



Applying Continual Service Improvement Practices to Study Quality of Healthcare Information System Services: A Case Study

Sanna Heikkinen¹, Marko Jäntti²(✉), and Kaija Saranto²

¹ Istekki Oy, P.O Box 2000, 70601 Kuopio, Finland
sanna.heikkinen@istekki.fi

² University of Eastern Finland, P.O Box 1627, 70211 Kuopio, Finland
{marko.jantti,kaija.saranto}@uef.fi

Abstract. Continual Service Improvement (CSI) plays a critical role in increasing the quality of IT services leading to better customer satisfaction. However, a key challenge in service management is that service provider organizations do not identify CSI activities although they carry out improvements task on daily basis. An ad hoc approach to CSI may result in delays in improvement projects, poor transparency of improvements tasks and lack of focus in service improvement. The research problem of this study is: how to manage service-related improvements with ISO/IEC 20000 compliant CSI model. The main contribution of this paper is to study how service-related improvements are managed. By using case study methodology, we shall describe how CSI can be applied to healthcare information system services. Case study results are analyzed through a Socio-Technical System (STS) view. Our results show that service improvements can be managed with an ERP system including CSI records, workflows and status monitoring of CSI. Additionally, applying CSI to healthcare information systems requires a new set of skills from service managers covering service management, healthcare and medical device regulation. Finally, we show that multiactor network may cause challenges to CSI such as coordinating multiple vendors, stakeholders and customer representatives.

Keywords: Continual Service Improvement · Service quality · IT service management

1 Introduction

Continual Service Improvement (CSI) [7] is a service lifecycle phase that is responsible for improving the quality of IT services and underlying products,

Supported by Digiteknologian TKI-ympäristö project A74338 (ERDF, Regional Council of Pohjois-Savo).

components, processes and practices. CSI (Continual Improvement in IT Infrastructure Library Edition 4 [2]) may initiate and manage improvements regarding continuity management, risk management, availability management, capacity management, as well as service operations of the service provider. Interoperability and security of IT services play a crucial role especially in healthcare sector where IT-related incidents (especially software incidents) or poorly managed technical changes can cause service downtime or prevent access to healthcare systems. Technical failures may cause risks to patient safety.

Previous studies on IT service management (ITSM) have mainly focused on success factors of IT service management [24], challenges in service operation processes [15] or other IT service management areas than continual improvement such as implementation of preventive service systems [3], measurement of IT service management [9] and implementing ITIL with Lean methods [20].

However, their findings can be used to deploy continual improvement in a more systematic way. Deployment of CSI should take into account factors that are crucial to any ITSM initiative [12] such as senior management involvement, competence and training, information and communication to staff and stakeholders, and culture.

In Finland, it is mandatory for healthcare organizations to have procedures on how staff can participate on quality management and patient safety improvement actions. Medical Devices Act (629/2010) [19] maintains and promotes the safety of instruments and equipment in healthcare as well as their use. For example, staff can participate on quality assurance by reporting potential threats or incidents to the HaiPro patient safety violations systems [22].

In order to perform change and technological transformation, IT service providers need to play an active role in developing digital solutions that integrate with healthcare processes and systems. For example, nowadays in Finland electronic patient records (EPRs) and filmless picture archiving and communications systems (PACS) are source of important patient information covering 100% of both primary and specialized care [6]. This information system needs to be updated and continually improved to deploy new features through a large number of IT service providers and suppliers.

IT service providers and healthcare organizations need to improve their own operations (internal improvement) in order to create, deliver and support healthcare services and deal with the growing number of legal requirements and medical regulations. Related to ISO/IEC 20000 service management standard [13], the organization shall have procedures to monitor changes in legal, regulatory, and vendor requirements. The study of Varsha and Ganesh [1] revealed that using appropriate quality management standards the quality of delivered service was improved.

