Aalto University

Mannonen, Petri; Hölttä, Venlakaisa

Where the Knowledge Goes? Information Gathering and Managing Practices in a Global Technical Support Center

2nd International Through-life Engineering Services Conference

Where the knowledge goes?
Information gathering and managing practices in a global technical support center

Petri Mannonen*, Venlakaisa Hölttä

Strategic Usability Research Group, Aalto University School of Science, PO Box 15400, FI-00076 Aalto, Finland

* Corresponding author. Tel.: +358-50-469-0515; *E-mail address:* petri.mannonen@aalto.fi

Abstract

Successful maintenance and support services rely on efficient information use. Organizational learning and information reuse is one of the most potential ways to improve the efficiency of maintenance and support services. Many parts of knowledge creation, storing and searching can be automatized but in the problem-solving phase of the maintenance work the organizations need to often rely on maintenance workers' and customers' reports and descriptions. This paper presents the results of a study about information gathering and managing practices of a global technical support (GTS) center. The aim is to identify organizational and technical support and hindrances for collecting and reusing problem solving information, as well as maintenance workers work practices that support or prevent the information gathering and reuse. Based on the findings, suggestions for maintenance organizations to overcome the major problems are created.

1. Introduction

Knowledge is a core part of maintenance and support services. In addition to spare parts and tools, the maintenance worker needs to possess or obtain deep enough understanding of maintained equipment to analyze the root causes of problems based on symptoms the equipment have or is reported to have, and to conduct the needed maintenance and repair work. Knowledge or information is actually linked to all three criteria Betz [1] lists as requirements for successful maintenance:

1. Precise and timely information on the machines to be maintained
2. Real-time transfer of information on critical incidents
3. Fast access to the knowledge and means necessary to fix the problems.

Maintenance organizations usually utilize some kind of customer request management solution, which is used to keep track on open customer request cases and assign cases to workers. In addition the goal usually is to gather and reuse the repair and problem solving information. Although, the maintenance work is highly non-routine [1,2], maintenance organizations would benefit from case and solution databases since similar problems occur to similar equipment and in global maintenance organization problems can repeat though individual maintenance workers do not come across similar problems very often. Thus, efficient information reuse would allow faster and more reliable service for the customers and also produce significant savings for the service provider.

Since maintenance and repair work is based on understanding the problem correctly, information gathering forms a large part of maintenance workers work. While information gathering can be a difficult task, parts of it can

also happen automatically. For example, the equipment can collect and send usage logs, error reports etc. and correct manuals can be fetched based on serial number of the equipment. From organizational perspective, the most problematic phase is the actual problem solving and solution testing. In these phases the information gathering systems are forced to rely on the maintenance workers' and customers' reports about their activities and thoughts. Collecting the installation and customer specific information from people has turned out to be a difficult problem. As a result it often stays with the individual workers [3].

One of the reasons for not being able to gather all the relevant information from the maintenance workers can be problems in the ICT tools. Collaboration and communication tools are complex systems and their design can be very difficult. Grudin [4] lists three key problems in designing and evaluating systems that support cooperative work:

- Disparity between those who benefit from the system and those who need to do additional work to support it
- Lack of management intuition for collaboration supporting applications
- Extreme difficulty of evaluating collaboration supporting applications.

Since the problem solving in technical support is collaborative work, the problem-solving information management system can be seen as collaboration or communication solution. In it, the knowledge creators communicate and in some cases actively collaborate with the knowledge retrievers and users. When the problem-solving database is integrated with customer request management solution, the amount of collaborators rises as the customers (through help requests) and management of the organization (by measuring success and costs of problem solving) join to the system.

This paper presents the results of a study of global technical support (GTS) centers problem solving and information gathering and managing practices. The main goal of the research was to improve the collaboration practices and tools of the maintenance organization.

As a result we present the observed organizational and technical support and hindrances for collecting and reusing problem solving information, and the GTS workers work practices that support or prevent the information gathering and reuse. The focus in the analysis is on the GTS workers' viewpoints and in the fits and mismatches in the goals and actions of the organization, used technical solutions, and the workers. Based on the findings, suggestions for maintenance organizations to overcome the major problems are created.

