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SANNA HEIKKINEN

Continual Improvement in Information Technology Service Management

Studies on Managing Improvements in
the Context of Continual Service Improvement (CSI)

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Author's address: Sanna Heikkinen
University of Eastern Finland
School of Computing
P.O. Box 1627
70211 KUOPIO, FINLAND
email: smheikki@student.uef.fi

Supervisors: Marko Jäntti, Ph.D.
University of Eastern Finland
School of Computing
P.O. Box 1627
70211 KUOPIO, FINLAND
email: marko.jantti@uef.fi

Professor Markku Tukiainen, Ph.D.
University of Eastern Finland
School of Computing
P.O. Box 111
80101 JOENSUU, FINLAND
email: markku.tukiainen@uef.fi

Reviewers: Professor Pekka Abrahamsson, Ph.D.
Tampere University
Faculty of Information Technology and Communications Sciences
33720 Tampere University, FINLAND
email: pekka.abrahamsson@tuni.fi

Professor Tommi Kärkkäinen, Ph.D.
University of Jyväskylä
Faculty of Information Technology
P.O. Box 35
40014 University of Jyväskylä, FINLAND
email: tommi.karkkainen@jyu.fi

Opponent:

Professor Markku Oivo, Ph.D.
University of Oulu
Empirical Software Engineering in Software, Systems and Services
Faculty of Information Technology and Electrical Engineering
P.O.Box 8000
90014 University of Oulu, FINLAND
email: markku.oivo@oulu.fi

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ABSTRACT

The scope of this thesis is information technology (IT) service providers' continual service improvement (CSI) in the context of information technology service management (ITSM). The implementation of improvements should be part of the daily operations of IT service providers. Improvement frameworks typically involve some type of improvement cycle. In the IT infrastructure library, this cycle is a seven-step improvement process. It describes activities that IT service providers can use to implement continual improvements.

The goal of this thesis is to explore the concept of CSI to better understand how to systematically manage continual improvement. A qualitative research approach was used in this study. The case study was selected as the research method for the thesis. Multiple sources of evidence (e.g. interviews, documents, and observations) from various case organisations were used to study CSI activities.

The main contribution of this thesis involves the identified ITSM challenges in IT service provider organisations, the establishment of an improved CSI model, and viewpoints of implementing CSI. The results might

be particularly useful to quality management teams of IT organisations and managers who lead and manage IT services using ITSM practices.

Keywords: Information technology, IT service management, information technology service, continual service improvement, continual improvement, seven-step improvement process

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Sanna Heikkinen

LIST OF ABBREVIATIONS

BSC	Balanced Scorecard
CMMI	Capability Maturity Model Integration
COBIT	Control Objectives for Information and Related Technology
CSI	Continual Service Improvement
ICT	Information and communication technology
IEC	International Electrotechnical Commission
IMRAD	Introduction, Methods, Results, and Discussion
IMS	Innovation Management System
ISO	International Organization for Standardization
IT	Information technology
ITIL	Information Technology Infrastructure Library
ITSM	IT Service Management
PDCA/PDSA	Plan-Do-Check-Act cycle/Plan-Do-Study-Act cycle
SMS	Service Management System
SSME	Service Science, Management and Engineering

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on data presented in the following articles, referred to by the Roman Numerals I–VI.

I Heikkinen S, Jäntti M. (2012). Identifying IT service management challenges: A case study in two IT service provider companies. In: 23rd International Workshop on Database and Expert Systems Applications. DEXA 2012. pp. 55-59. IEEE Computer Society.

II Jäntti, M., Rout, T., Wen, L., Heikkinen, S., Cater-Steel, A. (2013). Exploring the impact of IT service management process improvement initiatives: A case study approach. In: Software Process Improvement and Capability Determination. SPICE 2013. Communications in Computer and Information Science, Vol 349, pp. 176-187. Springer, Berlin, Heidelberg.

III Heikkinen, S., Jäntti, M. (2012). Establishing a continual service improvement model: A case study. In: Systems, Software and Services Process Improvement. EuroSPI 2012. Communications in Computer and Information Science, Vol 301, pp. 61-72. Springer, Berlin, Heidelberg.

IV Heikkinen, S., Jäntti, M. (2019). Studying continual service improvement and monitoring the quality of ITSM. In: Quality of Information and Communications Technology. QUATIC 2019. Communications in Computer and Information Science, Vol 1010, pp. 193-206. Springer, Cham.

V Heikkinen, S., Jäntti, M., Saranto, K. (2020). Applying continual service improvement practices to study quality of healthcare information system services: A case study. In: Quality of Information and Communications Technology. QUATIC 2020. Communications in

Computer and Information Science, Vol 1266, pp. 155-168. Springer, Cham.

VI Heikkinen, S., Jäntti, M., Tukiainen, M. (2023). Continual service improvement: A systematic literature review. In: Quality of Information and Communications Technology. QUATIC 2023. Communications in Computer and Information Science, Vol 1871, pp. 30–44. Springer, Cham.

The above publications have been included at the end of this thesis, along with their copyright holders' permission.

AUTHOR'S CONTRIBUTION

I) Sanna Heikkinen (90%) was the principal author responsible for defining the research problem, performing the data collection, analysing the data, and managing the writing process. The author wrote the article, while the co-author (10%) commented on and supported the writing process. The paper was presented by the author at the 2012 DEXA conference.

II) The first author (40%) was responsible for conducting the writing process. The second author (10%) contributed to the article with knowledge of ITSM standards. The third (10%) author provided assistance in establishing a visual requirements tree for ISO/IEC 20000 standard for problem management. Sanna Heikkinen (30%) contributed interviews and ITSM trainings. The fifth author (10%) was responsible for reviewing the study and participated in strengthening the theory section.

III) Sanna Heikkinen (90%) was the principal author responsible for defining the research problem, performing the data collection, and data analysis. The paper was written by Sanna Heikkinen and commented on by, and edited together with co-author (10%), who supervised the writing and publication process. The paper was presented by the author at the EuroSPI 2012 conference.

IV) Sanna Heikkinen (90%) was the principal author responsible for defining the research problem, performing the data collection, and data analysis. The paper was written by Sanna Heikkinen and commented on by and edited together with co-author (10%), who supervised the research process.

V) Sanna Heikkinen (90%) was the principal author responsible for defining the research problem, performing the data collection, and data analysis.

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Table of contents

1 Introduction

The success of a business depends more on the good operation of information technology (IT) services, as customers require the functionality, availability, continuity, and security aspects of IT services (Ali & Anwar, 2021). Thus, it is important for IT service providers to continually evaluate and improve IT services and service management processes (Krishnan & Ravindran, 2017). Worldwide, IT service providers have implemented IT service management (ITSM) practices that support their IT departments in working more effectively to achieve the objectives of services or processes. ITSM is a set of roles, responsibilities, and processes to direct and control the IT service provider's activities and resources for the design, transition, operation, and improvement of services to answer customers' service requirements (Shang & Lin, 2010). Several frameworks are available for ITSM, such as the Information Technology Infrastructure Library (ITIL), which includes ITSM practices (AXELOS, 2012). ITIL version 3 consists of multiple phases (service strategy, service design, service transition, service operation, and continual service improvement) to cover the IT service life cycle (AXELOS, 2012; Yamamoto, 2017).

An important phase in evaluating IT services is continual service improvement (CSI), which is an ideology and a cyclic way of improving ITSM (Widianto & Subriadi, 2022). CSI is defined as recurring activities to increase the ability to fulfil service requirements and improve organisational practices (ISO/IEC, 2018). For example, improvements can be related to various targets within ITSM, such as launching a new IT service innovation, updating the content of IT service contracts, increasing ITSM process maturity, implementing new technologies, or increasing the skills of partners and staff with training and communications (Luxembourg Institute of Science and Technology, 2015). The goal of the CSI phase is to align IT services with changing business needs on an ongoing basis by making appropriate improvements through the activities of a seven-step

improvement process (Lloyd et al., 2011a; Widianto & Subriadi, 2022). CSI enables IT service providers a process-oriented way of thinking, with the involvement of all levels of people in the organisational hierarchy (Lamichhane, 2019).

The CSI phase includes a seven-step improvement process with the following activities (Lloyd et al., 2011a): identify the strategy for improvement; define what will be measured; gather the data; process the data; analyse the information and data; present and use the information; and implement the improvement. For example, CSI enables IT service providers to increase the productivity of ITSM by removing process bottlenecks, reducing the number of unplanned service outages, and decreasing service operation and maintenance costs (Shrestha et al., 2014; Krishnan & Ravindran, 2017). This will increase the competitiveness of the IT service provider organisation and increase customer satisfaction with the provided IT services (Krishnan & Ravindran, 2017).

The ISO/IEC 20000-1:2018 Part 1: Service management system requirements for service management standard (clause 10.2) addresses the need for a procedure that describes the following: documenting, evaluating, approving, prioritising, planning, implementing, measuring, and reporting implemented improvements (ISO/IEC, 2018).

1.1 Research motivation

CSI is one of the core elements of ITSM frameworks. However, it is still an emerging research area in service science. Many researchers criticise CSI because of its abstract nature; for example, it does not provide concrete guidelines and evaluation tools to help plan and implement improvement initiatives in real-life practice (Lamichhane, 2019; Lima et al., 2012; Obwegeser et al., 2019). Several studies have focused on resolving IT service provider's specific ITSM process problems. For example, Arisenta et al. (2020) identified change management process maturity and related improvements, and Lineberry (2019) focused on improving knowledge management (KM) practices. In those studies, case organisation's challenges

were analysed to identify the root cause of the problem and then discover how the ITIL processes can be improved. These studies support the search for solutions to identify similar problems, for example, in the improvement of an incident management process. However, through these studies, it is challenging to clarify a systematic and repeatable seven-step improvement process that could be implemented in the IT service provider organisation.

Iden et al. (2020) and Abdelkebir et al. (2017) found that CSI maturity is still low in most firms. According to a CSI study (itSMF Finland, 2014), the biggest obstacles to CSI are low awareness, unclear roles, and poor implementation of CSI practices. Other improvement challenges are related to internal gaps in organisational silos, multiple tools, and lack of improvement process (Baily & Nair, 2021). Additionally, ITIL and ISO/IEC 20000 seem to lack practical and concrete models for implementing ITSM to match IT service providers' needs (Abdelkebir et al., 2017).

Although many IT service organisations are aware of the need for continual improvement, they often struggle with systematic improvement actions (Birch-Jensen et al., 2020; ISO/IEC, 2013; Case, 2009). For example, Birch-Jensen et al. (2020) reported that when the service feedback volume suddenly increased, the organisation in their study appeared to be quite lost, questioning who owns this issue and to whom we should direct this feedback. In addition, customer feedback did not lead to wider analyses or systematic improvements because it was handled in the individual customer relationship (Birch-Jensen et al., 2020). Challenges may also arise when continual improvement is not an inbuilt part of the organisation's daily operations but an activity conducted as a separate task that only comes up in annual or quarterly workshops (itSMF Finland, 2014). In addition, service provider organisations spend a lot of time on reactive improvement actions due to complex IT service systems, and, as a result, often have no time left for proactive actions (Case, 2009).

Existing academic studies have not adequately addressed the structure of CSI in IT service organisations, leaving a research gap that needs to be filled.

1.2 Research questions

The goal of this thesis is to explore the CSI concept to better understand how to manage continual improvement in a more systematic way. The research problem of this thesis is: *How can IT service providers systematically manage continual improvement?* The research problem was divided into four research questions:

1. What challenges are identified related to IT service management from the IT service provider's perspective?
2. What impacts have resulted from the improvement of IT service management processes?
3. How can IT service improvement be transformed into a continual and systematic organisational activity?
4. How can IT service provider organisations implement continual service improvement as part of daily IT service management?

A qualitative research approach was used in this study. The case study research method was selected as the research method for the thesis. Multiple sources of data (e.g. interviews, documents, and participant observation) from various domains were collected to answer the research problem.

1.3 Scope of work

The scope of this thesis is IT service providers' CSI in the context of ITSM. ITIL in the context of ITSM was chosen as the research framework for this thesis because it is widely used in IT provider organisations (ITGI, 2011; itSMF Finland, 2014). A CSI study conducted in Finland (itSMF Finland, 2014) showed that 65% of Finnish IT service providers have implemented an ITIL framework. Hence, ITIL and CSI were chosen for this thesis because IT service providers are familiar with these concepts, and they do not need to implement a new framework for improvement.

