>
<td>answer number describing resolution</td>
</tr>
<tr>
<td>title</td>
<td>answer title</td>
</tr>
<tr>
<td>incident</td>
<td>unique tracking number</td>
</tr>
<tr>
<td>date</td>
<td>date incident opened</td>
</tr>
<tr>
<td>time</td>
<td>time incident opened</td>
</tr>
<tr>
<td>closed</td>
<td>date incident closed</td>
</tr>
<tr>
<td>callback</td>
<td>quality callback to customer performed?</td>
</tr>
<tr>
<td>entered by</td>
<td>staff member responsible for initial data entry</td>
</tr>
</tbody>
</table>

Table 4  Selected Tracking System Data Fields

Beyond these specific data entry fields, unlimited comment text can be added.

Display 3  Comment Screen

IT’S A SWISS ARMY KNIFE DISGUISED AS A TRACKING APPLICATION

All the existing functions of our tracking application are too numerous to describe here. Several that we recommend for inclusion in any tracking system have been selected for further detail below.

The Overview Screen

This is a summary screen listing the incidents of interest to you. The incidents selected for this display are designated by the user’s search criteria.

Display 4  Overview Screen

Customizable Profile

A user profile lets each user establish preferences concerning use of the tracking system. Sample settings that can be chosen include search criteria for automatic subsetting, viewer, sort sequence, etc.
Display 5  Profile

Date/Time Stamping

Any field containing dates or times an event occurred or was reported is automatically filled in. When a problem report is opened or closed or when a comment is recorded, date and time stamps are appended. This eliminates the drudgery of manually recording this data.

Selection Lists/Data Validation

All data fields with fixed response categories can be completed via the use of data driven selection lists or by entering a valid value. This permits quick data entry for users familiar with data values but provides a lookup mechanism for others.

Detail Expansion Windows

Links to other data sources can provide additional look up sources of information. For example, selecting data in user or equipment fields will link to employee or inventory data to provide further identifying data. This is particularly useful for providing information that is not always needed. It does not routinely clutter the screen, but is easily available when needed. These windows are achieved via calls to other data sets (or subsets) maintained with other MIS supported applications.

Electronic Mail

A variety of email functions exist. By default, automatic email is sent to all interested parties and owners when an incident is opened, reassigned ownership, or closed. In addition, users can initiate a mailing to those groups at any time (for example, when adding a comment) or manually send email to any specified mail address.

Search

A search criteria interface is available. This is a scrollable window that lets you mix and match the criteria on which you want to conduct a search. After the criteria is chosen, data values are specified. The search interface allows you to customize the subset of incidents on which you will operate. While that operation may simply be viewing, you can also choose such functions as reporting, sorting, or printing the existing subset.

Display 6  Search Interface

Print/Report

As mentioned above, you can print or report on any incident subset or individual incident. After choosing the incident via the search interface, you can print results to your screen, a printer, a data set, or delivery via email.

Answers

The answers interface is the mechanism for accessing the answers data base. The answer data base contains comment text documenting procedures for problem resolution or instructions to customers. Each answer has associated key words and titles that can be used for searching. Like problems and requests, an answer can have unlimited lines of comment text. When an answer is associated with an incident at closing, the text of the answer is included in the generated email. This makes it simple to provide written instruction to the customer for the solution of their problem.

Display 7  Answers Interface

Calendar

Access to incidents during a specific time period is easily available with the calendar interface. This is a search/subset function based on when any event in an incident occurred. Similar results can be achieved with the search interface.
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Display 8 Calendar Interface

Hours

Time spent on incidents can be recorded via the hours interface. Detailed time entries and a generated running total are used. This is useful in time accounting reports. All incidents on which ISD staff record hours are totaled.

Display 9 Hours Interface

Ownership Assignment/Routing

Specifying staff members responsible for incident resolution (owners) and staff members interested in details of the incident (interested parties) can be performed via the interested parties interface. Changing, adding new, or deleting existing staff member assignments are performed via menus on the interested parties interface. It is possible to customize goal dates and email actions for each owner.

Display 10 Interested Parties Interface

TRACKING SYSTEM DESIGN AND TECHNIQUES

The tracking system used by ISD was developed using Object Oriented Programming (OOP) and Object Oriented Analysis (OOA) employing SAS Screen Control Language behind SAS/AF® software entries. This has proven beneficial to the task. New methods and objects are easily added. We have also been able to clone new tracking systems for other Institute divisions by inheriting all the existing classes and coding little clone-specific code on top of that. We now have tracking system clones that track ideas, printing projects, facilities tasks, and so on.