While many IT service provider organizations are aware of the need of continual improvement, they often struggle with improvement actions (e.g., clear service roadmap or service improvement plans, schedules, monitoring) due to lack of a process to manage improvements [11]. Additionally, one of the challenges is that organizations are not able to measure the maturity of continual

improvement although there are service management maturity frameworks and standards (for example, ISO/IEC TS 33074:2020 [14]) available.

However, improvements or innovations in healthcare need engagement of multiple stakeholders. IT service providers manage effective and efficient service delivery and they need to be able to rapidly respond to the requirements of the customers and service requests and feedback from service users. Healthcare professionals represent the business perspective and participate in defining the requirements for services.

In this paper, the goal is to study how IT service providers utilize continual service improvement in their operations and services they offer. The focus is on service improvement practices of a Finnish IT service provider company. The results of this study can be used by service managers, business managers, and any other service employees to improve service delivery in a multiactor network and the ability of the company to respond to rapid cyclical developments. The results can be applied for understanding the social and technical aspects of managing improvements related to IT services.

The remainder of the paper is organized as follows. Section 2 describes the research methods. Section 3 presents the results of the study. Section 4 provides an analysis, and conclusions are given in Sect. 5.

2 Research Methods

This study aimed at answering the following research problem: How to manage service-related improvements with ISO 20000 compliant CSI model? In this study, we used a case study method with single organization to answer the research problem. The research problem was divided into three research questions:

- How service-related improvements are managed in Enterprise Resource Planning (ERP) software?
- How CSI model can be applied to IT services on the healthcare domain?
- How CSI is operated in a multiactor network?

This study focused on continual service improvement methods in the context of IT service management. By using case study methodology, we shall present how CSI can be utilized by IT service provider in the healthcare IT services. The case study can be defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context” [25]. The real life context refers to daily service management of an IT service provider organization (see Fig. 1).

In this study, we focused on exploring the CSI activities of IT service provider in a healthcare domain. CSI in our case involves measurement of services and service processes, identification of improvement ideas through measurement and management of improvement actions [11]. Results are presented through Socio-Technical System (STS) view. STS focussed at the phenomenological level, identifying the types of socio-technical interactions that occur when humans use IT

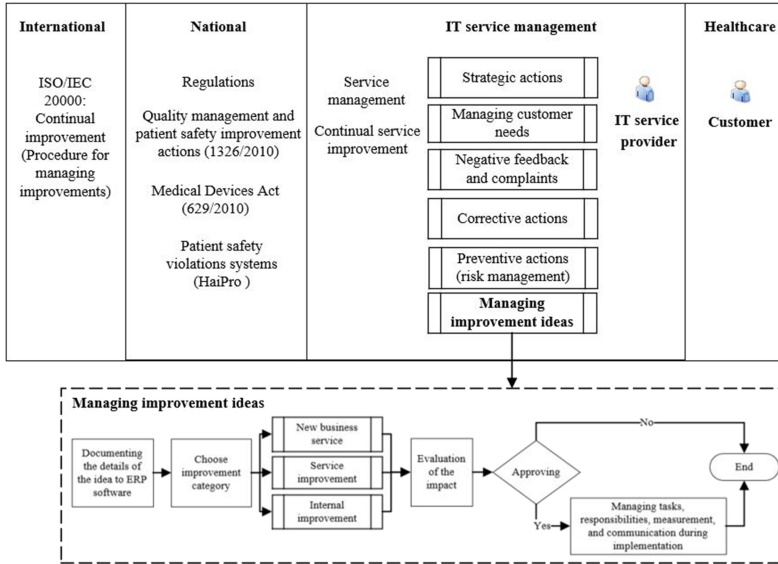


Fig. 1. The context of the case study.

in health settings [8]. As a theoretical framework of the study we used service science, information technology (IT) service management, Continual Service Improvement (CSI), quality management (preventive actions, corrective actions), ISO/IEC 20000 service management standard (improvement management), as well as healthcare laws and regulations (e.g. HaiPro).

