User-Centred Design and Evaluation of Support Management System

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Abstract

An important aspect of redesign for usability is to evaluate the system with its real users in order to explore implications for better design. In this paper we discuss the redesign of a support management system deployed in a small and medium sized enterprise (SME) in the UK. The system is used to support complex and distributed cooperative activities taking place in the SME. We evaluate the current system and analyse work practices using a user-centred design and evaluation philosophy. Following that we discuss how user needs are incorporated into the enhanced design of the support management system. The user-centred design techniques used in this research include interviews, questionnaires, observations and user tests. Finally, we present comparative evaluation results that show significant improvement in performance of user tasks using the redesigned support management system.

Keywords: User-requirements, Support Management, Participatory Design, Interviews, Questionnaires, Test, Observation.

1. Introduction

In order to design and develop systems which can be successfully deployed, it is necessary to follow a user-centred design and evaluation philosophy from the outset. Importantly to ensure that user needs are included in the enhanced design, a multitude of methods of investigation should be applied [1].

In this paper, we discuss the redesign of a support management system that does not reflect the user needs. This failing limit its usage (cf [2]).

The support management system is used by a UK based SME which focuses on developing Internet applications. The company develops various Internet based software solutions, from content management systems to e-learning support tools and fully integrated e-commerce applications.

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The application development expertise is supported by a blend of consultancy and supporting services. This includes business process analysis and re-engineering; systems analysis and design; network and infrastructure design; usability and accessibility. The company provides high quality solutions. This high standard is kept by an in-house quality assurance team by providing support after the product has been deployed.

The support management system is used to support and monitor several internal and external activities of the SME as discussed in the following section. The system is intended to be widely used by different people within and outside the SME but the usability problems of the system limit its usage internally as well as externally. Due to this the internal users have established alternative means for completing their work e.g. keeping an additional spreadsheet and sticky notes etc. But the consequences of the external not being able to use the system are severe in terms of business reputation and also due to the fear of losing customers and business. Therefore, it is necessary to address the usability aspects of the system.

To incorporate human aspects into the enhanced design, we have firstly evaluated the current system and conducted extensive user studies in order to capture user requirements. Following that, we have carried out the redesign and development process by involving all stack holders. The methods used include in-depth interviews, questionnaires, observation and user tests.

The rest of the paper is organised as follows. Section 2 discusses the current support management system and highlights some problems with the current system. Section 3 presents a user study and summarises findings. Section 4 discusses design recommendations and the development of a revised collaborative support management system. Section 5 discusses evaluation results. Section 6 concludes this paper by summarizing this work and providing future direction.

2. Support Management System

The support management system has a multitude of users who use the system with different goals. These

groups include Quality Assurance, Developers, Project Managers, Administrators, Account Managers and Senior Directors, and Clients/Customers.

The quality assurance team and the development teams work together using two systems: (i) change management and; (ii) support management systems. Currently both systems are working in isolation. Furthermore, additional spreadsheets are maintained by different users for their quick references.

The quality assurance team evaluates the product and requests changes from the development team using the change management system. Before a project is deployed it has to go through three test cycles of alpha, beta and user acceptance testing.

After the project is deployed, changes are managed using the support management system. These changes are logged as support requests (SRs) by the customer on the system and are then handled by the support and development teams. In order to give a clear overview, the life cycle of an SR is shown in Figure 1.

The business of this company has been evolving for the last few years and the current system does not meet the growing needs of its users. The system is also used by customers. However, the system is rather difficult to use and the support requests logged by the customer can be quite difficult to process within the company. This results in staff members having to go through a time consuming process of gathering more details.

The major shortcoming of the current system is that it does not allow the management of SRs (Support Requests). For example, the QA (Quality Assurance) team has to spend a considerable time and effort to find which SR has been assigned and needs to be fixed urgently, or which SR is awaiting client feedback and needs to be chased up.

In the current system, the QA team is not able to report on how many SRs have been received and fixed or current SRs in the pipeline. It is also difficult for developers to manage their workload.

