Improving IT Service Management Processes: A Case Study on IT Service Support

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Abstract. IT services and IT service management play a very important role in the today's IT industry. Software as service approach enables IT customers to focus on using the software while IT service providers take care of the installation, configuration, support and maintenance activities. Various process frameworks can be used to improve IT service management processes. The most widely used IT service management framework is the IT Infrastructure Library (ITIL) that provides best practices for IT service providers on how to design, manage and support IT services. Despite the IT service management process frameworks, implementing an effective service support interface between an IT service provider and an IT customer is a big challenge. The research problem in this study is: what types of challenges are related to the service support interface between an IT service provider and IT customers. The main contribution of this paper is present challenges in a service support interface identified during a case study with a large IT service provider company in Finland.

Keywords: IT Service Management; ITIL; IT Service Support; Service Support Interface.

1 Introduction

For many IT companies IT service support processes are currently a high priority process improvement targets. These processes are considered important because they are directly connected to the customer interface. In this paper, we call this interface a service support interface. A *service support interface* is service support-related interaction between IT service providers and IT customers. It includes the communication and knowledge sharing between IT service providers and IT customers regarding to the following IT service support processes: incident management, problem management, change management, configuration management and release management. Typical business objectives for the improvement of these processes are increased customer satisfaction on provided IT services, reduced support and maintenance costs and better process performance [1], for example to be able to handle larger incident volumes.

Many companies start the establishment of service support interface from the incident management process. Incident management is performed by the

service desk function and is likely the most visible part of the IT organization for customers. The main objective of incident management process is to restore normal service operation as quickly as possible and minimize the adverse impact on business operations [2]. However, the incident resolution time depends on the service level agreement [3]. The typical activities of incident management include recording, classifying, escalating, investigating, resolving and closing the incidents and service requests.

Difficult incidents that require more investigation and systematic incidents are handled as problems by the problem management process. The goal of problem management is to minimize the impact of incidents and problems on the business that are caused by errors within the IT infrastructure, and to prevent recurrence of incidents [4]. Problem management should be both proactive (preventing incidents through e.g. trend analysis, defining corrective actions) and reactive (reacting to the already reported problems). Problem management is responsible for creating workarounds and storing information on known errors into a knowledge base to which customers and users have access [5].

The goal of the change management process is to ensure that standardized methods and procedures are used for efficient and prompt handling of all changes [2]. Customers and users may request additional features to IT services. These types of requests should be logged as change requests to the customer support system. Additionally, error corrections that require code changes should be brought under change management. Customers can be invited to the change advisory board (CAB) meetings to discuss which IT changes should be implemented.

Configuration management accounts for all the IT assets and configurations within the organization and its services, provides accurate information on configurations and verifies the configuration records against the infrastructure [2]. Configuration items, such as products, services and their components, are stored in the configuration management database [6]. Configuration management provides the foundation for other IT support processes. In the ideal situation, the IT service provider has detailed and updated information also on customer's configuration items.

Release management deals with managing both large software releases and smaller release packages, such as bug fix patches [7]. The main objective of release management is to define and agree release and deployment plans with customers, assure the quality of release packages and to design and implement efficient procedures for the distribution and installation of IT changes [2] to customers. Customers should inform the IT service provider of business critical times when release packages cannot be deployed. All the above mentioned support processes are more or less related to service support interface and must seamlessly work together.

1.1   Related Work

Much has been written about IT support and maintenance. Previous studies have dealt with predicting incident volumes by statistical methods [8], service

desk and incident management challenges [9], activity-based management of IT service delivery [10], knowledge management-centric help desk [11], the maturity of the problem management process [12], using problem reports for quality assessments [13], dynamic change management model for managing IT changes [14], release management in component-based development [15], open source software releases [16], critical elements of the patch management process [17], and patch management challenges [18].