2.1 Case Organization

The case organization Alfa has over 600 employees and provides information, communication and medical technology services to its customers in Finland. Alfa also operates in a service integrator role for social and healthcare organizations and municipalities. The case organization was selected because the main author of this paper was working for the case organization, thus having an easy access to data. Additionally, we considered the case as a representative case of a typical IT service provider organization because its service operations and processes are compliant with standards (ISO/IEC 20000, ISO 9001) and it delivers IT services to customers in healthcare domain by using a core ITSM system (ERP in this paper). This study can be considered as exploratory case study with service improvement aspects [21].

2.2 Data Collection Methods

Data for this study was collected by using multiple sources of evidence from the case organization Alfa during the year 2019. The data was captured by the

first author while the second author participated in supervising and documenting the case study, and third author provided additional insights regarding the socio-technical system and healthcare information systems.

- Documentation: case documentation such as quality handbook, ITSM process descriptions, ITMS process charts, standards: ISO 9001 and ISO/IEC 20000, monthly steering board info, intranet information letters)
- Archival records: improvement records in the ERP software
- Interviews/discussions: CSI process owner, quality manager, quality specialist, group managers, ITSM tool specialist, process managers in Service Management Office (SMO)
- Participative observation: observations on CSI, participation in SMO meeting, participation in a business steering group meeting
- Validation interviews (number of staff): ERP software main user (1), Security manager (1), Information management specialist (1), Software architect (1), Directors (4), HR Development Manager (1), Executive Assistant (1), Development manager (3)
- Semi-structured theme interviews: two service managers of social and healthcare information system services
- Direct observations: Listening and making notes from conversations during training sessions (ITIL 4)

2.3 Data Analysis Methods

The research problem of this research is to describe how to manage service-related improvements with ISO/IEC 20000 compliant CSI model. According to socio-technical theory [17], an organization consists of two interdependent systems [18]. First, it includes a social system including the people and organizational structures. Second, it involves a technical system including tasks and processes as well as technologies and tools that people use to produce goods or services to their customers.

The findings of the study were analysed by using within case analysis technique and taking into account four aspects involved in the Socio-Technical System (STS). Adopting the Socio-Technical System enables viewing the service improvement practices as a wider and more sustainable perspective than just as a single process area of IT service management. We shall describe four viewpoints and present how to keep the continual improvement momentum going on in the context of an IT service organization. In this study, the results shall be analyzed through socio-technical components [5] in a way similar to the study of Blomberg, Cater-Steel and Soar [4].

3 Results

The results of this study are presented in this paper according to three research questions. These research questions are used to answer the main research problem of this study: How to manage service-related improvements with ISO 20000 compliant CSI model?

3.1 How Service-Related Improvements Are Managed in Enterprise Resource Planning (ERP) Software?

In case Alfa, ERP software (service management system) has been developed to support effective way of work and management of customer needs (lead), projects, invoices, and support request (ticket) in a one master data tool.

Discussion with the continual improvement process owner revealed the need to collect and manage employee's improvement ideas related to new business service innovations, IT services or internal practices via ERP software. The author of this paper designed the workflow to the ERP software based on the ISO/IEC 20000 standard requirements concerning management of improvement ideas (see Fig. 1).

The process of managing improvement ideas guides employees to operate with improvement records always in the same way. This type of model supports and increases quality to the management process and encourages employees to think how ideas would benefit the services of the organization.

The ERP software (deployed in 2018) enables designing particular forms of ticket workflows and tasks to processes. The author designed a form where service-related ideas can be documented in a basic web form. This supports a structured and informative form of Continual Improvement record. The employees see this valuable because it forces to document basic information on improvements (description, benefits, quality aspects).