Usually, the QA team relies on their memory of any recent SR that was either chased by the customer or recently logged. As a quick reference, QA has developed several practices, for example, QA maintains a spreadsheet to manage their SRs, which is not linked to the central system as shown in Figure 2.

3. User Study

An extensive user study was carried out in order to understand the complex and distributed cooperative activities of a support management system. The interest of this research is to inform the system design in order to develop an appropriate computer support that reflects the needs of people running these crucial operations.

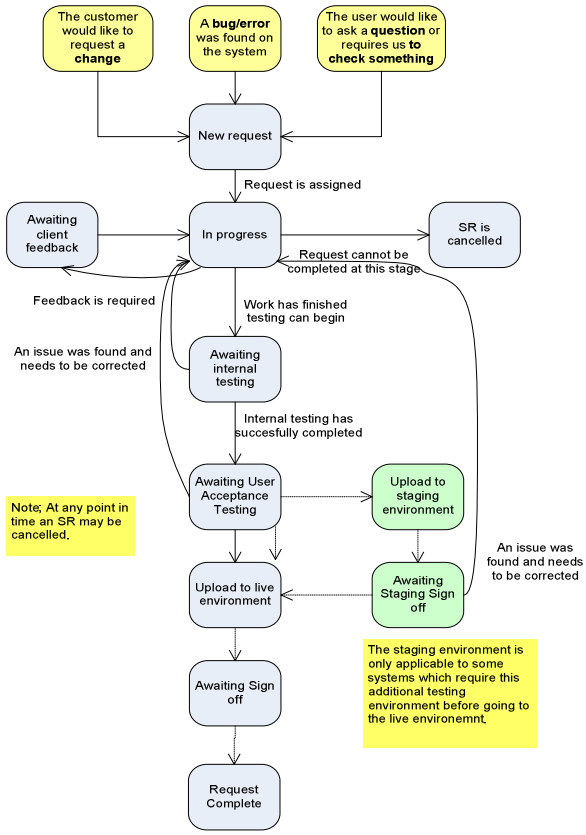

Figure 1: Life cycle of a request

This research has gained insights into the working practices involved in this operation. The principal methods of data collection used were in-depth interviews, questionnaires, participant observations, documents and informal social contacts with the participants over an extended period of 3 months. A comprehensive overview of user-centred design and evaluation approaches can be found in [3].

Throughout the research, the focus has been on the analysis of the cooperative activities. In order to understand the role of formal constructs — formal structures, procedures, workflows and process models [4] in coordinative work — during this study, different aspects have been highlighted such as the manuals of instruction and procedures, the job description, the dependencies between the activities, the workflow, the actors involved and their roles. This also includes a review of paper-based documents such as reports, spreadsheets and QA procedures etc.

3.1 Interviews

The interviews were used to capture user requirements. The interviews were held with a particular group of people or individuals who used the system in a distinct manner, e.g. developers, financial administrators, quality assurance and project managers.