There are several frameworks and standards that can be used to improve the service support interface. The *IT Infrastructure Library (ITIL)* is the most widely used IT service management framework [2]. The ITIL version 2 defines best practices for service delivery [19] and service support processes [2]. The structure of the ITIL version 3 addresses the service lifecycle: service strategy [20], service design [21], service transition [6], service operation [4] and continual service improvement [22]. For each support process, ITIL defines process goals, benefits, roles and responsibilities, activities, metrics and relationships to other processes. In order to be effective, the process must be a defined process [23].

The *ISO/IEC 20 000* standard specifies the auditable requirements for IT service management. It consists of two parts: Specification for service management [24] and Code of practice for service management [25]. The *Control Objectives for Information and related Technology (COBIT)* is an IT governance framework that also includes delivery and support processes. COBIT does not describe the processes in the similar way than ITIL although it provides a brief summary of business and operational goals, process inputs and outputs, metrics, and control objectives for support processes. Capability Maturity Model Integration for Services [26] is an extension to the CMMI process maturity framework. It is designed for service provider organizations and it describes five maturity levels and their requirements. Additionally, the Framework for Counting Problems and Defects [27] provides practical examples how to measure the software quality.

1.2   Our Contribution

This paper is a part of the results of ongoing MaISSI (Managing IT Services and Service Implementation) research project at the School of Computing, University of Eastern Finland, Finland. The MaISSI project has three main goals: to improve IT service management processes, support the development of new services and service-oriented applications in MaISSI organizations, and to share new ideas and experiences regarding the IT service management.

The work in the MaISSI research project has been divided into eight subprojects (we call them MaISSI pilot projects). The pilot project for improving the service support interface was one of the MaISSI pilot projects and the study was carried out in year 2009. The main contribution of this paper, based on the pilot project, is to:

- Describe the identified challenges and problems in the service support interface between an IT service provider company and its customers.
- Propose solutions to the identified process challenges and problems.

Identification of process challenges is a crucial step in process improvement. Instead of software process improvement, we focus in this paper on improving IT service management processes. The results of this study might be useful for IT support process managers, software quality managers, project managers, IT consultants that are responsible for customers, and the customers of IT service providers. Additionally, the results can be used to improve the quality of the IT service support processes and IT services.

The rest of the paper is organized as follows. In Section 2, we describe the research questions, methods and case context of this study. In Section 3, we present the identified challenges in the service support interface and provide lessons learnt from the analyzed case in Section 4. The conclusions in the Section 5 summarize the case.

2   Research Questions and Methods

The research problem in this study is:

– What types of challenges and problems are related to the service support interface between an IT service provider and IT customers?

The research problem was derived from the feedback that the case organization had collected from its customers. The application service manager of the case organization adressed the research problem to the MaISSI research team. The research problem was divided into two main research questions:

– RQ1: What types of challenges exist in the service support interface from IT customer's perspective?
– RQ2: What types of challenges exist in the service support interface from the IT service provider's perspective?

A *research framework* defines the research problem in a conceptual level. The research framework in this study was a combination of IT service management, software process improvement and software engineering concepts.

Both case study research methods [28] [29] and action research methods [30] were used to answer the research problem. The case study method can be defined as an "empirical research that searches a contemporary phenomenon within its real-life context" [28]. A case study is "a research strategy which focuses on understanding the dynamics present with single settings" [29]. The main objective of the action research is to improve the working practices within the organization. In the action research method, a researcher or researchers do they work in the middle of the action (participative observation) [30]. The following subsections describe the case context, data collection methods, and data analysis method.

2.1   Case Organization

Our case organization for this study is a medium-sized business unit of a large IT service provider company. The company offers IT, R&D and consulting services for various industries.

The case organization is an industrial partner of the MaISSI project. Thus, convenience sampling was the case selection method. They were interested in improving the IT service support processes based on the IT service management framework ITIL.

IT service support processes are defined in the case organization's own ITIL-compliant business framework. Figure 1 shows the general structure of the case organization's IT service support and the context of the case study. The customer sends an incident (a ticket) to the case organization through its own IT service management tool, by phone or by email. The service desk in the first-line support acts as a single point of contact (SPOC) [4], receives the ticket and records it to the IT service management tool. After that, the service desk starts resolving the incident or assigns it to the second-line support or to the third-line support depending on the case. The second-line support can resolve the incident or assign it to the third-line support that starts working with the incident. When the incident has been resolved and closed by the service desk, the release management implements a release package and sends it to the customer. All these processes are connected to configuration management that records configuration items (CIs) in the configuration management database (CMDB).