During the study, we identified a challenge in the information quality of improvement records. Ideas may be received like a post it notes with incomplete information. Improvement records can be directed to a right group or people for evaluation by using automation. The improvement record can be used to replace case organization's other forms such as financial expenditure form and minimize the number of emails related to processing and content of ideas. This provides the employees better opportunities to learn and remember only one tool where they can document ideas. The improvement record includes the following functionalities:

- Categorization and subcategorization of the improvement idea: enables effective routing of improvement idea to a right team or a person
 - Improvement of current service ticket type (shall be assigned to quality management group)
 - Internal improvement idea (shall be assigned to area manager, for example, improvement ideas related to corporate security shall be assigned to security manager, human resources-related improvement ideas to the HR Development Manager)
 - New business opportunity (shall be assigned to Business Development group)
- Reminders: After two weeks of documenting the idea, the reviewer will receive an automatic reminder of the pending evaluation. The evaluation must be done within 21 days. This is seen important because it forces to conduct a review and make either a Go or a No Go decision.

- Evaluation of the improvement idea: Each idea is evaluated by using multiple factors, such as expected business benefits, business impact, leading to measurable results, time required for implementation, required resources, impact to customer, summary of evaluation, decision of implementation.
- Communication of decision: Information on the decision (not implemented/implemented) shall be delivered automatically to the person who submitted the idea and the support person who performed the evaluation
- Status monitoring: The status (new, waiting evaluation, on handling, closed) of the development idea changes automatically (new, pending evaluation, implementation, etc.)

The tool provides employees a channel to represent ideas related to new business service innovation, a service or an internal practice and increases the visibility of ideas to employees. This enables employees to make a conversation of ideas and support the progress. During the study, we observed the need is to ensure that there is clear role to evaluate ideas, keep the implementation work going on, and active dialog between participants.

There is a large number of potential ideas but in relation to benefits (cost, effective, resources, risks) there is need to make selection. It is important to review ideas by using the same attributes and aspects to ensure the equality of ideas.

During the study, we captured comments (participative observation, interviews) that indicated the need to communicate improvement ideas to employees and ensure that the processes are in place to support smooth management of improvements. This includes identification of new ideas and allocating them to the right people who can make the evaluation, motivated employees to design the solution and work with implementation, as well as communicating the benefits that are achieved.

The observations and interviews revealed the need of a ticket, because a customer may suggest, for example, ideas related to internal practices and at the moment it is not clear for employees how to manage this type of ideas. Customer feedback and ideas should be brought under case organization's processing and someone should take action on them. One of the interviewees commented that it is good that there is a tool to support the management practice, but there is also need for employees that perform the implementation of improvements in addition to their normal work.

3.2 How CSI Model Can Be Applied to IT Services on the Healthcare Domain

How Service is Measured? In case organization, quality manuals describe measurement and metrics on service and customer satisfaction (e.g. customer surveys, customer feedback, project meetings, project feedback). The researchers observed that measurement of the service benefits and impact is a challenging task to perform. There should be common criteria and methods on how service benefits can be evaluated. This type of analysis could show how IT service

brings broader benefits to customer and this data can be used by sales staff to increase service sales. For example, regarding the robotics service there are viewpoints such as cost quality aspects (patient safety, data transfer), and employee experience (less manual checks and data copy and paste between systems).

What Type of Knowhow Is Required in a Service Manager Role? IT service organization need different roles and skills on work. For example, one important skill type for service managers are interaction skills, because they manage the performance of provided service by working together with the customer, organization's experts and suppliers. Interviews revealed also need for customer relationship management, service pricing, performance of maintenance, contract management, procurement, contract management, service reporting to organization management and to customers, continual improvement of the operational services.

For service delivery, service managers need to have knowhow on ITSM practices such as incident management, change and project management, continuity and availability management, and service level management. Additionally, they need to have tools for monitoring the service management. Service managers reported that they have business intelligence (BI) tools to monitor the profitability of the service. They can use the tool to identify and analyse the costs of the service and service profitability. In the future, the service managers would need to increase skills at service design, Medical Device Regulation related to healthcare systems and service improvement perspectives in Finland, and benchmark to competitors.