The areas studied in this research included service science, process improvement, and service quality management. These areas are related to IT service improvement of IT service solutions (service science), continual improvement of ITSM processes (process improvement), and the goal of high-quality IT services with the participation of customers (service quality management).

1.4 Structure of the thesis

This thesis consists of an introduction section and six original research publications. Chapter 2 describes the theoretical background. Chapter 3 presents the research methodology. Chapter 4 presents a summary of the original research publications (Papers I–VI) and the cross-case conclusion on CSI. The original publications can be found as appendices at the end of this thesis. Chapter 5 discusses the results of this thesis, capturing the main contributions and theoretical and practical implications. Chapter 6 concludes the research by answering the research questions, presenting the limitations of the work, and providing recommendations for future research.

2 Theoretical background

This chapter describes the theoretical background of this thesis. The theoretical background encompasses service science, process improvement, and service quality management (Figure 1). These areas can be seen as related to IT service improvement of IT service solutions (service science), continual improvement of ITSM processes (process improvement), and aiming for high-quality IT services with the participation of customers (service quality management).

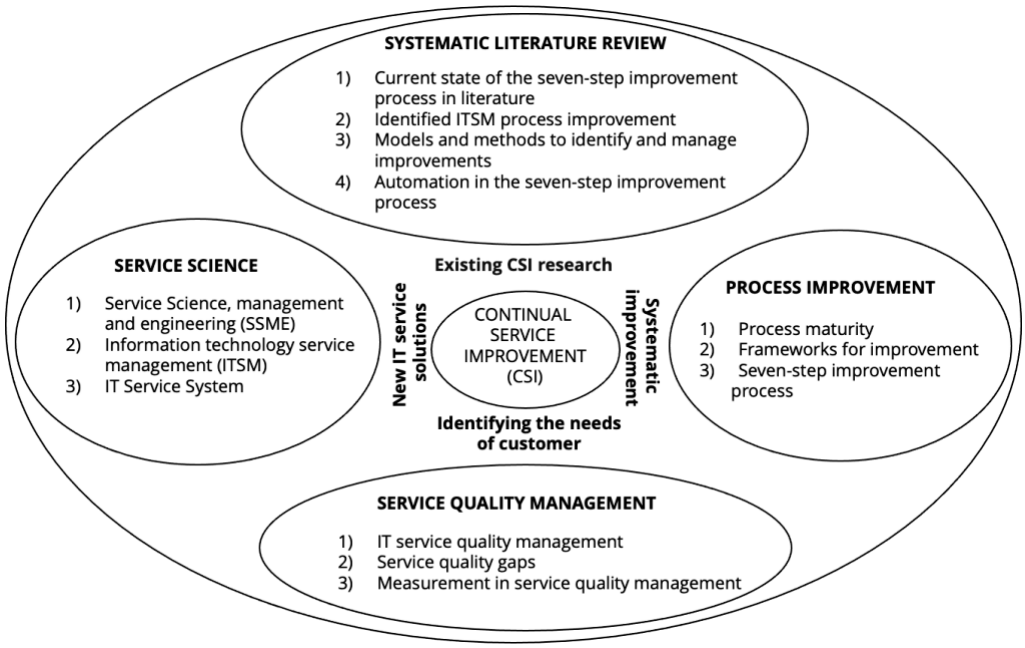

Figure 1. The theoretical background of this thesis

2.1 Systematic literature review

A systematic literature review was conducted to identify relevant research on CSI (Figure 1, Paper VI). For this thesis, the systematic literature review provided a very valuable picture of CSI approaches, frameworks, and challenges and enabled positioning the results of this thesis to existing studies. The following research questions were formulated for the systematic literature review: (1) What is the current state of the seven-step improvement process? (2) What kind of ITSM process improvement has been identified in the literature? (3) How can improvements related to IT services and ITSM processes be identified? (4) What opportunities could automation bring to the seven-step improvement process?

Regarding the first research question of the systematic literature review, "*What is the current state of the seven-step improvement process?*", we focused on studying how CSI and the seven-step improvement process have been studied in the IT service management literature. The results showed that there is a wide variation of improvement frameworks available for improving both IT services and processes. In many studies, the ITSM processes were improved by using other methodologies, such as Six Sigma (Herrera & Van Hillegersberg, 2019) and Lean (Ruostesaari, 2019).

We observed that only a few studies have thoroughly explored CSI concepts. Some CSI-related studies have dealt with a seven-step improvement process and the maturity of CSI (Yamamoto, 2017) and proposed a CSI framework including phases (Kummamuru, 2011). Kirilov and Mitev (2021) proposed a pattern of ITIL integration activities consisting of four stages: assessment of ITSM processes, creating a roadmap for ITIL implementation, managing the transition and evaluation, and CSI. Our review indicates that not much research has been conducted on the CSI phase and its seven-step improvement process, which could be used to systematically improve services. According to previous studies, CSI activities typically rely on unstructured procedures based on weak data (Lamichhane, 2019; Lima et al., 2012; Trinkenreich et al., 2018).

Regarding the second research question—"*What kind of ITSM process improvement have been identified in the literature?*"—we found several studies on ITSM process improvements (Arisenta et al., 2020; Lineberry, 2019; Macías et al., 2018; Ilvarianto & Legowo, 2017; Yuan et al., 2017; Dos Santos et al., 2011; Kajbaf et al., 2011). These articles focused on specific process challenges in which data were analysed to identify the root causes of problems and discover how the ITIL processes could be improved. The literature findings revealed that process improvement has been studied, especially from the perspectives of Lean and Six Sigma methods. Six Sigma refers to a statistical measure to indicate the error within a process (Herrera & Van Hillegersberg, 2019), and Lean can be applied in situations in which the process is already in use but need for improvements (Ruostesaari, 2019). From this point of view, Six Sigma and Lean would have brought a slightly different perspective, focusing more on fixing problems than on creating a process to continually improve service (Ruostesaari, 2019).

The third research question of the literature review, "*How can we identify and manage improvements related to IT services and ITSM processes?*", focused on studying models and practices. Several models and practices were found, such as a pattern of ITIL integration activities (Kirilov & Mitev, 2021), tasks to support ITIL usage (Abdelkebir et al., 2017), and a process maturity assessment (Jaadla & Johansson, 2020). We also noted maturity assessment frameworks, such as a Software-mediated Process Assessment (SMPA) approach (Shrestha et al., 2016), an IT Process Assessment (TIPA) framework (Cortina et al., 2013), a graphical notation to support Enterprise Architecture (EA) (Silva et al., 2015), a practical agile framework for ITSM (Abdelkebir et al., 2017), an IT service quality measurement framework (Cater-Steel & Lepmets, 2014), and a Keys to IT Service Management Excellence Technique (KISMET) model for process improvement (Jäntti, 2012).

The fourth research question of the literature review, "*What opportunities could automation bring to the seven-step improvement process?*", focused on aspects of how to use automation and process visualisation to implement the seven-step improvement process. The following examples were found in the literature: a graphic visualisation of the relationships between

processes and documents (Shiono et al., 2021), documentation and effective process design (Ahmad et al., 2020), an assessment review for automating processes to meet demands of digital services (Krishnan & Ravindran, 2017), a method to analyse Twitter messages (tweets) (Guzman et al., 2017), and an ITIL-based framework for ITSM software selection criteria (Rouhani, 2017). Our results suggest that digitalisation can be used, for example, to increase visualisation of the relationships between processes and documents (Shiono et al., 2021), and to analyse service management records and tweets.

The results of the literature review were tabulated to reflect three viewpoints: highlighting various aspects of improvements, identifying and managing improvements related to IT service and ITSM processes, and improving and automating the seven-step improvement process. Figure 2 summarises the key findings.

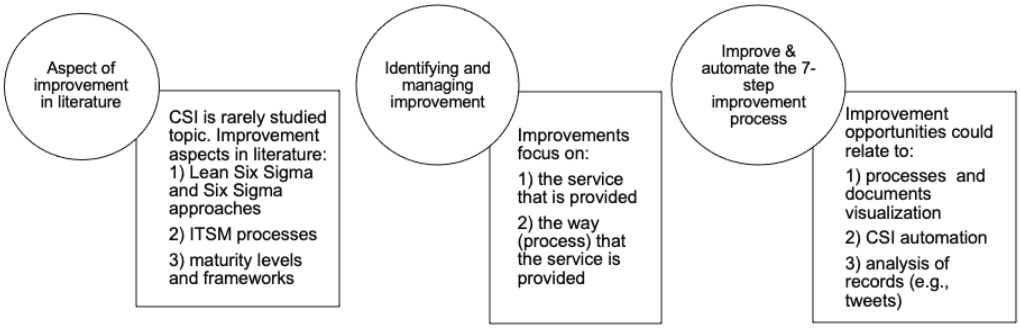

Figure 2. Summary of key findings

Our main finding from the systematic literature review is that CSI-related terminology needs clarification and consistency both in academia and in practice to guide future CSI research in, for example, clarifying the roles and internal practices of CSI and providing a staged approach for continual improvement.

2.2 Service science

IT is the use of computers and consists of, for example, hardware, and software that companies need to transfer, save, and edit data via systems and create platforms for IT services (e.g. communication services, devices services, and connectivity services (Laudon & Laudon, 2011). Customers in different domains (e.g. energy, banking, health care) use information technology in many work tasks. This has led IT to become a vital part of any organisation, supporting the business in many ways to transfer, store, and retrieve data. For example, during workdays, employees might use various specialised software to communicate with colleagues online or check reports on organisation dashboards (Spohrer & Kwan, 2009).

2.2.1 Service science, management, and engineering

Service science is an interdisciplinary approach that includes theories from service, management, and engineering (SSME) with the purpose of improving services (Spohrer & Kwan, 2009). According to Maglio et al. (2006), in SSME, *services* are used to create theories and knowledge about services, *services management* invests to improve the process of creating the service value, and *engineering* is related to the practical problems of producing benefit through creating the knowledge. Service science emphasises service value, service process, service systems, and service competence more broadly, while service management and engineering focus on the analysis, design, modelling, and operation of service (Wang et al., 2010).

There are many definitions of service. A *service* can be defined as "delivering value to customers by facilitating the outcomes that customers want to achieve without the ownership of specific costs and risks" (ISO/IEC, 2018; Cannon et al., 2011). According to von Mises (1998), a service is aimed at or related to adding value through collaboration. Spohrer and Kwan (2009) state that services benefit from more sophisticated forms of cooperation as a value-creation mechanism. Yustianto et al. (2015) stated that services include at least four components: service provider, customer, act of service, and produced benefit. In the act component, a transformative

task is performed by the service provider for the customer, with a certain degree of involvement from the customer. Grönroos (2015) specified three well-established basic features that describe services. The first is the nature of the process. The second feature is interaction with customers and their involvement in finding a solution to the customer's problems. The third feature of the service is that consumption and production occur simultaneously. Wang et al. (2010) stated that a service can be a physical resource, such as software, or a non-physical resource, such as knowledge, skill, or information. The value of an IT service consists of utility—that is, the service's functional requirements and warranty—which indicates the service's availability, continuity, security, and capacity (Galup et al., 2020). Table 1 shows a summary of the features of a service.

Table 1. Features of a service (ISO/IEC, 2018; Cannon et al., 2011; von Mises, 1998; Spohrer & Kwan, 2009; Yustianto et al., 2015; Grönroos, 2015; Wang et al., 2010; Galup et al., 2020)

Feature/ quality dimensions	**Description**	**Example**
Consist of components	Service includes components such as service provider, customer, act of service, and created benefit.	Service provider delivers and enables benefit co-creation by facilitating services that customers want, without the customer having to manage specific costs and risks.
Act of service	Transformative tasks are performed to produce benefit.	Both customer and IT service providers share ideas to find the best service solution.
Value creation	ITIL comprises IT service value consisting of utility and warranty	Utility includes, for example, service functional requirements and warranty, such as

		availability, capacity, continuity, and security.
Interactive	Value is added through collaboration with customer. Service requires the involvement of customers and service providers to find a solution to a customer's problem.	The service based on dialogue in developing services to recognising benefits from the customer's perspective. The customer participates in service interactions, for example, giving feedback to a customer satisfaction survey
Heterogeneous	Services are offered at different levels to suit the needs of different customers.	One customer can be assisted over the phone to solve a problem, whereas another customer will need a technician's personal assistance to solve the same problem
The nature of the process	Set of interrelated or interacting activities that transforms inputs into outputs to create the service for the specific requirements	A service is produced with the combination of processes which includes, for example, work products, tools, roles, and responsibilities of employees
Consumable	As a service consumption and production occur at the same time	A ticket booked for a specific show cannot be used for a different show
Physical/ non-physical resource	A service can be a physical resource such as software or a non-physical resource, such as knowledge, skill, or information	An IT service could be a software which the IT service provider maintain on a monthly fee. Or it could be knowledge of an IT project manager who coordinates projects on behalf of the customer
Intangible	Service is not a tangible object that can be tasted, touched, seen or heard.	Customer requests a new user account at the help desk, but does not receive a physical good

In this thesis, the author uses definitions of service as following: “delivering value for the customer by facilitating results the customer wants to achieve” (ISO/IEC, 2018), and “enabling value co-creation by facilitating outcomes that customers want to achieve, without the customer having to manage specific costs and risks” (AXELOS, 2012).