Object Oriented Design (OOD) allowed us to realistically reflect the tasks at hand. The tasks (for example: open, route, close, and so on) are implemented as methods. As new tasks need to be executed, we simply add new methods. If a new functionality is generic enough to perform on multiple objects (for example, requests and problems), then it is added to the parent (incident) object. This way both the problem and request object have the newly added functionality as well as the objects in tracking system clones. So you can see, by adding one method in one place, several objects within the ISD tracking system and several clones gain benefits. Now, we maintain the code in only one place. This brings the almost impossible task of maintaining numerous applications to a much more reasonable undertaking.

Inheritance plays a big factor in the productivity of the tracking system objects. For example, the problem and request objects both inherit their similar functionality from their parent: the incident class. In an age where we are short on time and long on projects, this keeps us from having to duplicate any code throughout the tracking application and its clones resulting in tremendous time savings in development and maintenance.

We have also held to the Model Viewer Controller (MVC) paradigm. The primary objects (problem and request) are nonvisual objects. This allows users to select their favorite screen to view the object and allows us to run the object in background (batch) mode. An example of use of background mode is our automated process that receives email sent to the Help Desk. In turn, this process opens an incident, routes it to the Help Desk, and includes the text of the email in the comments for the incident. Without using the MVC design, we would have to recode the same functionality to run in batch mode rather than using code that is already written. We find the Object Oriented Design to be valuable in this and many other applications using SAS/AF Software.

As the ISD tracking system has evolved, our use of other specific
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applications has diminished. Employing an OOD approach has meant that links to other applications or data sources could be incorporated into the tracking system instead of direct access to the applications themselves. For example, when we expressed the need to access inventory and network information on the equipment about which an incident was being opened, connections to the Institute’s INSINC (Institute System for Inventory and Network Consolidation) application were added. To gather further information about the customer, connections to data from the Institute’s directory were made available.

ON THE HORIZON

Like every other Help Desk in every other company, there is more that needs to be done than we have staff to handle. Having a tracking application that aids in problem resolution, information organization, and communication, yet is still easy and quick to use boosts our productivity. Specific features we hope to see added to our tracking system are

- an additional searching function for the answers data base to search the entire text of answers and return a list of answers prioritized by the number of hits meeting the search criteria,
- a mechanism to allow customers to directly update an open incident based on the incident tracking number via email.

Besides our currently established areas of expertise, plans are underway to assume first level support for porting tool support and all MIS-developed applications.

There is an eternal need for more documentation and updates to existing documentation. The payback from documentation is rich and therefore needs to be a priority in the work plan. Much of our documentation is moving from hard copy distribution and other online sources to access via our internal Web site. We believe that more online documentation will promote access by users and more current updates by authors. In conjunction with making more documentation available through our internal Web, we hope to add a query mechanism via the web to our tracking system answers data base that would permit customers to search for information they need.

As more departments throughout the Institute identify the need to track services they offer, additional requests for tracking applications pour in. The discussion on the tracking system design earlier explained the possibilities for cloning, reusing existing code, and inheritance of functionality to make more tracking systems available. Plus, by detaching the viewer and model, multiple views can be offered that can meet the needs of a variety of Institute departments. In addition, links are made to cloned tracking systems that allow the migration of an incident from one system to another. For example, the European Headquarters maintains a separate tracking system for their ISD. However, it is sometimes necessary for staff in US Headquarters to perform tasks for European staff and vice versa. The connection of the tracking systems easily enables this transfer of an incident. The other option being used is to continue expansion of the original tracking system to more Institute divisions and owners. As we have added other Institute division staff, it has simplified coordination of tasks that span divisional lines.

CONCLUSIONS

Customer service is the first and foremost key to our success. We identified and implemented methods to reliably be accessible to our customers. The creation of an excellent tracking system is absolutely essential. To create a useful tool, we evaluated our needs related to information tracking, considered what we wanted to learn and what tasks we wanted to accomplish. We fine-tuned procedures prior to the actual development of the tracking system. With this in mind, we planned the functions of the tracking application.

With the use of SAS Software, we could use an OOD approach for the functions of the tracking system and OOP techniques for the implementation. Once in place, this object oriented approach continues to reduce enhancement and maintenance effort.

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