How Service Managers Perform Service Improvement? According to interviews, in IT and healthcare domains there is no other alternative than continual improvement. Healthcare legislation and regulative frameworks result in continuous stream of changes to the requirements due to government's social and healthcare reform. Additionally, customers' growing need for digitalization requires that IT service providers pay attention to improve services and service management. In our case organization, continual improvement is performed in many levels, roles, cycles and actions.

The researchers observed that continual service improvement is important in case organization from value creation perspective. The case organization's goal is to add value to customers and do things for the customers by supporting their operations in a way that the customer can focus on their own business and the service provider organization will take care of the IT service improvement and IT-related problems.

The service manager of case Alfa commented in interviews that service improvement requires IT service management processes that are running smoothly and there should be time to develop those processes that supports the IT service delivery.

Which Roles Participate in Decision Making of Service Related Improvements? While improving the service there might be different roles that participate in the design and decision making. It depends on the scope

of improvement activity. In the case organization, participating roles included business manager, specialists and service managers.

Depending on the value of investment and other factors described earlier in this paper decision-making authorization is defined and limits for purchases are set. The service manager gathers information from various sources to make the business decision to move forward. We observed that it has been a little unclear who will decide the bigger and smaller improvement thing.

Sometimes the implementation of development ideas may involve investments that are seen to result in sufficient benefits through the calculations and whether it is worthwhile to continue the implementation. From the company's management perspective, it would be better if ideas should be refined and not directly presented as raw ideas in strategic decision-making.

In case organization, the business development team evaluates and filters new business ideas which are recorded in the ERP system. If there is only one person to decide, then there is a risk of not recognizing the potential.

How Service Review Meetings Are Organized? According to the case Alfa's quality manual, 2–4 service meetings are organized annually. Service managers reported that meetings include overall service situation such as service development needs, service functionality in production, customer satisfaction, potential cost increase needs, and from the quality point of view, the number of service requests from the ERP tool.

Participation depends on the meeting subject and could include customer's information management persons (e.g. responsible and accountable persons, system administrators and executives). Service meetings are case-by-case, which allows to choose the best customer relationship management model when there is really no one-size-fits-all model.

3.3 How CSI Is Operated in Multiactor Network?

Which Actors and Stakeholders Are Related to the Service? The case organization utilizes suppliers to provide the service. The suppliers are social and healthcare system and equipment providers. Additionally, service-related actors are the case organization's business units and the production groups (e.g., network, database, integrations), customer representatives and other authorities such as the Finnish Institute for Health and Welfare (THL), Digital and Population Data Services Agency, the Ministry of Social Affairs and Health, and the Social Insurance Institution of Finland (KELA). Existing ICT communication tools (e.g. Skype, Teams) enable cooperation with suppliers and customers.

How Improvements Are Implemented in Multiactor Network and Which Challenges Has Been Identified? According to the interviewee, service improvement requires a good cooperation with suppliers and support from organization's management. To make things progress there is need to identify right channels for ideas and contact persons to communicate with regarding the idea. The case organization has recognized that service development in multiactor network is a complex and time-consuming process. The most demanding

step is the co-ordination if there are multiple vendors, other stakeholders and the customer involved in the development.

Service improvement begins with identification of a customer's needs, planning, kickoff and review of suppliers' offers. When the solution to a customer need is known internally and externally, then the offer from the case organization will be introduced to the customer. The scope of improvement affects the delivery model where large implementations can be managed as projects and smaller implementations can be managed as service requests. One of the interviewees commented that it is good if a service manager would be involved in the improvement because he/she can ensure that the business perspective is taken into account.

To provide service via a multiactor model, the goal is to integrate the services of internal and external service providers into a seamless service chain. Certain challenges have been identified in delivering the service in terms of information flow and managing information on the supplier's operating practices. Additionally, one of the interviewees pointed out challenges related to service support times. The case organization needs to take into account all supplier contracts to define service support times and service levels.