2.2.2 Information technology service management

Many customers outsource IT services to IT service providers. Instead of struggling with installations and deployment of hardware and software with the high maintenance costs and effort required, customers purchase IT services, which allows them to solely focus on their own tasks. This has shifted IT service providers’ interest from the development of IT applications to the management of IT services (Van Bon, 2007). An *IT service provider* could be defined as an organisation or part of an organisation that manages and delivers IT services (e.g. help desk services, software services, desktop services, server services, hardware services and data network services) to internal or external customers (ISO/IEC, 2011a; Trinkenreich et al., 2018). Internal customers are departments (or other organisational units) of the same IT service provider, while external customers represent other companies (Trinkenreich et al., 2018). For example, an IT service provider can be an IT company whose business is to sell IT services, software development, and software products to other companies (external customers), but it also provides the same IT services internally to its own company (internal customers) (Trinkenreich et al., 2018).

The transformation from a technology-oriented IT department to a customer-focused one has changed how IT and businesses work together to deliver IT services, becoming more service-oriented (Tan et al., 2009; Keel et al., 2007). Traditionally, the IT provider was shaped around the technologies supported. For example, there might be a network team and a workstation team that operate independently with their specific resources, tools, and processes (Keel et al., 2007). These specialised processes and tools may no longer be appropriate (Keel et al., 2007). It is likely that the development of

services will change the internal practices, processes, and structures of IT service providers (Laitinen et al., 2013).

IT service providers have understood that while managing IT as a function is a challenging task, collections of IT services are easier to deliver to customers (Gacenga & Cater-Steel, 2011). A service orientation allows IT service providers to be better aligned with the business objectives of their organisations and to provide services from a customer's perspective (Tan et al., 2009; Hochstein et al., 2005).

Many IT service providers embrace the ITSM and service-oriented approach in managing daily IT operations (Gacenga & Cater-Steel, 2011). *Service management* is a set of capabilities and processes to direct and control the IT service provider's activities and resources for the design, transition, delivery, and improvement of services to fulfil the service requirements (ISO/IEC/IEEE, 2017). *Activities* refer to a set of tasks of a process that consume time and resources and whose performance is necessary to achieve or contribute to the realisation of results (ISO/IEC TR 24766, 2009a). Iden and Eikebrokk (2013) described ITSM as a concept that IT service providers can apply when adopting service management in IT operational activities. The goal of ITSM is to manage the IT services of an IT service provider to guarantee the operational management of IT services, as many vital operations of organisations depend on those services (Adams et al., 2009). To fulfil this purpose, the ITSM needs to be organised by roles, follow transparent practices, and employ appropriate IT professionals (Kemppainen et al., 2012). These goals require a systematic approach from the IT service provider involved in operating the IT services (Kemppainen et al., 2012). According to Keel et al. (2007), ITSM allows customers to view IT technology as a service that the IT service provider is responsible for providing expertise in applying technology to business requirements. This definition of responsibility provides a clear and efficient operating relationship between customers and IT service providers (Keel et al., 2007).

To manage and control management activities, it is essential to put a *service management system* (SMS) in place (Abdelkebir et al., 2017). An SMS helps IT service providers deliver and maintain IT services to their

customers, maximise resources, and improve the quality of IT services and customer satisfaction (Abdelkebir et al., 2017; Shang & Lin, 2010). The SMS should include policies, processes, documentation, and resources required to enable IT services for clients (Abdelkebir et al., 2017). Additionally, ISO 20000 (ISO/IEC, 2018) requires IT service providers to have SMS in place and provide evidence of its results.

To manage SMS, IT service providers may use ITSM software to manage ITSM processes, such as incident management and configuration management (Muni et al., 2017; Nadarajah & Syed, 2016). For example, incident tickets are raised due to different errors occurring in IT services. These incidents need to be resolved to ensure the delivery of uninterrupted services (Muni et al., 2017) and minimise the business impact of incidents (Kubiak & Rass, 2018). Incident records include details on the incident and its resolution using a range of structured fields, such as description, date, and a person responsible for resolving the incident (Muni et al., 2017).

2.2.3 IT service system

The development of IT services such as communication services or network services supports digital contents exchanged over the Internet and thus enables customers to benefit from the advantages of technology (Sugawara, 2017). To meet business needs, IT service providers need an appropriate mix of people, processes, and information technology as a form of an IT service system to design new services or manage the quality of implemented IT services (AXELOS, 2011; Spohrer & Kwan, 2009). A *system* is defined as an integrated set of elements or subsystems to accomplish a defined objective (IEEE, 2022). *A service system* is defined as a dynamic (active, changing, and developing) value co-creation structure of resources, including people, technology, and shared information (Spohrer & Kwan, 2009). Co-creation is goal-oriented cooperation between people (e.g. customers, employees, suppliers) to improve a service or a working practice (Merriam-Webster, 2022).

Information technology creates an infrastructure for IT service systems that can be used, for example, encrypting, and protecting customer data and

locating networks and routing information (Sugawara, 2017). The goal of adding benefits to the lives of IT service users is critical to improving the delivery of existing services and the design of new service (Williams & Radnor, 2022). An IT service provider should define its IT service system through an understanding of the changing service environment, service demand, effective organisation, adaptable, and sustainable processes, and information structure (Wang et al., 2010).

The implementation of new IT services, such as software, involves various hardware and databases that might not be easily applied in the current IT service system. This requires an understanding of a set of specialised IT service provider's resources, such as people and their knowledge and computational resources, to enable value for customers in the form of services (Adams et al., 2009; Spohrer & Kwan, 2009).

According to Hakari (2015), an IT service acts as an enabler of a business service. Therefore, IT services lay the foundation for various types of business services. A *business service* could consist of technical IT services and their IT infrastructure components, which serve as a business outcome (Hakari, 2015). IT services may include software, laptops, local or wireless networks, and databases for the transfer, storage, and retrieval of data.

A wide variety of hardware and software applications running in company networks daily make ITSM complex due to its volume and complexity (Kumbakara, 2008). IT services are directly influenced by a stable or unstable IT infrastructure (Kubiak & Rass, 2018). Complex IT service systems require the work of several specialists and groups to solve IT-related problems. When IT services run at the service operation stage, they need to be continually improved. This drives most IT service providers to spend a significant part of their time just "maintaining the lights" and leaving little time to invest in and take advantage of the innovations that drive the business forward. Figure 3 describes the layers of services and processes of the service provision.

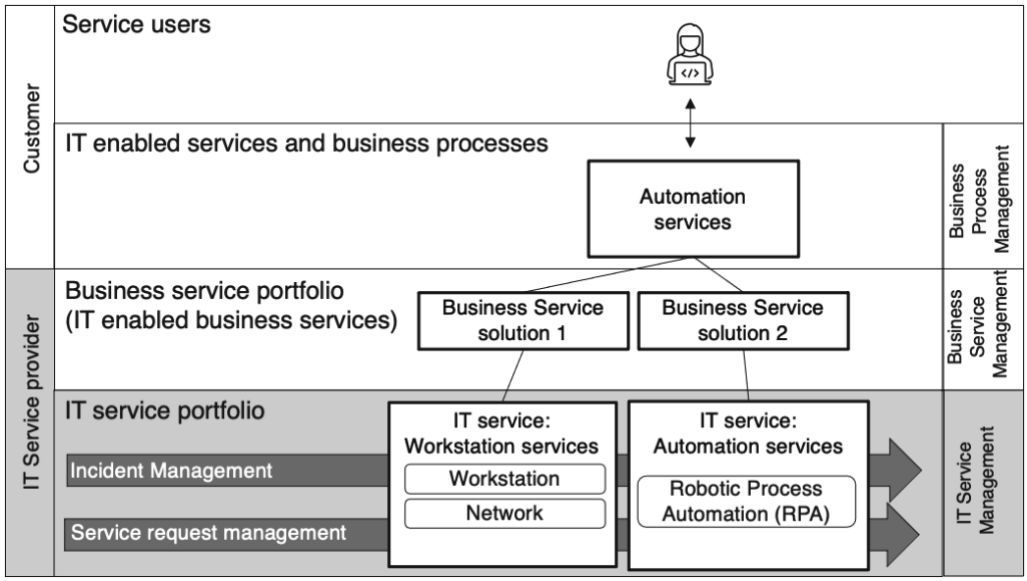

Figure 3. The layers of services and processes of the service provision. Modified from the original (Hakari, 2015)

The goal of service science and service system research is to speed up service innovation, which can reduce costs, improve efficiency, and create value effectively (Wang et al., 2010). Modern technologies, such as robotic process automation, have opened up new opportunities to digitise and automate work processes. It is important to support IT service providers in managing these kinds of new emerging IT opportunities from business and IT service perspectives. To improve the performance of service systems, there is a possibility of increasing service innovation by applying scientific methodology, engineering technologies, and management practices (Wang et al., 2010).

Service computing is a discipline of continual changes in the computing environment, software system architecture, and software development methods (Wu et al., 2014). It aims to implement service-based technology to provide business services more effectively (Wu et al., 2014; Suhardi et al., 2017). The services computing discipline addresses the important role of web services enabling the integration of distributed software via the World Wide Web (Wu et al., 2014).

Zhang et al. (2007) indicated that *service computing systems* consist of components that should be supported by the service model, services computing technology, service architecture, and service optimisation and analysis (Figure 4). The service model describes elements of IT service operation, delivery to the customer, and service capacity. IT architecture is an important component to support the designing and building of the system in cases requiring relevant new technology to improve the performance of IT services. Additionally, optimisation and analysis methods are needed to continually enhance the systems and develop, manage, and improve the system (Zhang et al., 2007; Suhardi et al., 2017).

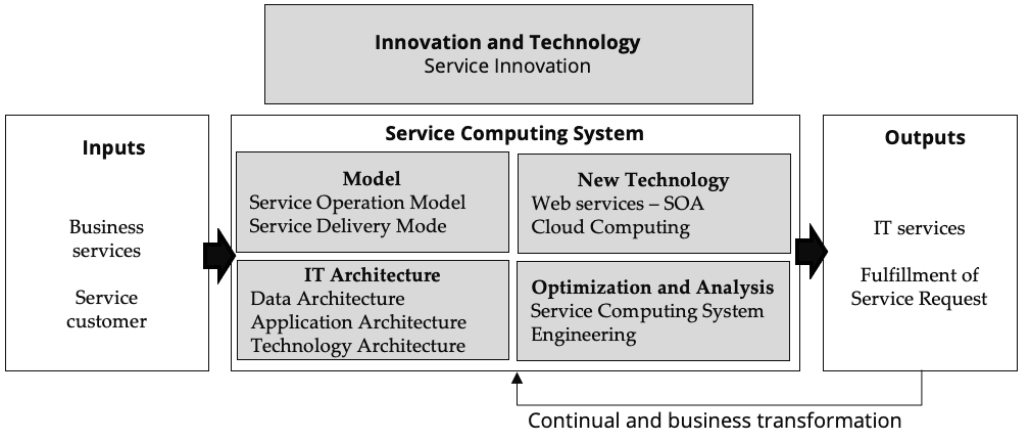

Figure 4. Service computing system. Modified from the original (Suhardi et al., 2017; Zhang et al., 2007)

New technology provides value to IT service providers, with the goal of creating IT services that support business services (Suhardi et al., 2017). Competition in the IT service industry raises the need for constant improvement efforts (Breen et al., 2020). Continual improvement is not a new idea in business (Helman, 2007). When designing scalable and sustainable service systems, the areas of service computing and web services are one of the most relevant fundamental areas of emerging disciplines (Zhang et al., 2007). Identifying new service ideas at an early stage enables the development of the service in the background and the provision when the market is interested in them.