The pilot project between the MaISSI research team and the case organization was carried out in the last part of the year 2009. The main target of the pilot project was to identify the challenges and problems in the case organization's customer interface of IT service management and propose solutions to these challenges and problems to increase the transparency of the service support processes to customers.

2.2   Data Collection

Multiple data sources were used in collecting data from the case organization's service support processes. The following data collection methods and data sources were used:

- Participative observation during field visits. This part included the working meetings with the application service manager.
- Two process training sessions organized by the research team.
- Interviews with case organization's customers.
- Documentations from the case organization and its customers.
- Email documents from the application service manager.
- Tool access: access to the case organization's intranet and the customer support database.

The main goal of the pilot project was to identify the challenges and problems in the case organization's customer interface of IT service management and propose solutions to these challenges and problems. The research process included the following phases:
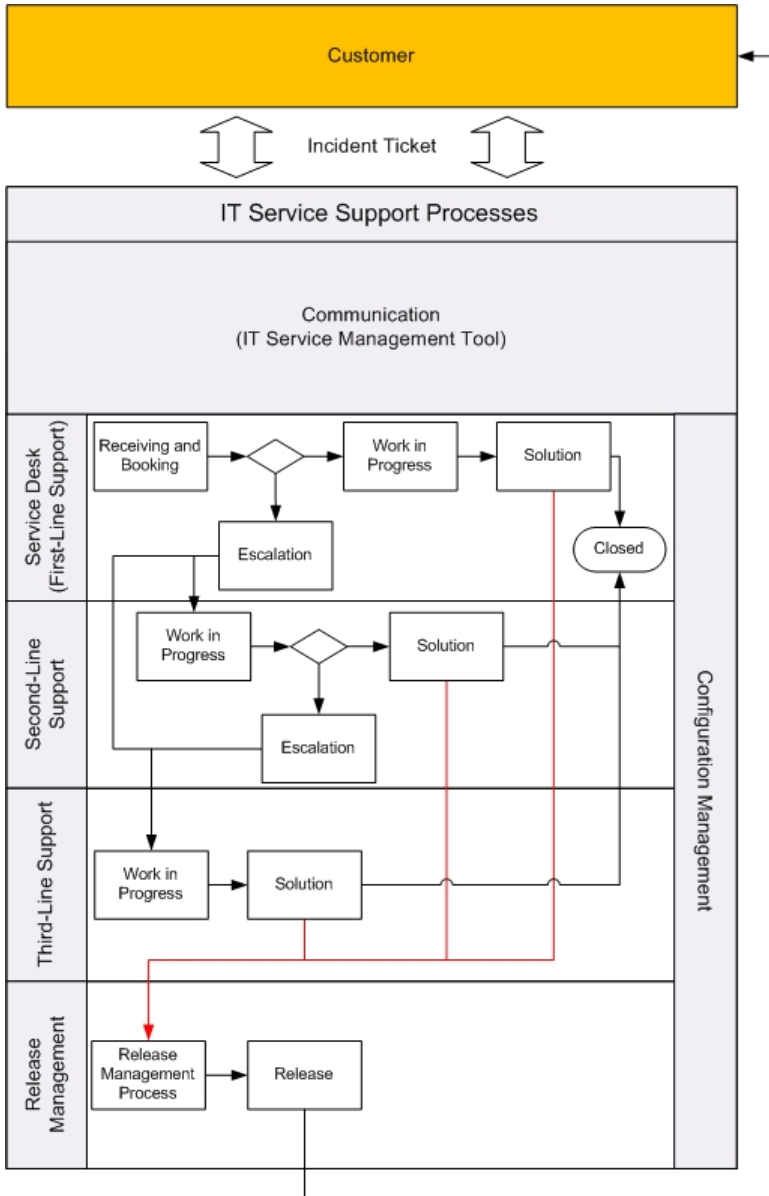
Fig. 1. The case study context and the general structure of the case organization's IT service support

- 10 September 2009: The kickoff meeting of the pilot project.
- 1 October 2009: The requirements meeting.
- October - November 2009: Participative observation phase by two researchers in the case organization.
- 22 October 2009: The review meeting of the pilot project.
- 12 November 2009: The final review and conclusion meeting of the pilot project.