What Types of Expectations Customers Have Regarding the Service?

The operating environment of service is becoming more diverse and customers expect that the case organization is able to provide customers with solutions holistically through a wide catalogue of services. The expectations are related to meeting the agreed service level requirements, for example, response times should match customers' requirements and service times for operations should follow defined service levels. Additionally, staff needs to be aware what is happening in the service environment, have readiness to improve the provided service, and to collaborate and engage stakeholders. Customers also expect that the case organization monitors the operating environment and provides added value, not only from a perspective of a single service, but holistically from a wider business perspective.

4 Analysis

Table 1 shows the analysis of results according to two elements of social view. Data source has been described by using abbreviations: IN = Validation interviews and theme interviews, DI = Discussions, DO = Documentation, PO = Partic. observation, DOB = Direct observation, PA = Physical artefacts. Other abbreviations: CSI = Continual Service Improvement.

A within-case analysis technique [10] was applied to analyze the data from the case organization. The focus was in the continual service improvement. This requires skilled service staff, appropriate organizational structure, defined processes and effective tools to support service delivery. Next, we shall present the analysis by using the components of the Socio-Technical System as patterns (categories).

People: The IT service provider needs competent staff to lead the service improvement implementation and smooth service delivery to the customer. Utilizing staff throughout the organization to identify unnecessary job bottlenecks increases job satisfaction. When new business service innovation, IT service, or internal practice is recognized by staff and customer, employees are encouraged to make a conversation about the recorded ideas and process the ideas together.

The customer expectation is that the case organization can provide added value, not only from a perspective of a single service, but holistically from a wider business perspective. The service provider needs to be aware of what is happening in the service environment and take proactive actions, have readiness to improve the provided service, and to collaborate and engage various stakeholder groups.

Table 1. Summary of key findings according to 4 views in the Socio-Technical System

STS	Findings (source)	Implication to CSI
People	Interaction and cooperation skills IN Creativity & innovation to improve services DI, IN The tool provides a channel to present ideas related to service innovation DI, IN Be aware of changes in service environment IN Have readiness to improve provided service IN Collaborate and engage stakeholders IN	Ensure that CSI skills exist Foster innovation skills Utilize the full org. potential in CSI Know the service environment Plan engagement
Structure	Various roles participate in design, decision making, and implementing improvements. IN Communicate improvements to employees IN Measurement of the service benefits and impact from value creation perspective. IN	Set clear roles and responsibilities to support smooth CSI. Create visibility to CSI Emphasize managem. of benefits
Process	Meetings with customers and suppliers related to service delivery. IN, DO Planning the future roadmap helps to gather and implement service improvements. IN, DO Managing improvement ideas process ensures unified processing of ideas. IN, DO, PO, DI Common methods and criteria needed to evaluate service improvement targets. IN, AR, DO	Organize service meetings to improve service delivery Use roadmaps to show direction for improvement Define a process for managing improvements Evaluation of improvements requires clear criteria
Technology	ERP should enable managing service tasks and support effective work. DO, PO, IN ERP should produce monitoring data DO, PO, IN Design a workflow where ideas can be captured in a common form; helps creating an informative impr. record. DO, PO, IN	Design a system supporting service lifecycle management Use standardized procedures and workflows in ITSM tools

Structure: In order to provide service via a multiactor model, the case organization aims at integrating the services of internal and external service providers into a seamless service chain. To improve service, there is need to ensure that there are clear roles to evaluate ideas, motivated employees to design the solution, keeping the implementation work going on, active dialog between participants, and effective communication on the benefits that have been achieved.