Although IT services are already widely used to support business services, continual improvement is also needed to promptly respond to business needs and IT trends affecting IT service providers' businesses (Suhardi et al., 2017). This requires training of employees and monitoring of the environment. If the service structure is visible and clear, it is possible to identify components or interfaces that could be improved. These changes require IT service providers to continually improve the quality and efficiency of the IT services and the underlying IT infrastructure capabilities, such as automated processing, storage of records, and web technologies (Buco et al., 2012; Wang et al., 2010).

2.3 Process improvement

The transition from a technology-oriented IT department to a customer-oriented IT service provider requires structured internal processes (Hochstein et al., 2005). A *process* is a structured set of activities that transforms inputs into outputs and is designed to accomplish a specific objective (AXELOS, 2011; Van Bon, 2007; ISO/IEC, 2011a). According to Nadarajah and Syed (2016), the difference between a functionally driven organisation and a process-driven organisation is that the functionally driven organisation's goal is to meet its targets, while a process-driven organisation focuses on meeting and satisfying customer needs.

IT services are continually evolving, which requires IT service providers to improve and reorganise their service management processes, such as incident management and request fulfilment. The goal is for internal processes and services to work smoothly and seamlessly together (Ali-Yrkkö et al., 2017). *Improvement* can be defined as the act of making something better or more useful (Merriam-Webster, 2022). In IT services, improvement involves collecting and providing data for service-related decision-making, improving the reporting of IT services and ITSM processes, and implementing cost-effective ITSM practices and models (Tan et al., 2009).

A *continual improvement* encompasses recurring activities targeted at increasing the ability to fulfil a need or service requirement (ISO/IEC, 2018).

According to Gamme and Lodgaard (2019), even though companies have extensive experience with continual improvement methods, they still face challenges in managing them. For example, IT organisations spend a lot of time on reactive improvement actions and, as a result, often have no time left for proactive actions (Case, 2009). Major data breaches can originate from a situation in which a single computer is lost or hacked. This example describes a situation in which IT support personnel are continuously in a reactive mode of maintaining and repairing systems. This is often called "IT firefighting", as employees move from one incident, or "fire", to another to restore users' services (Nicho & Mourad, 2012).

Process management is related to the direction, control, and coordination of work performed to develop a product or perform a service (ISO/IEC/IEEE, 2017). Process management emphasises the systematic use of tools, documentation, and information systems that are important to sharing common practices and standardising and automatising activities (Martinsuo & Blomqvist, 2010; Martin, 2021). A defined process has a process description that is documented and maintained, contributes work products and measures, and contains information on process interfaces to other processes (ISO/IEC, 2015b). Describing and improving the process includes identifying key responsibilities and resources and allocating the work to resources (Martinsuo & Blomqvist, 2010).

The key aspects of process management are goal orientation, systems thinking, customer focus, effective use of feedback in improving operations, and systematic process development for performance improvement (Martinsuo & Blomqvist, 2010). The ITSM framework can be used to shift the IT service provider's focus and practices to service provision (Marrone et al., 2014). In Mesquida et al.'s (2012) study, large and small software companies began implementing a process-oriented culture to address the need for better services. Additionally, Hochstein et al. (2005) have observed benefits of implementing service-oriented IT management, such as (1) client/service orientation and the quality of IT services, (2) efficiency due to standardisation, optimising of processes and process automation, and (3) transparency and comparability through process documentation and

process monitoring. However, performing ITSM is costly (Abdelkebir et al., 2017). Small changes (e.g. maintaining and operating an information infrastructure) in a process can lead to major changes in other management processes within the IT service provider and, eventually, profit (Abdelkebir et al., 2017). In addition, commitment to quality systems could make it difficult to implement changes, as bureaucracy and multiple participants make decisions complex (Gamme & Lodgaard, 2019).

2.3.1 Process maturity

According to Galup and Dattero (2010), IT organisations often lack a process definition and structured process flows, periodical process reviews, and efforts to carry out continual improvement activities. Expected IT service impacts are not achieved if the performance of the processes is often chaotic (Barafort et al., 2009).

Process maturity is an indication of how an IT service provider consistently implements processes within a defined scope that contributes to the achievement of its business needs (IEEE, 2022). If the maturity of the process is low, it will not meet its main objectives and thus will not be able to fully support other processes. Increasing process maturity should be a constant objective for an IT service provider (Office of Government Commerce (OGC), 2007). This systematic work helps IT service providers provide services of high quality and well-performing ITSM processes (Barafort et al., 2009). From an improvement perspective, an analysis of the current state of processes could be used to identify weaknesses and bottlenecks (Sommerville, 2011).

Maturity models help IT service providers identify the strengths and weaknesses of their processes and thus continually improve them to ensure the smooth flow of activities (Barafort et al., 2009). Many IT organisations have adopted process assessment techniques to conduct a systematic measurement of processes (Lloyd et al., 2011a). Jaadla and Johansson (2020) stated that the assessment of process maturity is commonly used as the starting point to identify improvements that would be the most beneficial to perform.

Various maturity models are available, such as the Capability Maturity Model Integration (CMMI) (Van Haren Publishing, 2017), CMMI for Services (CMMI-SVC) (Software Engineering Institute, 2010), Tudor's ITSM Process Assessment (Luxembourg Institute of Science and Technology, 2015), and ISO/IEC 15504-8 (Barafort et al., 2009; ISO/IEC, 2012a). CMMI aims to define a set of processes and a set of assessment levels in order to easily identify the level of achievement for every process (Rubio & Camazon, 2018). CMMI-SVC provides guidance for applying CMMI best practices in a service provider organisation (Software Engineering Institute, 2010) and 24 process areas for developing and improving mature service practices that contribute to service provider performance and customer satisfaction (Software Engineering Institute, 2010). Tudor's ITSM Process Assessment (TIPA) is a framework for assessing the ITSM process maturity levels of service providers related to the ISO/IEC 15504-8 Process Assessment Standard (Barafort et al., 2009; ISO/IEC, 2012a). Process maturity is assessed in TIPA with five maturity levels (0 = incomplete process to 5 = optimising process) (Luxembourg Institute of Science and Technology, 2015). The goal of the TIPA framework is to provide a measurement framework for ITSM processes, for example, a seven-step improvement process (Barafort et al., 2009).

According to the TIPA framework (Luxembourg Institute of Science and Technology, 2015), the seven-step improvement process maturity level is at 0 (incomplete) if the IT service provider cannot verify that it has implemented the activities of the seven-step improvement process (identify the strategy for improvement, define what needs to be measured, gather the data, process the data, analyse the information and data, present and use the information, and implement the improvements). If process maturity is at the 0 level (incomplete), the following challenges may be encountered (Luxembourg Institute of Science and Technology, 2015):

- The performance of the seven-step improvement process is often chaotic, and the expected results are not achieved.

- The seven-step improvement process is not implemented or does not meet its main objectives, such as improvements in quality, value, capability, cost, productivity, resource utilisation, and risk reduction.
- There is little or no evidence showing that the purpose of the seven-step improvement process is systematically satisfied.

According to TIPA (Luxembourg Institute of Science and Technology, 2015) to achieve maturity level 1 (performed process) for the seven-step improvement process, the IT service provider organisation should verify some tangible evidence from the seven-step improvement process activities. For example, outputs from performed activities, such as service improvement plans, are identified, service measurements are performed, reports are produced, and the CSI register is in place.

Process maturity is at level 2 (managed process) when the IT service provider has implemented and managed the seven-step improvement process activities:

- Process performance management: Process has purpose and goals, process is monitored, roles are identified and introduced to the organisation, and interfaces to other processes are identified.
- Work product management: Process documents are appropriate. For example, process templates are produced, versioning is in place, employees know how to use templates and process tools, and process activities are frequently reviewed.

On level 3 (established process), the IT service provider needs to verify, for example, the following (Luxembourg Institute of Science and Technology, 2015):

- The seven-step improvement process description document supports the deployment of a standard process.
- A diagram describes relationships with other processes.
- Roles and competencies for performing the process are identified.
- Tools supporting the performance of the process are available.
- Mechanisms to monitor the efficiency and suitability of the process across the organisation are in place.

- Reports are produced based on business requirements.

As a result of successful implementation of the seven-step improvement process, the IT service providers are able to (1) perform monitoring and reporting of services and processes throughout all lifecycle stages; (2) identify opportunities for service improvements. These opportunities may include improvements of organisational structures, processes, resourcing capabilities, partners, technology, staff skills, training, and communications; (3) maintain services that remain continuously aligned to business needs; (4) improve service quality gradually and continually; and (5) control and gradually improve the cost effectiveness of services (Luxembourg Institute of Science and Technology, 2015).

2.3.2 Frameworks for improvement

To make IT operations more effective, IT service providers are turning to frameworks and standards in the field of ITSM (IT Governance Institute, 2007). A f*ramework* can be defined as a simple logical structure for classifying and organising a descriptive representation of a service provider (Whitman et al., 2001). The framework is significant for the managers for review, direct, and for the development of the organisation and its service management system (MacLean & Titah, 2023).

There are several frameworks to bring structure on improvement goals in IT service provider organisations. Depending on the target for improvement, IT service providers can choose a framework that applies actions to achieve comprehensive improvement. The Global Status Reports (ITGI, 2011; Forbes Insights, 2017) highlight that ITIL is the most frequently mentioned framework used by IT organisations. Other frameworks are Six Sigma (15.1%), COBIT (12.9%), and CMMI (9.3%) (ITGI, 2011). According to itSMF Finland (2014), 65% of Finnish IT service providers have implemented an ITIL framework.

Many IT service providers have implemented the ITSM framework using the methods and best practices of ITIL (Shrestha et al., 2014). *Best practice* is defined as a way of working (process, technique, method, activity) that is believed by multiple organisations to be the most effective (best results) and

efficient (least amount of effort) way of performing a task (Cannon et al., 2011; AXELOS, 2019). Eikebrokk and Iden (2016) showed that ITIL is a management tool for influencing behaviour in service orientation, and it can be used to strengthen the IT service climate directly and indirectly through process management. ITIL deals with the organisational structure, competence requirements and transparency of IT processes (Proehl et al., 2013; Shang & Lin, 2010).

ITIL version 3 approaches ITSM from the perspective of the IT service lifecycle, with every life cycle phase including processes that IT organisations may use while implementing and managing an effective framework for ITSM (Shang & Lin, 2010). These processes (e.g. description of activities, policies, roles, work instructions, and metrics) address the organisation structure and skill requirements of the IT organisation (Hochstein et al., 2005). The ITIL 4 framework was released in 2019 to provide a practical and flexible basis supporting a wide range of organisations on their journey of digital transformation in the modern service economy (Beadle, 2018). Continual improvement is a key element of value creation, as CSI aims to structure resources and operations (AXELOS, 2019).

Potgieter et al. (2005) observed that both customer satisfaction and operational performance improved as the use of ITIL-based activities increased. Further, the benefits of ITSM adoption include less downtime, which causes less suffering in the form of operational disruption (e.g. errors in service) and loss of productive hours (Kabachinski, 2011). According to Nicho and Mourad (2012), ITIL emerges as a preferred tool for ITSM to shift the organisation's reactive mode from the so-called "IT firefighting" processes to a proactive mode of ITSM.

CSI is one of the phases of the ITSM lifecycle. The CSI phase ensures that when the service is in the production environment, the IT service provider has practices in place to check the performance and quality of the service and processes to continually identify goal-based actions on how to improve them (Lloyd et al., 2011a).

Process improvement frameworks typically involve some type of improvement cycle. In ITIL version 3, this cycle is a seven-step improvement

process. It describes activities that IT service providers can use to implement continual improvement (Lloyd et al., 2011a). The purpose of the seven-step improvement process is to identify opportunities for improving services, processes, and tools to reduce the cost of providing services and ensure that IT services enable the required business outcome to be achieved (Lloyd et al., 2011a). The seven steps are as follows (Lloyd et al., 2011a):

1. Identify a strategy for improvement. Choose areas of improvement, such as service strategy or operational performance, and implement decision-making and management based on them.
2. Define what you will measure. Continual improvement is a recurring activity that focuses on targets that are measured and thus enhances measurable results.
3. Gather the data. Data (qualitative and qualitative) can be gathered from different aspects (e.g. from viewpoints of a balanced scorecard), various times in the year, in numerous roles, and with many tools.
4. Process the data. The raw data are organised using different tools that enable data to be transformed into information.
5. Analyse the information and data. Analysed data allows for answering questions about what, when, where, and how, as well as trends and the impact of actions.
6. Present and use the information. The analysed data are shared with stakeholders, presenting them an accurate picture of the results of measurements.
7. Implement the improvement. At this point, stakeholders have identified areas that need to be improved. For example, the implementation of improvement could be done using goal-oriented improvement action (e.g. corrective actions) to quality issues or answering negative complaints.