	A	B	C	D	E	F	G
1							
2		Key					
3			Live and needs client sign off			Notes:	
4			In progress				
5			Need assigning				
6			Waiting for client feedback				
7			On Hold				
8		Jr	New SRs this week				
9			Awaiting Internal Testing				
10			Waiting to go live				
11							
12	Bill?	New?	Client	PRJ ref.	PSR ref.	Support request title	Work to be done
13	N		NCSL "Issue Management System" provision	PRJ046	PSR0260	Export issues from MS to CSV file and de-activate system	Needs to be signed off by Ian p. He will get sign off from Matt Woodcock
14	N		NCSL "Issue Management System" provision	PRJ046	PSR0266	Create a query or report to export issues for migration	Waiting for feedback from Matt Woodcock.
15	N		NCSL "Issue Management System" provision	PRJ046	PSR0267	De-activate user accounts for issue management system	Needs to be signed off by Ian p. He will get sign off from Matt Woodcock
16	Y		Severn Trent Water Support	PRJ075	PSR0259	Site Search Error	On Hold
17	Y		Severn Trent Water Support	PRJ075	PSR0199	Water quality report changes	Waiting for client to sign off on UAT.
18	Y		Surftower Learning - Online management system	PRJ071	PSR0246	Error while running report wizard	Waiting for danny to sign this SR off on live
19	Y		Surftower Learning - Online management system	PRJ071	PSR0251	Can't register if I've already registered for the evaluation	Needs David to sign off on live and the other part to be raised under SR1
20	Y		Surftower Learning - Online management system	PRJ071	PSR0310	Change the error message on repeat registration	Needs Danny to sign off live.
21	Y		Surftower Learning - Online management system	PRJ071	PSR0490	Lock outs not showing	Awaiting live sign off
22	Y		Surftower Learning - Online management system	PRJ071	PSR0494	User Access count is wrong	Waiting client sign off on live.
23	Y		Surftower Learning - Online management system	PRJ071	PSR0511	Teacher can't view assignments once they've been reviewed	Awaiting live sign off
24	Y		Support: Ma CRM System	PRJ025	PSR0336	On hold until Chris signs support agreement.	On hold until Chris signs support agreement.
25	Y		SWH Service Release 4	PRJ091	PSR0419	Spanish Translation Changes for new homepage	Waiting for more changes before we work on this one.
26	Y		Support: BMG Music Search	PRJ081	PSR0231	Download Email Link - Incorrect behaviour in Safari	Craig needs to comment on this.
27	Y		BMG MusicSearch.com and Killer Tracks deployement	PRJ1197	PSR0223	Songs activated worldwide have not inherited new Countries	Feedback from client received. Assigned to Craig now.
28	Y		Killer Tracks T&M Support	PRJ1411	PSR0477	Killer Tracks: Licensing Issue	Looking for resource

Figure 2: SR tracking sheet used by QA

All interviews were informal and questions were asked to provoke discussion, thoughts and feelings about the system as well as ideas for improvements.

At first, the interviews were focused mainly on gathering information for the user requirements. However, they were also used to evaluate the current system, e.g. the user might explain what they want to do with the support system, how the current system does not work very well for them and how they would like that to be changed.

The results from the interviews were mostly used as indicators of where usability problems occur, which could then be validated against user testing and observation.

While conducting the evaluation, it did become clear that one particular advantage of using interviews as part of the evaluation is that missing functionality can be much more easily identified. For example, users explained how they cannot currently manage support requests effectively and maintained a separate spreadsheet. This aspect may not be tested using heuristics tests or user tests and observation as they focus mainly on the system and the tasks that can be performed on it, as opposed to the tasks you cannot perform.

3.2 Questionnaires

In order to gain some measurable insight into how well the current support system works, a questionnaire was distributed to all users of the support system. For this purpose, we have selected the WAMMI questionnaires (Web Site Analysis and Measurement Inventory) which is a standard industry questionnaire [5]. WAMMI has been iteratively developed using techniques from the science of Psychometrics. WAMMI has Cronbach's Alpha coefficient reliability rating of 0.90.

It is a convenient and cost-effective method of assessing the value and usefulness of a system. The questionnaires produce quantitative data which is used to compare the system against the redesigned system.

Below is the brief description of WAMMI scales.

- **Attractiveness:** An Attractive system is visually pleasant, and also offers much of direct interest to the intended users, whether it be functionality or information.
- **Controllability:** If a system scores well on Controllability the users most probably feel they can navigate around it with ease. Poor usually means a poorly organised system.
- **Efficiency:** When users give a high Efficiency rating they feel they can quickly locate what is of interest to them and they feel that the web site responds (possibly, the pages load) at a reasonable speed.
- **Helpfulness:** A system which is high on Helpfulness corresponds with the users' expectations about its content and structure. A system low on Helpfulness can be misleading about its content.
- **Learnability:** When Learnability is high, users feel they are able to start using the system with the minimum of introductions. Everything is easy to understand from the start. When Learnability is low, users feel that the site may be using concepts or terminology which is unfamiliar. More explanations are needed.
- **Global Usability:** Global Usability centres round the concepts that a system must make it easy for users to access what they need or want from the system, that there is a good, understandable level of organisation, and that the system 'speaks the users language'.