2. Methods

The study of GTS workers information gathering and managing practices was part of a larger research project, which aimed to improve the collaboration solutions and followed the basic principles of user-centered design, i.e. early and continuous involvement of users of the to-be products and their tasks, iterative design, and empirical measurements of success of the designs [5].

The research was conducted as a case study in a global technical support center of a global cranes and tooling machines manufacturer. The GTS centers serve the company's own field maintenance workers.

The main research methods were contextual inquiry and a problem solving simulation game. Contextual inquiry is a part of user-centered design approach called contextual design [6]. Contextual inquiry aims to be an efficient field research method and emphasizes the real environment (context) of users or to-be users activities. In contextual inquiry, the researchers or designers observe the users in their normal environment. Instead of aiming not to interfere users activities, the researchers are encouraged to participate to users tasks and conduct interviews in situ. The goal of the participator observation is to form a master-apprentice relationship between the user and the researcher.

During the contextual inquiry, semi-structured interviews with the GTS workers were conducted. Semi-structured interviews enable probing for more clarification regarding informant's answers as well as tailoring the interview to suite individual differences in a heterogeneous informant group [7].

After the contextual inquiry, a problem solving game simulating the GTS workers problem solving work with its different collaboration partners and information resources was designed. The game utilized real customer reported problems from the company's customer request database and brought in playful and competitive dimensions by restricting the availability of information resources and providing scoring rules.

During the contextual inquiry, the GTS workers were observed 35 hours and in the problem solving game, 12 real customer-reported requests were simulated. Data analysis was conducted by identifying all communication and information gathering or handling actions and categorizing them depending how they relate to information reuse. The used categories were: supporting, neutral, and contradictory to organizational information reuse.

3. Results

The results can be divided into four themes:
1. GTS workers work practices
2. Organizational guidance
3. Technical aspect
4. External factors.

The work practices of GTS workers mean the current ways the workers do their tasks and view their work. Organizational guidance relates to maintenance organization's ways to motivate the workers as well as the organization's goals. Technical aspects mean ICT tools' features and underlying principles. By external factors we mean for example laws and regulations that affected on information usage in maintenance services.

3.1. GTS workers work practices

The main task and goal of a GTS worker is to solve the customer's problems. All other duties, also reporting and communicating the solution to others, come after this. Usually

customer sees things quite similarly. For example a customer request can stay open long after the solution has been found and implemented, since the customer is focused and interested about the equipment and its correct functioning and can forget to accept the closing of the case in the customer request management system.

Depending on the problem, GTS workers utilize very different information sources. In some cases all can be found from easily accessible digital documentation and in some cases workers need to hunt down old and obsolete printed manuals or consult Internet discussion forums. Thus gathering a comprehensive description about the problem solution into a digital form can mean a lot of extra work.

Although, the communication between the GTS center and the field experts happens through the customer request management solution, the most of the problem solving work happens often offline. The GTS workers had a habit of writing down notes in notebooks or other papers such as post-it notes and making calculations with traditional calculator instead of computer software. As a result a lot of important information about the problem's solution is not in digital form.

At least some of the workers had recognized the importance of writing down the solutions. One of them had for example very structured way of writing down all details in his personal notebooks and storing the notebooks in his own garage. Although, he personally rarely needed the old notes, he often consulted them when helping other GTS workers. As a matter a fact, many other GTS workers had recognized his vast knowledge and asked often help from him in very difficult problem cases.

3.2. Organizational guidance

The studied maintenance organization was focused on serving customers as efficiently as possible. In practice this meant measuring and continuously improving response and problem solving times. Although this meant that new customer requests were taken quickly under work, the side effect was lack of motivation on filling in details to the customer request database. Measuring pushed the GTS workers to close cases quickly or at least push the cases quickly to phase were just customers acceptance to the solution was missing.

Team managers and other leaders in the organization spoke about collecting the problem and solution details as well as about the importance of also filling in the details to the customer request database. However, since the speeches were not visible in the organization's measuring and rewarding actions, there was no real motivation for the workers to do extensive reporting.