According to Yamatomo (2017), there are some critical problems in introducing ITIL practices, such as ITIL assuming the Plan-Do-Check-Act (PDCA) cycle to continuously improve service management operations. The PDCA cycle starts in the planning phase. However, it is difficult to develop a

plan for improving service operations without a clear understanding of current service operations (Yamamoto, 2017).

Several process frameworks are available for process improvement, such as Six Sigma and Lean IT, which are based on process analysis and improvement with the elimination of waste on product delivery. *Six Sigma* is a data-driven process improvement approach that supports continual improvement, focusing on reducing process variation using statistical measures (Lloyd et al., 2011a). It uses process analysis to provide a product in a 'quality gap' expected by the customer and the company. This allows the company to limit variations and defects in the process (Lloyd et al., 2011a). Lean IT (Van Haren Publishing, 2017) focuses on identifying the elimination of waste in the context of IT process improvement. Waste is defined as something that adds no value to a service.

DevOps is a software development framework that combines software development with information technology operations, focusing on shortening the system's development process (Ebert et al., 2016). The first three letters of *DevOps* come from the word "development" and the abbreviation "ops" from the word "operations" (Abdelkebir et al., 2017). In DevOps, the designing, testing, and releasing of software takes place quickly by using automated tasks. This emphasises the close collaboration between the roles of software development in creating fast feedback loops from delivery and supporting software development (AXELOS, 2019). For example, DevOps improves the maintenance of software versions and reduces development and maintenance costs (Toivanen, 2023).

Scrum is a process framework for software development that focuses on iteratively evaluating, refining, and ensuring regular delivery of new software product versions of the development teams (Agh & Ramsin, 2021). Scrum helps people, teams, and organisations generate value through adaptive solutions for complex problems. The fundamental unit of Scrum is a small team of people consisting of a product owner, a Scrum master, and developers. A product owner orders the work for a need, and after that, the developers work in short sprints to develop a solution for a problem (Schwaber & Sutherland, 2020). For example, due to a change in the law, a

new service feature needs to be added to the software. The feature can be designed and implemented using Scrum methods, which enable more visible work progress and, thus, interaction with customers.

From a governance perspective, IT service providers could implement IT framework, such as Control Objectives for Information and related Technology (COBIT) (IT Governance Institute, 2007). *COBIT* is a governance framework for harmonisation of existing IT standards and practices and an evaluation tool for establishing IT governance processes and assessing internal controls (IT Governance Institute, 2007; Lloyd et al., 2011a). It focuses on strategic alignment with business and IT plans, IT, value delivery, resource management, risk management, and performance measurement (IT Governance Institute, 2007). The Plan and Organise (PO) domain of COBIT provides direction for service delivery, for example, ensuring continuous and measurable improvement of the quality of IT services delivered (PO8: Manage quality) (IT Governance Institute, 2007). The Monitor and Evaluate (ME) IT performance domain of COBIT covers monitoring and reporting process metrics and identifying and implementing performance improvement actions (IT Governance Institute, 2007).

2.3.3 Standards for improvement

To increase the quality management of IT services, IT service providers may certify their service management practice based on ISO/IEC 20000 standard (ISO/IEC, 2018) for management systems. The standard has been introduced to IT-related fields, such as financing, business process outsourcing, and public services, and has produced positive effects (Park & Kim, 2012).

ISO/IEC 20000-1:2018 standard for service management Part 1 (Figure 5) presents requirements for establishing, implementing, maintaining, and continually improving an SMS. An SMS supports the management of the leadership, planning, support of the SMS, operation of SMS, performance, and improvement of services, which meet agreed requirements and deliver value for customers, users, and the organisation delivering the services (ISO/IEC, 2018).

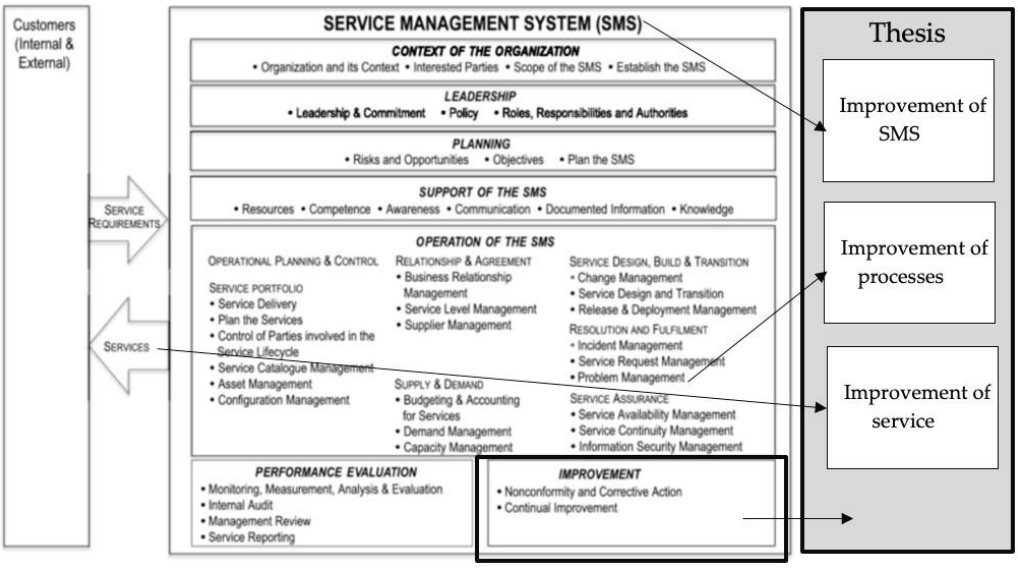

Figure 5. The role of Improvement in the Service Management System (SMS). Modified from the original (ISO/IEC, 2018)

ISO/IEC 20000-1:2018 standard for service management (clause 10.2) addresses the need for continual improvement, which includes a documented procedure that defines the authorities and responsibilities for following identifying, documenting, evaluating, approving, prioritising, managing, measuring, and reporting improvements (ISO/IEC, 2018).

IT service providers can certificate with ISO/IEC 38500, which is an international standard for the governance of IT for the organisation (ISO/IEC, 2015). It provides principles and definitions for good governance of IT, to assist governing bodies (e.g. owners, managers, partners, executive management) to understand and fulfil the legal and regulatory obligations of an organisation's use of IT efficiently, and acceptably (ISO/IEC, 2015). The standard provides guidance to improve the performance of enterprise governance, identify and minimise IT risks, and properly manage IT investments.

Worldwide, IT organisations have also implemented quality management systems, such as ISO/IEC 9001 to support IT departments in working more effectively and gain transparency as well as targets for monitoring. The ISO

9001 quality management standard (ISO/IEC, 2015a) includes principles related to a customer focus, the implications of top management, the process approach, and continual improvement (ISO/IEC, 2015a). It considers an IT service provider's activities as chains of interlinked processes within a loop (To et al., 2018):

- Management responsibility refers to leadership that places customer requirements as the key point of the organisational objective (customer focus).
- Resource management covers the engagement of people and mutually beneficial supplier relationships (relationship management).
- Product/service realisation covers process approach and evidence-based decision making and turns customer requirements and organisational resources to products/services.
- Measurement, analysis, and improvement use quality assurance tools to analyse customer satisfaction levels. The results are utilised by management to evaluate staff and internal results, leading to continual improvement.

IT service providers might need new, innovative service aspects. In this regard, the CEN/TS 16555 Innovation Management (CEN, 2013; Finnish Standards Association, 2017) provides guidelines on establishing and maintaining an innovation management system (IMS). It provides guidance for identifying innovation-driving factors, developing the innovation management process, evaluating and improving the performance of the innovation management system, and understanding and using innovation management techniques (CEN, 2013).

In an ever-changing world, IT service providers must deal with uncertainty on a daily basis. How an organisation identifies and deals with uncertainty and potential risks influences its success. The ISO 31000 risk management standard helps an IT service provider identify, evaluate, and address the impact of risk on achieving organisational goals (ISO/IEC, 2009). As ITSM involves the management and evaluation of service-related risk (especially

in Continuity Management), the ISO/IEC 31000 (ISO/IEC, 2009) may be used to strengthen these risk management practices.

In the aspect of information technology, it is important to pay attention to information security. ISO/IEC 27001 is a standard for information security management that specifies the requirements for establishing, implementing, maintaining, and continually improving an information security management system within the context of the organisation (ISO/IEC, 2022). It provides an approach to security information assets, such as digital information, paper documents, computers and computer networks, and the know-how of individual employees (ISO/IEC, 2022). With ISO 27001, IT service providers identify improvements related to protecting systems and data that are vulnerable to a wide range of outside hackers.

2.4 Service quality management

The quality of the provided IT services plays an important role in today's service business, where IT-related incidents (especially security incidents) can quickly decrease the IT service provider's competitiveness (Rubio & Camazon, 2018; Forrester Consulting, 2012). For example, an unmanaged technical change can cause business downtime and prevent customers from accessing or purchasing a service provider's online services. This may cause a significant decrease in customer satisfaction, and the incident may reduce the productivity of the IT service provider's employees (Forrester Consulting, 2012).

2.4.1 IT service quality management

Quality can be defined as the "ability of a product, service, system, component, or process to meet customer or user needs, expectations, or requirements" (ISO/IEC/IEEE, 2017). *Service quality* can be related to the consistency between consumers' perceptions of services offered by a particular firm and their expectations about firms offering such services" (Parasuraman et al., 1985). Service refers to the essential features of a system, while quality refers to the use of mainly a user-based approach (Ali

& Anwar, 2021). According to Ali and Anwar (2021), service quality refers to the value of the service to the customer. Lewis and Booms (1983) defined service quality as a measure of how well the service level delivered matches customer expectations, with delivering quality service involving conforming to customer expectations on a consistent basis.

Service quality management refers to coordinated activities to direct and control an organisation's service to meet customer needs, expectations, or requirements, and thus provides value (IEEE, 2022). Its purpose is to increase the quality of the delivered service to meet the expectations of customers. Service quality management encompasses the monitoring and maintenance of the various services offered to customers by an IT service provider. To ensure that IT service is performed in a manner consistent with the organisation's policies, goals, and standards, IT service providers need employees and tools to create value to the customer with a chain of process activities (Martinsuo & Blomqvist, 2010) (ISO/IEC/IEEE, 2017).

However, determining quality is challenging because people have their own conceptions of the quality of services. Sometimes, these perceptual differences exist between IT service providers and customers, and differences can exist between two employees working for the same service provider (Foster & Gallup, 2002). Thus, different IT service provider's functions within the same organisation can perceive the needs of the customer very differently: developers view software features as important, marketing views timeliness in responding to the needs of the customer as important, and accounting sees the need to provide an adequate software or service at a cost that will satisfy the customer and provide a profit to the organisation (Foster & Gallup, 2002).

Quality is co-created in an interaction between customers and providers; thus, customers' processes need to be understood continuously (Grönroos, 2011). IT service providers need continual management efforts to promote, inspect, plan, and implement actions in the management system to ensure compliance with regulations, effective planning of resource operations, and seamless communication (Park & Kim, 2012). To assess and improve service quality, IT service providers need to evaluate service-related processes and

monitor goal achievement, such as service levels (Trinkenreich et al., 2018). Service quality can be understood as a measure of how well a service level meets customers' requirements and expectations. *Service levels* can be defined as "one or more metrics that define expected or achieved service quality" (AXELOS, 2019). Availability, capacity, performance, security, confidentiality, scalability, and adaptability are examples of quality attributes (ISO/IEC, 2011a).

Service level management (SLM) is a process of the service design lifecycle phase in ITIL v3. The purpose of the SLM process is to negotiate and document SLM agreements with appropriate stakeholders, and to monitor and produce reports to follow these agreements (Hunnbeck et al., 2011). SLM aims to support and enhance the quality of IT services to control and report on the accomplishments of IT services (Abdelkebir et al., 2017; AXELOS, 2016).

The intangibility of services makes it difficult to understand how customers perceive and evaluate service quality (Trinkenreich et al., 2018). *Service level agreements* (SLA) are contracts usually signed between the IT service provider and the customer to clearly define quality service attributes and acceptance criteria for the service (Trinkenreich et al., 2018). CSI has a strong participation in the SLM process to review and analyse accomplishment reports. Additionally, ISO/IEC 20000-part 1 standard (ISO/IEC, 2018) requires the results of the process monitoring to be recorded and reviewed to identify causes, nonconformities, and opportunities for improvement.