3.4 User Tests and Observation

The above discussed methods of data collection have provided valuable insight into the usability of the system. However, the user tests have provided real insight into how actual users were interacting with the system.

During the user test, actual users of the system, both staff and clients, were asked to perform a number of tasks on the system while being observed. Tests and observations took place in the company premises, with a fairly standard PC. Additionally, a software package called Morea [6] was used to monitor the user test which captures the screen of the user as well as visual and audio footage of the participant via a webcam. The Morea software also captures additional information such as how long tasks took and keeps track of mouse behaviour and web pages.

3.5 Summary of Findings

A large number of usability issues have been revealed in this study. Some of the major areas of usability problems are briefly described below. The issues are not discussed in detail and many are omitted due to space limitation. Details can be found in [7].

Unclear/lack of good overview and management functionality of support requests: It is not possible to view issues by priority, deadline, age or assigned user (views are structured by project and organisation only) as shown in Figure 3. Searching for an SR is made very difficult because of the poorly designed 'report search form'. It is impossible to manage SR's on the system and hence a separate spreadsheet is utilized for this purpose. Searching for an SR is also very difficult and 6 out of 7 participants were not able to complete the task during testing.

Overcomplicated and hard to use process to log a request: The process of logging SR's is over complicated. This results in users not filling in the right details or missing out vital information. It also makes the task more daunting which does not encourage users to log a request.

Issues with finding support requests: The 'Report' screen can be used to find a support request, particularly completed or cancelled requests. This screen was found to be very hard to use. The main problem is the selection of an organisation or project. The next issue is the confusion between the criteria, particularly the status.

Confusing information on support credits: The information that is presented is fairly hard to understand. Sometimes very confusing results are being presented. In some cases these may actually be bugs or errors in the system.

The results of questionnaires (WAMMI) show that attractiveness and learnability have scored badly. However, all aspects of the site are relatively very low as shown in Figure 4.

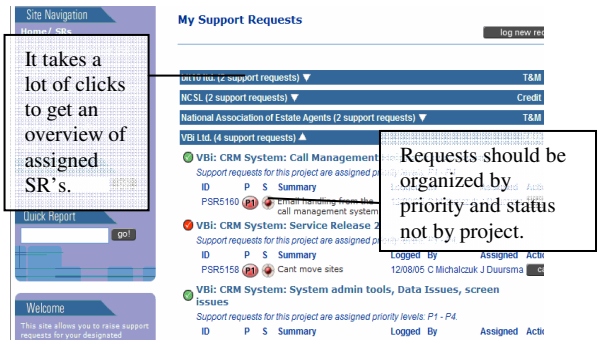

Figure 1: My support requests overview screen, [the data on this screen needs to be organised completely different].

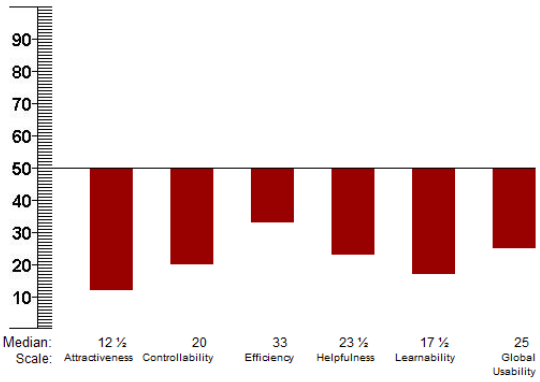

Figure 4: Summary of the questionnaire results.

The graph (in Figure 4) shows the average (median) values on the WAMMI scales Attractiveness, Controllability, Efficiency, Helpfulness, and Learnability. The last item is the Global Usability measure which is a weighted composite of items from each of the other scales.

The graph indicates very low scores for each of the scales. A score of 50 would be average, if larger than 50, the score would be above average, where lower than 50 indicates below average. Numbers below 30 indicate exceptionally low scores.

4 Design Recommendations and Development

There are serious shortcomings in the area of support request management. A global view of all support requests should be available. It should then be possible to order this list by various criteria such as priority, deadline or age, project and organisation, status and assigned user. This would allow users to gain all the data views they require to manage support requests.