If there is a service roadmap or a service improvement plan (SIP), it would help to prioritizing the improvement ideas. Additionally, SIP could help staff to be proactive and manage the workload effectively. ISO/IEC 20000 standard requires that IT service providers measure services and implemented improvements and take necessary actions if targets are not achieved. The case organization could pay more attention to identification of benefits (e.g. patient safety, increased employee experience), impact and goal-orientation while defining metrics.

Process: IT service provider collects service improvements during meetings with customers and suppliers. Meetings include overall service situation such as service development needs, service functionality in production, customer satisfaction, potential cost increase needs, and from the quality point of view, the number of support tickets from the ERP tool. Workflows in the ERP tool support and increase quality to the management of processes in the same way. There is a large number of ITSM process frameworks available for improvement purposes [16].

The ERP system supports a structured and informative form of Continual Improvement record. The employees see this valuable because it forces to document basic information on improvements (description, benefits, quality aspects). A well-known and familiar management process for improvements encourages employees to think how ideas would benefit the services and customers. Additionally, there should be common methods and criteria on how service improvement targets can be evaluated.

Technology: The ERP system should enable managing service lifecycle processes and workflows within the case organization. This supports identifying and analyzing the costs of the service and issues related to the effectiveness of the service profitability.

Our results support the findings of previous studies in CSI by emphasizing the need for systematic management of continual improvement actions for services [11]. However, this study did not deal with CSI based on maturity models [23] but instead applied a Socio-Technical Theory model in order to establish foundation for continual improvement practices.

5 Conclusions

This study aimed at answering the research problem: how to manage service-related improvements with ISO/IEC 20000 compliant CSI model. The main contribution of this paper was to present a case study focusing on studying continual service improvement practices of an IT service provider organization. The study consisted of three research questions. Regarding the first research question (How service-related improvements are managed?), we observed that the ERP system plays a central role in continual service improvement of the case organization. The ERP system includes CSI records, workflows, prioritization and categorization of improvement ideas, communication of decision and status monitoring of continual improvement records.

The second research question (How CSI model can be applied to IT services on the healthcare domain?) focused on studying CSI in the context of healthcare information system services. Our findings indicate that continual improvement can be seen as a mandatory process area for healthcare information system services because they need to respond to the changes in healthcare legislation, regulative frameworks and customers' changing needs. We observed that service managers need not only service management skills but also skills and knowhow on Medical Device Regulation related to healthcare systems. Additionally, service managers need information on customers' strategies, improvement roadmaps and actual service performance as well as solutions that help customers holistically.

Our findings from the third research question (How CSI is operated in a multiactor network?) revealed that service development in a multiactor network is a complex and time-consuming process. One of the major challenges is how to coordinate multiple vendors, stakeholders and customer representatives involved in the improvement. The multiactor model of service provision aims at integrating the services of internal and external service providers into a seamless service chain.

The following limitations are related to this case study: First, our study included only one case organization with limited number of interviewees and qualitative data. It would be interesting to conduct a study that compares CSI procedures of multiple organizations and utilizes both qualitative and quantitative data. Second, the selection of interviewees can also be seen as a limitation. Interviews could have included customer representatives to provide richer insights to CSI. Third, case study as a research method does not allow us to generalize research findings to other organizations. However, we are able to extend the theory of service management through our results. We aimed at improving the validity of the study by using multiple data sources and two interviewees validating and reviewing the case study. Reliability was improved by utilizing case study datastore and maintaining the chain of evidence.