2.4.2 Service quality gaps

The IT service provider's functions enable value to be generated for the customer to experience the quality of service in the service encounter (Parasuraman et al., 1985; Grönroos & Tillman, 2009). Parasuraman et al. (1985) identified five gaps that may cause customers to experience poor service quality (Figure 6)—that is, the lack between customer expectations and the actual services provided at different stages of service delivery. The service quality gaps are as follows (Parasuraman et al., 1985):

- Gap 1: Customer expectation–management perception gap. In this gap, the IT service provider is in a situation in which their views on quality and service do not match those of customers. For example, customers want different things from the service, which the IT service provider has decided not to invest in.
- Gap 2: Management perception–service quality specification gap. The service meets the quality requirements of customers, but no standard or similarity has been established for the quality of the service. For example, customers do not get the service they want in the end, as it can change depending on the IT service providers.
- Gap 3: Service quality specification–service delivery gap. This gap arises when part of a service delivery is inconsistent with a service quality requirement. For example, this may be due to poor employee training, missing or difficult instructions, or employee's reluctance to do their jobs in a quality manner.
- Gap 4: Service delivery–external communication gap. The assumptions and images created in marketing communications about the service may not match the service itself. For example, IT service providers lack marketing communications due to a failure to correctly present the service or its quality.
- Gap 5: Expected service–perceived service gap. The quality of the service has not met the customer's expectations, which creates a gap between the perceived and expected service experiences. For example, the customer assumes that the service is uninterrupted, but incidents occur in the IT service.

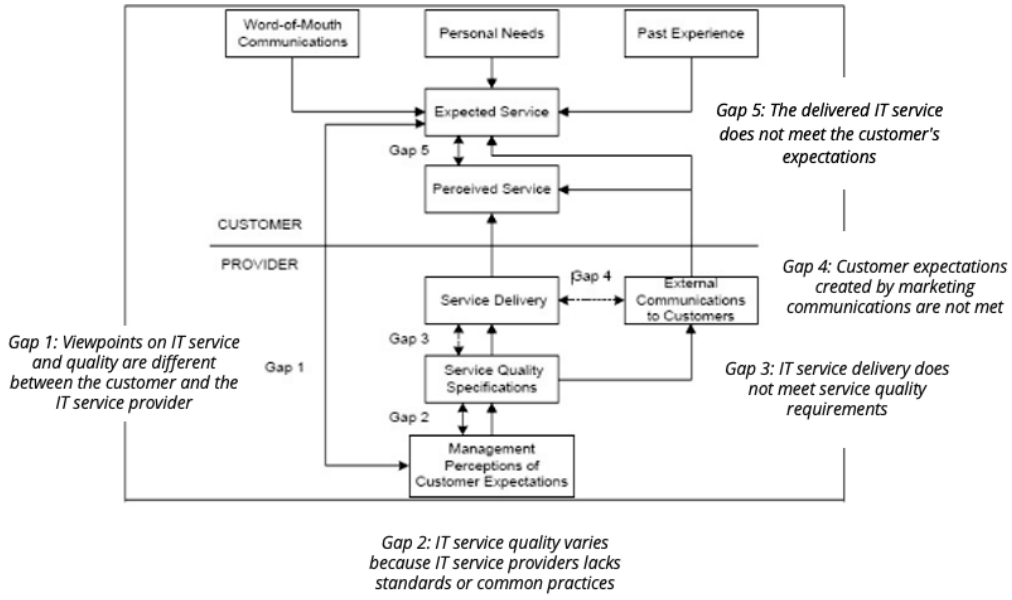

Figure 6. Applying the service quality model to CSI research. Modified from original (Parasuraman et al., 1985)

For IT employees, it may be difficult to design, implement, operate, and maintain IT service appropriately without strong organisational, managerial, and IT technological support (Kemppainen et al., 2012). IT service providers should understand the role of organisational support as a key factor in improving the IT services of that organisation (Kemppainen et al., 2012).

2.4.3 Measurements in service quality management

The main benefit of CSI for service quality management is that it provides information on service quality problems through various management processes, such as incident management and problem management (Lloyd et al., 2011a). In addition, CSI collects customer feedback that provides information on customers' future needs regarding service needs.

Metrics can provide evidence of the achievement of requirements and the successful delivery of expected outcomes (McWhirter & Gaughan, 2012). IT service and process measurement play an important role in quality management. However, many service providers still consider this a difficult

task (Lahtela et al., 2010). In Lahtela et al.'s (2010) study, measurement-related difficulties included a lack of a structured measurement approach, tools that did not enable effective measurement, a lack of practical examples in standards or frameworks, and difficulties in identifying the inputs of measurement because there are numerous targets to measure in quality.

Cronholm and Salomonson (2014) claimed that ITSM frameworks (e.g. CMMI, COBIT, and ITIL) suggest measurement mainly from a service provider perspective and do not focus on how customers perceive service quality (Cronholm & Salomonson, 2014). Sliep and Marnewick (2020) reported the difficulty of defining and measuring good-quality services. Ferreira and Otley (2009) stated that many management processes operate horizontally rather than vertically when these processes typically need non-financial measures. However, the literature seems to concentrate on vertical measures rather than those that follow processes or value creation (Ferreira & Otley, 2009). According to Kaplan and Norton (1992), most existing performance measurement systems have been designed by financial experts from finance departments, who do not need to heavily emphasise management aspects.

The customer's quality experience is particularly affected by dealing with the service provider's resources and practices. Since the quality of the service usually becomes apparent to the customer during a service encounter, employee performance is an essential part (Parasuraman et al., 1985). The quality of the service is thus highly dependent on the performance of the employees, which is not manageable by the organisation in the same way as the factors affecting the quality of the products (Parasuraman et al., 1985). Dos Santos et al. (2011) stated that in ITSM, many process tasks are performed by humans, rather than machines, and this introduces significant variability in the outcome. For example, an employee may execute the same process task in a different way each time, use a different sequence of steps, or be interrupted a number of times by external factors, such as an email or a telephone call. Due to its unpredictable nature, human behaviour and performance are much harder to model and optimise (Dos Santos et al., 2011). Hence, defining tight

performance goals in a human-staffed organisation is far more difficult than in a process executed by a machine (Dos Santos et al., 2011).

As organisations may possess various tools that process or store data, it is easy to feel overwhelmed by the massive amount of available information (McWhirter & Gaughan, 2012). Finding time to develop and document metrics, implement and manage the tools used for measuring, and create reports are challenging tasks, and as a result, there is also a risk that these remain low-priority improvement targets (McWhirter and Gaughan, 2012).

As a solution, an IT service provider could create a measurement framework that contains measurements for the entire ITSM, such as the areas of IT service quality, information systems quality, process performance, customer satisfaction, service behaviour, and IT service value (Cater-Steel & Lepmets, 2014). The framework would clarify measurable elements, providing information about the selection of services that service providers could improve (Cater-Steel & Lepmets, 2014). Using multiple metrics provides a better understanding of situations and can inform better decision-making on the actions (McWhirter & Gaughan, 2012).

According to Gacenga et al.'s (2011a) survey results, the balanced scorecard (BSC) (19%) was the most popular performance measurement framework used by itSMF members in Australia. The second largest number (45%) of members selected "do not know" and "not applicable" for the same question (Gacenga et al., 2011a). The BSC presents measurements from four different perspectives: financial, customer, internal process and innovation, and organisational learning perspectives (Kaplan & Norton, 1992). This enhances defining metrics that cover different areas and ensures that there is a suitable balance of metrics (AXELOS, 2016). Gacenga et al. (2011a) found a lack of ITSM process measurements from the BSC financial perspective.

Cross and King (2010) presented a model for describing categories (Table 2) that could be used to support the prioritisation of improvement ideas. Each category is assigned a score on a sliding scale of 1–5. The larger the value of the score, the more useful the implementation.

Table 2. Prioritisation scale for improvements. Modified from original (Cross & King, 2010)

Benefits to business	**1** No financial return	**2** >€ 1K	**3** >€ 5K	**4** >€ 50K	**5** >€ 100K
Impact on business	**1** Individual	**2** Teams	**3** Business unit	**4** Multiple units	**5** Whole company
Time to implement	**1** 1 year	**2** 12 months	**3** 6 months	**4** 1 month	**5** 1 week
Resources required	**1** Multiple departments	**2** Business unit	**3** Customers	**4** IT teams	**5** Individual
Customers	**1** None	**2** 50	**3** 100	**4** 500	**5** 1000

The selected improvements should be implemented using a structured actions because they are different in terms of complexity and realisable benefits (Kummamuru, 2011). IT organisations may use three types of quality management improvement actions presented (ISO/IEC, 2018; Tényi et al., 2013): (1) corrective actions (e.g. responding to nonconformities such as conducting a risk analysis for software) to correct detected nonconformities, (2) preventive actions (e.g. testing and user training) to avoid eliminating nonconformities beforehand, and (3) improvement initiatives (recurring activities to increase performance).

3 Research methodology

This chapter introduces the research methodology of this thesis, research methods, data collection methods, and the methods of data analysis.

3.1 Research problem and questions

Through discussions with the supervisors of the thesis, a preliminary analysis of the ITSM literature, and several CSI-related meetings with IT service provider companies in the KISMET project, the following research problem was defined: *How can IT service providers systematically manage continual service improvement?* The research problem was further divided into the following research questions:

1. What challenges are identified related to IT service management from the IT service provider's perspective?
2. What impacts have resulted from the improvement of IT service management processes?
3. How can IT service improvement be transformed into a continual and systematic organisational activity?
4. How can IT service provider organisations implement continual service improvement as part of daily IT service management?

The goal of this thesis is to explore the concept of CSI to better understand how to manage continual improvement in a more systematic way. The CSI activities of the seven-step improvement process (Lloyd et al., 2011a) provided a good starting point for CSI-related research. Additionally, the organisation where the author was working was using the ITSM process and provided a fruitful playground for validating the results in practice.

3.2 Research methods

Research methodology refers to ways of collecting, organising, and analysing qualitative or quantitative data to answer the research problem. *Qualitative research* seeks to understand the phenomenon. This means that the phenomenon under study and the factors affecting it are not known (Kananen, 2017). Hence, qualitative research aims to explore the phenomenon. In *quantitative research*, knowledge of a phenomenon comes through theories and models that explain the phenomenon, which requires knowledge of the phenomenon and the factors affecting it (Kananen, 2017; Eriksson and Kovalainen, 2008).

In this thesis, the researcher worked closely with IT service providers and collected data to understand the CSI phenomenon of the research problem. The research took place in the natural environment when the researcher explored case organisations' CSI practices at Keys to IT Service Management and Effective Transition of Services (KISMET) project as a researcher at the University of Eastern Finland's (2011–2014). Additionally, the research achieved a more practical focus when the author of this thesis started working in an IT service provider organisation as a personnel responsible for providing valuable insights on introducing CSI activities to employees (2016–2019). Qualitative research enables conducting the research in a natural context (environment) where the material is collected from the relevant interacting entities, and the goal is a holistic view of the phenomenon under study (Kananen, 2017; Creswell, 2007). Therefore, a qualitative research methodology was selected for this research.

In this thesis, a case study method was used as a research method (Papers I–V). According to Yin (2014), a *case study* research method is an empirical study that investigates a contemporary phenomenon within its real-life context. The aim of the case study is to obtain a deep and diverse picture of the phenomenon under study (Kananen, 2017). In this thesis, the phenomenon of interest was CSI and its seven-step improvement process. The real-life context for CSI research was ITSM performed by IT service providers.

The case study method fits the present research because it can be used to increase knowledge about CSI from a holistic and real-world perspective. The case study method was used in this thesis for exploratory purposes. Additionally, the research method can also be used for explanatory and descriptive purposes (Yin, 2014). *Exploratory research* aims to enter a research area that is little-known (Yin, 2014). The exploratory case study method enabled the researcher to study the concept of CSI and increase understanding of how to manage continual improvement in a more systematic way.

In Paper III, the researcher used a combination of the case study method and the *constructive research method*, which aim at producing solutions to practically and theoretically relevant problems (Kasanen et al., 1993). It can be defined as "problem solving through the construction of models, diagrams, plans, or organisations" (Kasanen et al., 1993). The researcher used constructive research to create a first version of the improved CSI model that provides a more detailed view of CSI activities (measurement, reporting, and managing improvements) than the existing ITIL-based seven-step improvement process. However, the case study method remained the main research method.