In the kickoff meeting of the pilot project, the MaISSI research team and the application service manager of the case organization discussed the project and its goals. Two targets were defined for the pilot project:

1. Improving the service support interface between the customer and the IT service provider based on IT service management principles.
2. Improving the release management process.

After the pilot kickoff, the requirements meeting was held and the requirements for this pilot project were collected from participants. Participants in this meeting were representatives of the case organization, one customer of the case organization and the MaISSI research team. Based on the gathered requirements, the participative observation phase was started in October 2009. The main goal of this phase was to identify the challenges concerning to the service support interface of IT service management. The phase was performed by using action research methods and collecting data from multiple different sources: interviews, workshops and meetings with service desk workers, customers, customer consultants, and IT service management process managers. Additionally, the researchers had permissions to view the customer support-related documentations and access to the IT service management tool that the service desk uses.

2.3   Data Analysis

The data analysis was based on a within case technique [28] with a single case. From each meeting with a case organization, a memo was created. The meeting memos and other documentation from the case were stored in the case study repository. Two researchers analyzed the case study material and created a list of identified challenges. We focused on the following issues to identify challenges: process concepts, roles and responsibilities, process activities, metrics and process relationships. Each process challenge was analyzed and improvement suggestions recorded. Challenges were validated in one review meetings with the case organization. Process challenges and improvement suggestions were documented as a project report "Improvement plan for customer support". In the final review and conclusion meeting, the MaISSI research team presented a table of service support challenges and improvement suggestions to the case organization. We observed that the case organization had started to solve the process challenges effectively.

3   Challenges and Problems in Service Support Interface

The main objective of the study was 1) to examine what types of challenges are related to the service support interface between an IT service provider and IT customers and 2) to propose improvements to the challenges. The following challenges and problems were identified (Sources: CU = customers, CA= case organization):

1. **Lost incidents (CU)**
   Description: Customers have complained that they don't know what happens to incidents after they have been send to the IT service provider.
2. **Priorization of incidents (CU, CA)**
   Description: Service desk workers stated that they cannot trust on the priority class of the incident when they escalate incidents to the second-line support and to the third-line support.
3. **Poor transparency of the second-line support and the third-line support activities (CU)**
   Description: Customers don't receive enough information from the IT service provider on what happens to the incident after it has been assigned from the service desk to the second-line or to the third-line support or from the second-line to third-line support.
4. **Information sharing on delayed incident resolutions (CU)**
   Description: Customers would like to receive information if the incident resolution will take longer than expected.
5. **Poor quality of the incident resolutions (CU, CA)**
   Description: Incident resolutions are written unclearly or with a too technical language. Customers have difficulties in understanding the resolutions.
6. **Open incidents (CU)**
   Description: Customers do not receive enough information on incidents that have open status and haven't been under work.
7. **Solution times (CU, CA)**
   Description: Customers do not receive information about estimated incident solution times.
8. **Tickets closing (CA)**
   Description: The second-line support can close tickets without informing the service desk.
9. **The rules for escalation are unclear (CA)**
   Description: Lack of information in some cases who is responsible for certain things concerning the IT service management. This is due to organizational changes.
10. **Too high release frequency (CU, CA)**
    Description: Customers have complained that they are not able to test the release packages if they are deployed daily.

4   Analysis

In the analysis phase, each challenge in the service support interface was analyzed and provided with an improvement suggestion. The analysis was performed by two MaISSI researchers.