3.3. Technical aspects

As mentioned above, the main tool of handling the customer requests and communicating between GTS centre and field experts allowed also detailed problem and solution reporting. However, the system was based on emails and did not provide easy ways of handling other than text-based information. The email as core technology of providing the connection from GTS centre to field was based on the needs of field workers. Sending email was possible even with phones and thus asking help from GTS centre was very easy to the field workers. Email was not the sole reason for the problems of the customer request management system. The system reflected organizational goals and performance measuring activities, i.e. provided easy ways to see how many open cases exist and how quickly the GTS centre can respond to the requests, instead of maintenance workers tasks and goals. For example the content of the customer requests was not as easily accessible as response times.

Other tools the GTS workers used were focused on certain specific technical tasks, i.e. creating licence keys, debugging logic programs, and checking device configurations. The tools had no links to the customer request database and thus it was easy to forget to add the tool usage details to the reports and just communicate the solution suggestion to the field experts.

In addition, the organization did not provide any knowledge creation or real collaboration solutions for the workers. As a result, the work was very individual and even in cases when the workers asked help from their colleagues, the responsibility of coming up and communicating the final solution to field worker was left solely to the original GTS worker owning the case.

3.4. External factors

Not many external factors were identified in the research. Only few cases of IPR or safety regulations obstructing information sharing were observed. These cases were usually such that the company was providing maintenance and support services for equipment that it had not manufactured itself and it either did not have rights to share manuals and other equipment documentation or the workers had problems in accessing the documentation.

4. Discussion

Problems relating organizational knowledge creation and reuse were observed in all four areas of GTS center's activities: work practices, organizational goals, ICT solutions and external factors. The GTS workers had a very individual focus in their activities and did not see the benefits of sharing the solutions of problems with each other. The workers had only seldom need to recheck the solution for a problem they had themselves handled. As a result, more comprehensive documenting of customer requests and their solutions was seen as an additional task that did not benefit the worker himself. This is also the first of Grudin's [4] key problems of designing and evaluating collaborative systems.

In organizational level the focus was on easily measurable actions. Although information reuse had been recognized as important theme by the management, there was no organizational motivation or rewarding systems that would push every worker to both creating and reusing information. In addition, the company lacked knowledge creation tools and maintenance workers were using ad-hoc solutions such as personal notebooks and post-it notes. This is near Grudin's

notion [4] of lack of management intuition for collaboration supporting applications.

Company's ICT solutions reflected the existing performance indicators and measurements and special technical tasks. Accumulation of information is possible with the solutions but they do not make it easy or push users towards it. Similarly external factors are mainly neutral but in some cases hinder information sharing possibilities.

As a solution for the observed problems, we suggest building balance between organizational, technical and workers' personal goals and activities. First step in this could be documenting the tasks, goals and interests of every user group of the organization's knowledge management solutions, and then reflecting the different user groups' viewpoints during the design of new solutions and whenever the solutions or their usage changes. In addition, developing long term measurements to evaluate organization's information reuse ability and ICT solutions support for it can help maintenance organizations on building and implementing development strategies.

Acknowledgements

References

[1] Betz, M. The Secret Life of Machines – Boundary Objects in Maintenance, Repair and Overhaul. Pervasive Computing, Lecture Notes in Computer Science 2010;6030:174-191.
[2] Orr, J. Talking About Machines: An Ethnography of a Modern Job. London: ILR Press; 1996.
[3] Cooke, F.L. Harnessing the Firm.specific Knowledge of The Maintenance Workforce for Organizational Competitiveness. Technology Analysis & Strategic Management 2010;14;1:123-140.
[4] Grudin, J. Why CSCW Applications Fail: Problems in the Design and Evaluation of Organizational Interfaces. In proc CSCW'88. New York: ACM ; 1988. p. 85-93.
[5] Gould, J.D, Lewis, C. Designing for Usability: Key Principples and What Designers Think. Communications of the ACM 1985;28;3:300-311.
[6] Beyer, H, Holtzblatt, K. Contextual Design: Defining Customer-Centered Systems. San Francisco, CA: Morgan Kaufmann Publishers; 1998.
[7] Barriball, L.K, While, A. Collectin Data Using a Semi-structured Interview: a Discussion Paper. Journal of Advanced Nursing 1994;19:328-335.