In Paper VI, the researcher used a *systematic literature review* procedure (Kitchenham et al., 2004) to conduct the research. The systematic literature review included three phases (Kitchenham & Charters, 2007): (1) planning the review, (2) conducting the review, and (3) reporting the review. The search process was organised according to the guidelines of Petticrew and Roberts (2006) using the PICOC (population, intervention, comparison, outcomes, context) criteria to frame the research problem and to construct search strings. The identified synonyms for words were linked using Boolean operators (OR, AND) as a data search in electronic databases. The selected research questions and a pre-defined protocol for CSI guided the author of this thesis to identify and specify which CSI-related articles to include and exclude.

3.2.1 Multiple case study design

A research design is a plan that logically links the research questions with the evidence to be collected and analysed in a case study (Yin, 2014). In this thesis, the phenomenon of CSI was studied with multiple sequential case studies. Thus, the author of this thesis applied a multiple case study design (Figure 7) to conduct the research.

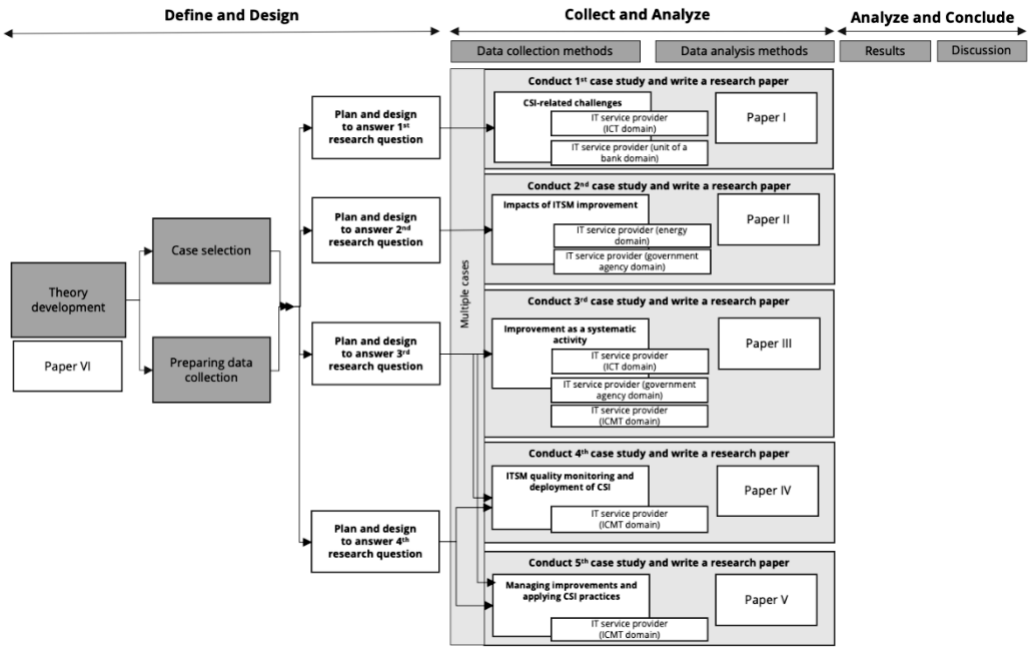

Figure 7. Multiple case study design in this thesis. Modified from original (Yin, 2014).

This research contained six case studies that contributed to solving the research problem on how to manage improvement in a continual and systematic way. The evidence from multiple cases is often considered more convincing, and therefore, the overall study is considered more reliable (Yin, 2014).

3.2.2 Theory development

In this thesis, the theoretical framework consists of service science, process improvement, and service quality management. Many IT organisations have shifted their focus from technology-oriented IT departments to IT service provider organisations that operate in a more service-oriented way. However, this service orientation requires a new type of approach to quality management. Quality aspects in IT services cannot be improved without systematic management of improvements.

In particular, the author of this thesis utilised the concept of a service management system from service science. CSI can be related to any part of the service management system: service management processes, service technologies and service infrastructure, skills of service employees, service documentation, applications, and systems. This diversity and wide scope cause challenges for understanding and managing CSI.

Regarding process improvement, key concepts directly supporting CSI are process management and improvement framework. Process management refers to the direct, control, and coordination of work performed to develop a product or perform a service. Improvement frameworks enable the systematic management of improvement and faster implementation of improvement ideas. Concerning service quality management, this thesis utilised service quality gaps and structured actions for improvement (corrective actions, preventive actions, improvement actions).

This thesis contributed to CSI theory development by:

- Providing better evidence that support managing improvement ideas in a transparent way and holistically covering the whole service management system.
- Providing tabulated measurement actions and categorised improvement actions.
- Establishing a consistent tool-assisted operational model for improvement ideas.
- Offering viewpoints on how to perform CSI activities more systematically through extending the seven-step improvement

process, for example, creating an organisation-wide categorisation schema for improvement actions.

3.2.3 Case selection

In this study, the cases are ICT provider companies and IT units in Finland in the field of the IT and information service segment. According to the Ministry of Employment and the Economy report (Ministry of Employment and the Economy, 2015), the IT and information service segment offers products and services, such as software, programming, and IT maintenance. The cases were selected from among the KISMET project's industry partners. Table 3 presents a description of these case organisations.

Table 3. Description of IT service providers used in this research

IT service providers	Description of IT service provider's services
Case organisation 1	Information and communication technology (ICT) services (e.g. application services, desktop services, servers and capacity services, network services). The company has around 700 employees, and its turnover was approximately 140 million euros in 2011. The company has a strong focus on ITIL, ISO/IEC 20000 and ITSM software improvement.
Case organisation 2	Business development, ICT services, and services for business process management for the financial sector (banking and investment services) in Finland. The research was carried out in the unit in charge of the development, production, and maintenance of the unit's products and services.
Case organisation 3	IT services, product development and consulting services in Northern Europe. The company has around 18,000 employees operating in 30 countries. The research was carried out in an energy business unit that provides IT services for Scandinavian energy companies.
Case organisation 4	IT services (e.g. desktop services, service desk) to a government agency in Finland. The government agency had 5,300

	employees in 2011. The research was carried out in the information system management unit of a government agency.
Case organisation 5	Information, communication and medical technology (ICMT) services in Finland. The company has around 570 employees, and its turnover in 2018 was 112 million euros. The IT service provider's service management system is based on ISO/IEC 20000 and ISO 9001 standards.

CSI was one of focus areas in the Keys to IT Service Management and Effective Transition of Services (KISMET) research project 2011–2014 at School of Computing, University of Eastern Finland (UEF). During the research project at UEF, the case organisations' representatives reported that they would like to improve the practices of managing improvement initiatives. The project's partners struggled with reactive improvement actions due to a lack of systematic management of the identified improvements. The author was a project researcher studying how to improve IT organisations' ITSM with CSI activities (Paper I-III).

The thesis work continued with a more practical focus when the author of this thesis started working in an IT service provider organisation as a CSI responsible (years 2016-2019). The author worked for an IT service provider company as a quality specialist in areas of CSI, ISO 9001 standard for quality management system, and ISO/IEC 20000-1:2018 standard for service management (Papers IV–V). The author was responsible for deploying CSI in the case organisation. Additionally, the author of this thesis worked as a designer on robotic process automation software service (2019–2023, Paper VI), which provided valuable insight into IT service design and IT service operation.

3.2.4 Preparation of data collection

In this thesis, the research used a case study protocol to guide data collection. The purpose of the *case study protocol* is to guide the researcher in carrying out the data collection from a single case to increase the reliability of the research (Yin, 2014). In this thesis, the case studies followed

the following protocol with some modifications: The first phase focused on defining and designing the research, which was related to a research plan and a project plan, the case organisations' annual goals, and objectives of CSI manager role in IT service provider organisation. The next phase focused on carrying out the research by collecting and analysing the data. In this thesis, data collection methods were based on Yin (2014) multiple sources of evidence. The last phase of the case study protocol involved analysing and drawing conclusions from the case study reports and the results. Some of the case study reports were used as a basis of research papers (following the IMRAD structure) and this thesis. Table 4 presents the relation between the research question and cases.

Table 4. Relationship between the research questions and cases

Research questions	**What kind of information are needed**	**Case Context**
RQ 1: What challenges are identified related to the IT service management from the IT service provider's perspective?	**ITSM-related challenges:** Employees' experience of challenges in IT service provider organisation	• IT service provider (ICT domain) • IT service provider (unit of a bank domain)
RQ 2: What impacts have resulted from the improvement of IT service management processes?	**Impacts of ITSM improvement:** Employees' experience of impacts from process improvements which may motivate to implement CSI practices	• IT service provider (energy domain) • IT service provider (government agency domain)
RQ 3: How can IT service improvement be transformed into a continual and	**Improvement as a systematic activity:** Identifying and designing actions for managing	• IT service provider (ICT domain) • IT service provider (government agency domain)

systematic organisational activity?	improvements in systematic way	• IT service provider (ICMT domain)
RQ4: How can IT service provider organisations implement continual service improvement as a part of daily IT service management?	**Identifying viewpoints on implementing CSI:** Exploring viewpoints on how to implement continual improvement into the ITSM practices	• IT service provider (ICMT domain)

3.2.5 Data collection methods

In scientific research, the researcher attempts to solve the problem using collected data (Kananen, 2017). The research data for this thesis were collected from IT service provider organisations (Table 4). The researcher used six sources of evidence (Yin, 2014) to collect data. This is typical in case studies, in which the researcher observes and analyses the environment by combining different data collection methods (Yin, 2014; Eisenhardt, 1989; Kananen, 2017). According to Yin (2014), case study findings can be considered more convincing and accurate if they are based on several sources of information. The data collection methods are presented next.

Participant observation: Observation as a data collection method aims to understand the phenomenon and how it works (Yin, 2014). It is not about evaluating the operation of the object but about understanding how problems are encountered in the context in which they operate or work, so that the researcher can ask more specific questions (Kananen, 2017). During the research, the author of this thesis participated in several meetings (e.g., process improvement meetings, weekly meetings) and workshops with IT service providers' representatives and employees. Given the collaborative work with IT service organisations representatives, the researcher was able to participate in the real-life environment, which provided valuable insight into CSI identifying challenges, creating an improved CSI model, and providing points of view to implement CSI.

Additionally, the author received useful ideas from other Finnish Continual Service Improvement Special Interest Group members during the

writing of a CSI-related white paper (itSMF Finland, 2014) in cooperation with the group. During the research, the author of this thesis participated in seminars and a conference workshop in which she took notes related to the topic of the thesis.

Documents: The researcher can gain knowledge of the phenomenon under study and the company with the help of existing materials (Paul et al., 2014). The author of this thesis used various documents from the IT service providers to obtain more knowledge of the research subject. Written types of data were collected, for example, from meeting memos, ITSM process descriptions, and ISO 9001 and ISO/IEC 20000 standardisation documentations, quality handbook. Additionally, documents included the IT service provider's Excel tabulation of improvements from customer satisfaction surveys.

Archival records: The researcher of this thesis examined archival records, such as incidents and service request tickets, in ITSM software.

Physical artefacts: The researcher of this thesis explores IT service providers' IT environments, such as ITSM software process modules (e.g. incident); survey tools to capture feedback on resolved tickets; file management systems to store process-related documentation; intranets involving information letters, process sites, and instructions; wiki systems involving production instructions; and reward management tools.

Semi-structured theme interviews/discussions: The researchers organised semi-structured theme interviews with the IT service provider's staff members (e.g. quality management manager, CSI process owner, unit manager, ITSM process managers, IT specialists, service desk specialists, quality expert, and software engineers). The interviews were organised with employees who held key roles in IT service provision and could provide valuable insights into ITSM. According to Yin (2014), key people can introduce other interviewees who may provide new insights on the interviewers. Additionally, the author of this thesis discussed informally (e.g. coffee table discussions) with employees to understand the subject at a deeper level.

Direct observations: The author of this thesis made direct observations during training sessions (e.g. ITIL) and seminars (e.g. ITSM), where participants commented on viewpoints and aspects related to their organisation ITSM and CSI practices. Direct observations helped to understand the challenges in CSI from the employees' point of view.

3.2.6 Data analysis methods

Qualitative data analysis methods were used in this thesis. Analysis can be understood as the organisation, processing, or summarisation of research data (Kananen, 2017). The data from case studies were analysed using the following analysis methods: case comparison analysis, within-case analysis and pattern matching.