1. **Lost incidents (CU)**
   Solution: Document the IT service support processes and present them to the customers with customer's language ("shared concepts and terminology").
2. **Priorization of incidents (CU, CA)**
   Solution: Create clear rules how to use priority coding system. Discuss the priority codes with customers. Monitor that the rules are followed.
3. **Poor transparency of the second-line support and the third-line support activities (CU)**
   Solution: Provide customers with an overview how the second-line support and the third-line support work together. The second line is often called the back office. Third-line support includes product development, 3rd party IT service providers and subcontractors. The problem management team can consist of second-line and third-line specialists.
4. **Information sharing on delayed incident resolutions (CU)**
   Solution: Identify customer's SLA warning limits for incidents (SLA warning means that a customer will send an inquiry of the status of incident resolution). Send customers notification before the customer's warning limit to avoid unnecessary incidents.
5. **Poor quality of the incident resolutions (CU, CA)**
   Solution: Monitor the quality of incident resolutions. Organize quality reviews weekly.
6. **Open incidents (CU)**
   Solution:The customer and the consultant that is responsible for the customer arrange a meeting every month where they go through every open ticket and put them on a priority list. The list defines deadlines for the open tickets.
7. **Solution times (CU, CA)**
   Solution: Provide customers with an estimated time when the incident should be resolved.
8. **Tickets closing (CA)**
   Solution: Only service desk should be able to close tickets.
9. **The rules for escalation are unclear (CA)**
   Solution: Maintain an updated list of contact persons in the intranet and make clear rules for escalation.
10. **Too high release frequency (CU, CA)**
    Solution: The IT service provider should provide monthly releases and define the release policy with the customer.

The identified challenges above are not presented in a priority order. The case study provided us important information on service support interface between an IT service provider and IT customers. According to our observations many of the identified challenges could be removed by improving the communication and knowledge sharing between IT service providers and IT customers. Although our study included five IT service support processes: incident management, problem management, change management, configuration management and release management, to our surprise the challenges focused mainly on three processes: incident, problem and release management.

5   Discussion and Conclusions

This study aimed to answer the research problem: what types of challenges are related to the service support interface between an IT service provider and IT customers. The main contribution of this paper was to present challenges and problems in a service support interface identified during a case study with a medium-sized business unit of a large IT service provider company in Finland. Several challenges were identified, such as priorization problems, challenges in information sharing, and poor transparency of support processes. Additionally, we provided a process improvement suggestion for each challenge.

The results of this study might be useful for IT support process managers, software quality managers, project managers, IT consultants that are responsible for customers, the customers of IT service providers, and other persons that are responsible for improving service support processes. However, there are several limitations to this study. First, data were collected from one case organization during a relatively short research period. The data were collected from few employees in the case organization and from few customers of the case organization. There could have been more interviews, workshops and discussions with the pilot project members but the time and resources were limited. Second, we cannot draw any statistical conclusions from the results of a single case. Although the generalization of results may not be possible, we are able to extend the theory of IT service management generally. Third, we do not have clear evidence that all our process improvement suggestions have been implemented by the case organization. However, we have received very positive feedback on the case study results from the case organization.

Further work could focus on examining service support interface challenges in other IT service provider organizations or IT departments of IT customer organizations.