References

1. Agarwal, V., Ganesh, L.: Implementing quality healthcare strategies for improving service delivery at private hospitals in India. *J. Health Manag.* **19**(1), 159–169 (2017)
2. Axelos: ITIL Foundation ITIL 4 Edition. The Stationary Office, UK (2020)
3. Barkai, O., Harison, E.: Preventive service management: towards pro-active improvement of service quality. *Rev. Bus. Inf. Syst.* **15**, 19–30 (2011)
4. Blumberg, M., Cater-Steel, A., Rajaeian, M., Soar, J.: Effective organisational change to achieve successful ITIL implementation: lessons learned from a multiple case study of large Australian firms. *J. Enterp. Inf. Manag.* 496–516 (2019)
5. Bostrom, R.P., Heinen, J.S.: MIS problems and failures: a socio-technical perspective. part I: the causes. *MIS Q.* **1**(3), 17–32 (1977)
6. Braithwaite, J., Mannion, R., Matsuyama, Y.: *Health Systems Improvement Across the Globe: Success Stories From 60 Countries*. CRC Press (2018)
7. Office, C.: *ITIL Continual Service Improvement*. The Stationary Office, UK (2011)

8. Coiera, E.: Putting the technical back into socio-technical systems research. *Int. J. Med. Inf.* **76**(1), 98–103 (2007)
9. Cronholm, S., Salomonson, N.: Measures that matters: service quality in it service management. *Int. J. Qual. Serv. Sci.* **6**, 60–75 (2014)
10. Eisenhardt, K.: Building theories from case study research. *Acad. Manag. Rev.* **14**, 532–550 (1989)
11. Heikkinen, S., Jäntti, M.: Studying continual service improvement and monitoring the quality of ITSM. In: Piattini, M., Rupino da Cunha, P., García Rodríguez de Guzmán, I., Pérez-Castillo, R. (eds.) *QUATIC 2019. CCIS*, vol. 1010, pp. 193–206. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-29238-6_14
12. Iden, J., Eikebrokk, T.: Implementing it service management: a systematic literature review. *Int. J. Inf. Manag.* **33**, 512–523 (2013)
13. ISO/IEC 20000:1: Information technology - Service management - Part 1: Service management system requirements. Finnish Standard Association (2018)
14. ISO/IEC TS 33074:2020: Information technology – Process assessment – Process capability assessment model for service management. ISO Copyright Office (2020)
15. Jäntti, M., Cater-Steel, A.: Proactive management of it operations to improve it services. *J. Inf. Syst. Technol. Manag.: JISTEM* **14**(2), 191–218 (2017)
16. Jäntti, M., Hotti, V.: Defining the relationships between it service management and it service governance. *Inf. Technol. Manag.* **17**(2), 141–150 (2016)
17. Leavitt, H.J.: Applied organization change in industry: structural, technical and human approaches. In: *New Perspectives in Organization Research*, pp. 55–71 (1964)
18. Lyytinen, K., Mathiassen, L., Ropponen, J.: Attention shaping and software risk - a categorical analysis of four classical risk management approaches. *Inf. Syst. Res.* **9**, 233–255 (1998)
19. Ministry of Social Affairs and Health: Medical devices act (1482/2019) (2019)
20. Obwegeser, N., Nielsen, D.T., Spandet, N.M.: Continual process improvement for ITIL service operations: a lean perspective. *Inf. Syst. Manag.* **36**(2), 141–167 (2019)
21. Runeson, P., Höst, M.: Guidelines for conducting and reporting case study research in software engineering. *Empirical Softw. Eng.* **14**(2), 131–164 (2009)
22. Ruuhilehto, K., Kaila, M., Keistinen, T., Kinnunen, M., Vuorenkoski, L., Wallenius, J.: Haipro-what was learned from patient safety incidents in Finnish health care units in 2007 to 2009? *Duodecim Med. J.* **127**, 1033–1040 (2011)
23. Shrestha, A., Cater-Steel, A., Toleman, M.: Virtualising process assessments to facilitate continual service improvement in it service management. In: *Australasian Conference on Information Systems*, pp. 1–14. Association for Information Systems, AIS, Asia and the Pacific (2015)
24. Tan, W.G., Cater-Steel, A., Toleman, M.: Implementing it service management: a case study focussing on critical success factors. *J. Comput. Inf. Syst.* **50**(2), 1–12 (2009)
25. Yin, R.: *Case Study Research: Design and Methods*, 5th edn. SAGE (2014)