The process for logging a support request should be made simpler and faster and focus more on the key information required to resolve the request.

There is no need to distinguish between 'my clients' and 'associated organisations', all organisations can be shown at all times. This would avoid confusion where an organisation cannot be found.

The 'report' or support request search form would no longer be required if there is a view which lists all active support requests. A SR archive view instead should be provided where users can easily view SR's that have been completed or cancelled. For internal users there should be some options to filter the list by organisation.

The support credits information and transactions need to be made clearer by stating the important information obviously, such as balance and monthly subscription, with negative numbers or deductions indicated by a minus symbol (as opposed to the bracket notation). Any confusing transactions should be made clearer and additional descriptions of transactions would

be useful. The support credit screens and messages need to be improved and more attention needs to be given on stating details more explicitly, e.g. using a minus sign to indicate negative balance as opposed to the bracket notation.

The user guide provides a wealth of information but is never utilised. The user guide should be provided as HTML and from various points in the system direct links should be made available to point to the relevant places in the user guide for more information. This would allow users easier access to the help content as users are not allowed to view and search the user guide.

The 'Report' screen can be used to find a support request, particularly completed or cancelled requests.

Another issue is related to criteria, particularly the status. This screen needs to be made a lot simpler and easier to use. It is recommended that the selection for projects is abandoned and only a drop down for organisation is made available. Furthermore, the majority of the criteria is not useful for accomplishing the tasks and could be replaced with a simple keyword search.

In line with user-centred design and evaluation philosophy, we have developed a new collaborative support management system. The overall improvements made can be summarised as follows.

- Generally improved user interface
- Better overview of support requests
- Simpler and easier way of finding support requests
- Added reporting functionality
- Improved communication and messaging
- Re-branded system with new design

Figure 5: A screen shot of the request overview screen for a selected organisation

5. Evaluation

In order to evaluate the new collaborative support management systems, we have conducted user tests. During the user test, actual users of the system, both staff and clients, were asked to perform a number of tasks on the system while being observed. We also used a software package called Morea [6] to monitor the user test and capture the user screen of the user as well as visual and audio participant activity.

The tests were carried out on both the old and new systems in order to compare them. Both user tests were conducted on 7 participants, 4 internal and 3 external with varying degrees of experience with the support management system. Most users have an average to above average general web experience. However, this may be expected from people working for an IT company or those responsible for websites and web applications. These users thus represent the user base of the support management system.

During the user tests various performance indicators were captured. We have compared the user tests using the following performance indicators.

- Performance scores based on successful completion of the tasks;
- Time spent on completing each task;
- Mouse clicks and mouse movement during tasks;
- Amount of web pages visited to complete each task.

5. 1 Tasks

The tasks that were part of the user test plan were as follows:

1) Login to the system and ask questions about first impressions
2) Log a support request on the system
3) Update the support request with additional information
4) Check the status of an existing support request already logged on the system
5) Add a log entry to the log of the support request to answer the developers questions
6) View two e-mail notifications from the system and ask the participant to interpret the e-mails
7) Sign off the request for UAT (User Acceptance Testing)
8) Find a request that was completed a few weeks ago
9) Get further information on the support credits for the organisation
10) How to get help with the system?

With the prototype tests, two additional tasks where added:

11) Find a support request that is new and needs to be investigated
12) Find the most urgent support requests

The key tasks in this set were tasks 2, 3, 4, 5, 7, 8 and 9. Tasks 1, 6 and 10 were added to make the whole test set complete and were useful for qualitative

feedback however less important when looking at the performance indicators.

During the user tests the success of a task was evaluated by marking the task as:

- Failed to complete – 2 points
- Completed with difficulty – 1 point
- Completed with ease – 0 point

The results are shown in Figures 6 and 7. Figure 7 shows a considerable improvement in ease with which different tasks were completed. Further details are omitted due to space limitation.