References

1. Bon, J.V., de Jong, A.: IT Service Management - An Introduction. Van Haren Publishing (2007)
2. Office of Government Commerce: ITIL Service Support. The Stationary Office, UK (2002)
3. Trienekens, J.J.M., Bouman, J.J., Zwan, M.V.D.: Specification of service level agreements: Problems, principles and practices. Software Quality Control 12(1), 43–57 (2004)
4. Office of Government Commerce: ITIL Service Operation. The Stationary Office, UK (2007)
5. Jäntti, M., Vähäkainu, K.: Challenges in implementing a knowledge base for software problem management. In: Proceedings of the 4th IASTED conference on Knowledge Sharing and Collaborative Engineering, St. Thomas, US Virgin Islands, November-December 2006, pp. 63–68. ACTA Press (2006)
6. Office of Government Commerce: ITIL Service Transition. The Stationary Office, UK (2007)
7. Liu, S., Kuhn, R., Rossman, H.: Surviving insecure it: Effective patch management. IT Professional 11(2), 49–51 (2009)
8. Caldeira, J., e Abreu, F.B.: Influential factors on incident management: Lessons learned from a large sample of products in operation. In: Jedlitschka, A., Salo, O. (eds.) PROFES 2008. LNCS, vol. 5089, pp. 330–344. Springer, Heidelberg (2008)
9. Jäntti, M., Kalliokoski, J.: Identifying knowledge management challenges in a service desk: A case study. In: Proceedings of the Second International Conference on Information, Process, and Knowledge Management, eKNOW 2010, St. Maarten, Netherlands Antilles, February 2010, pp. 100–105. IEEE Computer Society, Los Alamitos (2010)
10. Bailey, J., Kandogan, E., Haber, E., Maglio, P.P.: Activity-based management of it service delivery. In: CHIMIT '07: Proceedings of the 2007 Symposium on Computer Human Interaction for the Management of Information Technology, p. 5. ACM Press, New York (2007)
11. Gonzalez, L.M., Giachetti, R.E., Ramirez, G.: Knowledge management-centric help desk: specification and performance evaluation. Decis. Support Syst. 40(2), 389–405 (2005)
12. Kajko-Mattsson, M.: Problem management maturity within corrective maintenance. Journal of Software Maintenance 14(3), 197–227 (2002)
13. Mohagheghi, P., Conradi, R., Borretzen, J.: Revisiting the problem of using problem reports for quality assessment. In: WoSQ 06: Proceedings of the 2006 International Workshop on Software Quality, pp. 45–50. ACM Press, New York (2006)
14. Olsen, N.C.: The software rush hour. IEEE Softw. 10(5), 29–37 (1993)
15. van der Hoek, A., Wolf, A.L.: Software release management for component-based software. Softw. Pract. Exper. 33(1), 77–98 (2003)
16. Di Cosmo, R., Zacchiroli, S., Trezentos, P.: Package upgrades in foss distributions: details and challenges. In: HotSWUp '08: Proceedings of the 1st International Workshop on Hot Topics in Software Upgrades, pp. 1–5. ACM, New York (2008)
17. Gerace, T., Cavusoglu, H.: The critical elements of the patch management process. Commun. ACM 52(8), 117–121 (2009)
18. Gerace, T., Mouton, J.: The challenges and successes of implementing an enterprise patch management solution. In: SIGUCCS '04: Proceedings of the 32nd Annual ACM SIGUCCS Conference on User Services, pp. 30–33. ACM, New York (2004)

19. Office of Government Commerce: ITIL Service Delivery. The Stationary Office, UK (2002)
20. Office of Government Commerce: ITIL Service Strategy. The Stationary Office, UK (2007)
21. Office of Government Commerce: ITIL Service Design. The Stationary Office, UK (2007)
22. Office of Government Commerce: ITIL Continual Service Improvement. The Stationary Office, UK (2007)
23. Zahran, S.: Software process improvement: practical guidelines for business suscess. Addison-Wesley Longman Ltd., Amsterdam (1998)
24. ISO/IEC 20 000: IT Service Management, Part 1: Specification for service management. ISO/IEC JTC1/SC7 Secretariat (2005)
25. ISO/IEC 20 000: IT Service Management, Part 2: Code of practice for service management. ISO/IEC JTC1/SC7 Secretariat (2005)
26. Software Engineering Institute: CMMI for Services: Initial Draft. Carnegie Mellon University (2006)
27. Florac, W.: Software quality measurement a framework for counting problems and defects. Technical Report CMU/SEI-92-TR-22 (1992)
28. Yin, R.: Case Study Research: Design and Methods. Sage Publishing, Beverly Hills (1994)
29. Eisenhardt, K.: Building theories from case study research. Academy of Management Review 14, 532–550 (1989)
30. Kock, N.: Action research: Lessons learned from a multi-iteration study of computer-mediated communication in groups. IEEE Transactions on Professional Communication 46(2), 105–128 (2003)