6. Conclusions and Future Work

In this paper, we have discussed the redesign and development of a collaborative support management system to support complex and distributed cooperative activities using a user-centred design and evaluation philosphy. We have effectively evaluated the current system and analysed work practices through a user study. The evaluation process has explored many usability problems within the current system. Based on an in-depth analysis we have proposed some design recommendations which have been used for the redesign and development of the system. A comparative evaluation has been carried out to evaluate the usefulness of the system.

It is argued that collaborative systems should be developed using user-centred design and evaluation philosophy as discussed in this paper. By using this approach, we can ensure that the user requirements are accurately and thoroughly captured and used for the design and development of the system.

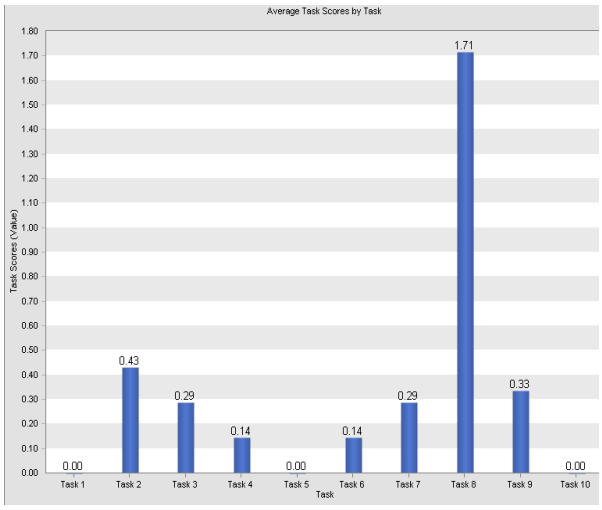

Figure 6: Success scores for the old design

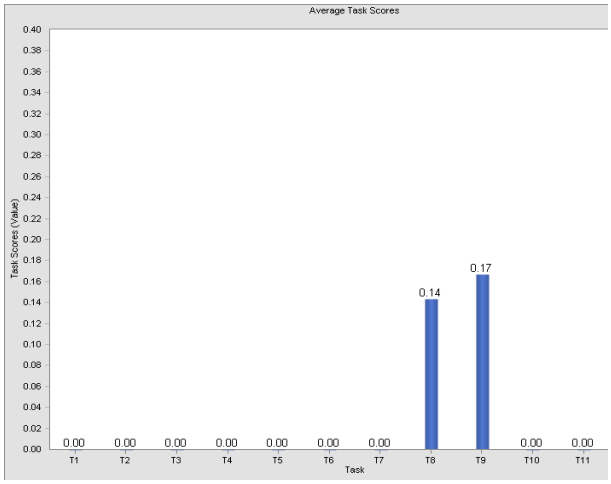

Figure 7: Success scores for the new Support Management System

Based on our experience and of our colleagues, in future, we will investigate the best practices for designing and developing collaborative systems. We envisage that such practices will be useful for other designers and developers of collaborative systems.

References

[1] Goguen, J. and Linde, C. (1993): 'Techniques for Requirements Elicitation', in Fickas, S., and Finkelstein, A., (eds.): Requirements Engineering (Proceedings of RE'93), IEEE Computer Society Press, pp. 152-64.

[2] Grudin, J., (1994): 'Eight Challenges for Developers', *Communication of the ACM*, vol. 37, no.1, pp. 93-105.

[3] Iqbal, R., Sturm, J., Kulyk, O., Wang, J., Terken, J., (2005) **"**User-centred design and evaluation of ubiquitous services**",** In proceedings of the 23rd Annual Internatinal Conference on Design of Communication: Documenting and Designing for Pervasive Information, pp. 138-145, ACM press.

[4] Schmidt, K., (1997): Of maps and scripts: the status of formal constructs in cooperative work, In proceedings of Supporting Group Work: The Integration Challenge, pp. 138-147, ACM Press.

[5] Available via: http://www.wammi.com/using.html

[6] Available via : http://www.techsmith.com/morae.asp

[7] Duursma J., (2008) "Redesign of a Support Managment Systems using User-Centred Design Process", M.Sc dissertation, Coventry University, UK.