A *case comparison analysis* technique focuses on searching for similarities and differences between cases (Eisenhardt, 1989; Eriksson & Kovalainen, 2008). In Paper I, the researchers identified similar ITSM challenges in two Finnish service provider organisations related to three different perspectives: people, process, and technology. In Paper II, the researchers explored the ITSM improvements in two Finnish IT organisations and compared the findings based on five categories (scope of process improvement, quality frameworks or standards used in ITSM process improvement, achieved benefits from improving ITSM processes, impact of ITSM training, and process improvement challenges).

A *within-case analysis* technique can be used to analyse case study results from a single case organisation (Eisenhardt, 1989). This technique was used in Paper III, Paper IV, and Paper V, when researchers explored CSI practices in one Finnish IT service provider organisation.

Pattern matching technique is useful in finding patterns (categories) from empirical data (Yin, 2014). In Paper IV, the researchers used three patterns: (1) quality monitoring and measurement, (2) organisation and deployment, and (3) management of improvements. Patterns 1 and 3 were the major elements of CSI (Lloyd et al., 2011a). In Paper V, the analysis was done using the four aspects of the socio-technical system as patterns (people, structure, process, and technology).

4 Case studies and results

In this chapter, summaries of the research results are presented. Section 4.1 describes the summaries of research Papers I–VI. In Section 4.2, the author of this thesis used a cross-case conclusion technique to extract the answer to the research problem from the extensive material of multiple cases. Figure 8 shows the relationships between the research papers in the multiple case study design.

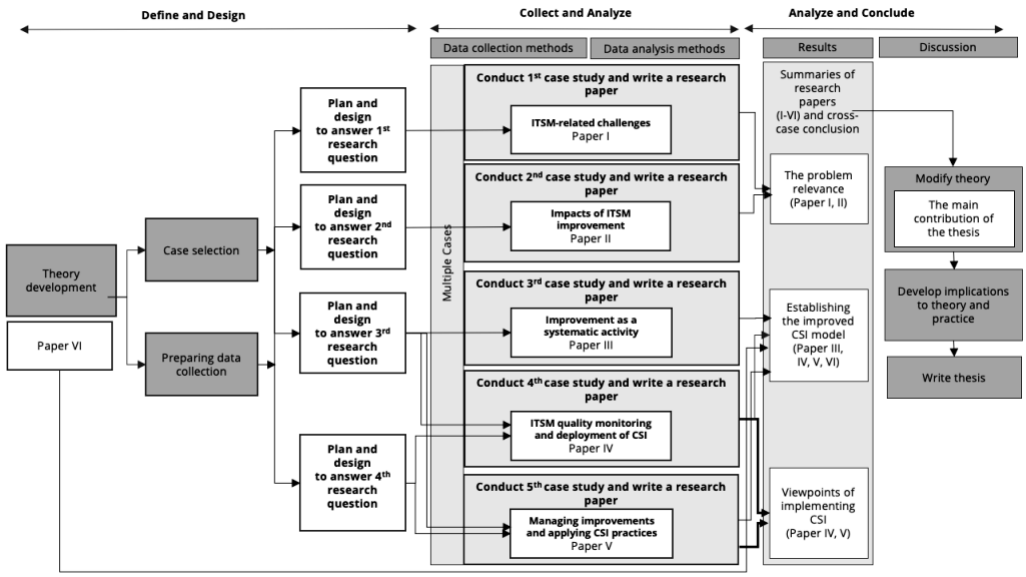

Figure 8. Relationships between the research papers in the multiple case study design. Modified from original (Yin, 2014).

4.1 Summaries of research papers

This chapter presents the summaries of research Papers I–VI. The goal of the paper, research method, main contribution, and limitations are described for every paper.

4.1.1 Identifying IT service management challenges

The goal of Paper I was to identify challenges that IT providers encounter in their ITSM. The identified challenges can be seen as inputs to CSI. The identified research problem formed as follows*: What types of challenges exist in IT service management from the IT service provider's perspective?*

A qualitative case study was chosen as the research method to answer the research problem. The author used the CSI lifecycle stage of the ITSM framework ITIL and ISO/IEC 20000-1:2010 Part 1 standard as a theoretical framework guiding the research. Data were collected from two case organisations from ICT and the unit of bank domains. Semi-structured theme interviews with the case organisation's specialists were used as the main data collection method. Data regarding the case organisations' service management were collected from other data sources (e.g. case organisations' internal documents, participant observation of meetings and ITSM training sessions, and access to the case organisations' intranet, reporting tool and ITSM tool). To analyse the results, the researcher used a case comparison analysis technique to identify the ITSM challenges in two case organisations related to three perspectives (people, process, and technology).

The main contribution of this study is to present ITSM challenges in two IT service provider companies in Finland. To categorise the results, we used the three core perspectives of ITSM people, process, and technology. These three areas provide inputs to the CSI lifecycle phase, which controls and manages the identified improvements.

This case study included the following limitations: (1) the study was performed with two case organisations. Multiple organisations would have provided a richer view on the challenges; (2) case studies do not allow for generalising the results to other organisations; and (3) more people in the unit of the bank domain could have been interviewed.

This study amplified the author's interest in exploring ITSM process improvement and its impacts.

4.1.2 Exploring the Impact of IT Service Management Process Improvement Initiatives

The goal of Paper II was to explore the impact of ITSM process improvement with the following research problem: *What impacts have resulted from IT service management process improvement?*

A qualitative case study method was used to explore the research problem. Data were collected from two case organisations in the energy and government agency domains. The following data sources were used: interviews on ITSM impacts, documentation, archival records, participant observation, and physical artefacts. Additionally, an ITSM training event was used as a data source in the government agency organisation. We used a case comparison analysis technique to analyse the findings in five categories: (1) the scope of improvement, (2) quality frameworks or standards, (3) achieved benefits, (4) impact of ITSM training, and (5) challenges. These findings were converted to lessons learned.

The main contribution of Paper II is real-world examples of the effects and benefits of ITSM improvement initiatives and training, and the challenges faced by organisations seeking improvements. For example, the following impacts were identified from ITSM process improvement: customer satisfaction, staff satisfaction, higher process maturity/more standard process, improved tools and technologies, standardised services, increased service quality, increased efficiency/productivity, and better transparency of operations.

The study included the following limitations: (1) only two organisations were studied; (2) data were collected only by qualitative methods, such as interviews, observation, and analysing the companies' documentation; and (3) interviews were conducted only with managers. Staff interviews might have provided additional perspectives.

The results from Papers I and II increased the author's interest in studying how to implement improvements. The identified challenges in Paper I could be solved as an improvement and have positive impacts, as identified in Paper II.

4.1.3 Establishing a continual service improvement model

The goal of Paper III was to create a systematic model for managing improvement actions concerning IT services and service management processes. The identified research problem was formed as follows: *Which methods and practices are related to continual service improvement in IT service management?*

To conduct the study, the researchers used case study research and constructive research methods with a single case organisation. A theoretical framework consisted of an ITSM ITIL, ISO/IEC 20000-1:2010 Part 1: Service management system requirements for service management (Plan-Do-Check-Act (PDCA) cycle, and COBIT framework (PO8: Manage quality) to guide the research. Data were collected from one case organisation from the ICT domain using multiple sources, such as documents, archival records, interviews and discussion, participant observation, and physical artefacts. The researcher used a within case analysis technique to analyse the data from one case organisation.

The main contribution of this Paper III is the presentation of an improved CSI model that provides a detailed description of CSI activities within measurement, reporting, and processing improvement ideas. The researcher identified that CSI has interfaced with change management and project management. The model was created in cooperation with the case organisation. In addition, the model was validated with two other IT service provider organisations (government agency and ICMT domains) that provided valuable comments for further work.

This study included the following limitations: (1) the CSI model was built mainly with one case organisation, (2) the generalisation of the results might be weaker due to the small number of cases, and (3) the model was validated with manager-level persons from IT service provider organisations. Unfortunately, the lack of time was a limiting factor.

This study increased the author's interest in further studying the deployment of CSI practice.

4.1.4 Studying CSI and monitoring the quality of ITSM

The goal of Paper IV was to study CSI practices of a Finnish IT service provider company. The identified research problem was: *How can IT service provider organisation perform continual service improvement methods as part of daily service operation management?*

To conduct the study, the researchers used a case study research method with a single case organisation. A theoretical framework consisted of the ITIL framework, ISO/IEC 20000-1:2011 Part 1 for service management, ISO 9001: 2015 for quality management, and ISO/IEC 15504-8 for process assessment to guide the research. Data were collected from one case organisation from the ICMT domain using multiple sources of evidence, such as documents, archival records, interviews and discussion, and participant observation. The researcher used a within-case analysis technique to analyse the data. The analysis was performed by using the pattern matching technique and tabulating the most relevant findings. The following patterns related to the deployment of CSI practices were used: (1) quality monitoring and measurement, (2) organisation and deployment, and (3) management of improvements.

The main contribution of Paper IV is the presentation of findings from a case study with a ISO/IEC 20000 compliant service organisation. We focus on exploring how the quality is monitored, how CSI is organised and deployed into practice, and how service-related improvements are managed.

This study included the following limitations: (1) research data were collected from one service company by one researcher; (2) case studies do not allow for generalising the results to other companies; (3) regarding internal validity, there may be bias caused by the fact that one of the authors was working in the case organisation; (4) we did not categorise results according to different organisational levels; and (5) most of our interviews focused on managers. Interviews with staff might have revealed other insights into CSI.

This study increased the author's interest in exploring how to manage improvement records systematically with ITSM software.

4.1.5 Applying CSI practices to study the quality of IT services

The goal of Paper V was to study how IT service providers utilise CSI in their operations and the IT services they offer. The identified research problem was: *How can service-related improvements be managed with ISO/IEC 20000 compliant CSI model?*

A qualitative case study method was chosen to answer the research problem. The researcher used the ITIL framework, ISO/IEC 20000-1:2018 Part 1: Service management system requirements for service management, and aspects of the socio-technical system as a theoretical framework to guide the research. Data were collected from one case organisation from the ICMT domain. Multiple data collection methods were used in collecting data from the case organisation (e.g. documentation, archival records, interviews and discussions, and participant observation). The findings of the study were analysed by using a within case analysis technique and considering four aspects involved in the socio-technical system. Adopting the components of the socio-technical system as categories (people, structure, process, technology) enabled the analysis of the service improvement practices from a wider perspective than just as a single process area of ITSM.

The main contribution of this paper is the presentation of a case study focusing on the service improvement practices of an IT service provider organisation and to study how service-related improvements are managed in ITSM software.

This study included the following limitations: (1) only one case organisation was studied with a limited number of interviewees and qualitative data. It would be interesting to conduct a study that compares CSI procedures of multiple organisations and utilises both qualitative and quantitative data; (2) the selection of interviewees can also be seen as a limitation. Interviews could have included customer representatives to provide richer insights into CSI; and (3) the case study research method does not allow for generalising research findings to other organisations.

4.1.6 Continual service improvement: a systematic literature review

The goal of Paper VI was to present the results of a systematic literature review increasing understanding about the CSI and seven-step improvement process and provide topics for future research. The identified research problem was the same as in this thesis*: How can IT service providers systematically manage continual improvement?* In Paper VI, we used a systematic literature review procedure to answer the research problem.

Our main finding is that CSI-related terminology needs clarification and consistency both in academia and in practice to guide future CSI research, for example, to clarify the roles and internal practices of CSI. Additionally, there is a need to provide a staged approach for continual improvement and to identify models that support improving and automating the seven-step improvement process.

Two limitations are related to this study. First, the literature review was conducted by one researcher, the first author. Several researchers could have provided more insights during the analysis of the literature review results. Second, the study was conducted within a limited time frame. A longer research period would have resulted in more studies and deeper analysis.

4.2 The cross-case conclusion on CSI

This chapter presents the cross-case conclusion of the research papers with the following themes: problem relevance, establishing an improved CSI model, and viewpoints of implementing CSI. With the cross-case conclusion, the author was able to explore and provide viewpoints of the research problem being studied (Stewart, 2012; Gustafsson, 2017).

4.2.1 Problem relevance: Why the focus on CSI?

In this thesis, challenges related to ITSM from the IT service provider's perspective were studied. The author of this thesis conducted a cross-case conclusion from Papers I and II to draw conclusions on problem relevance. Findings from Papers I and II suggested that there is a need to increase understanding about CSI phenomena and, more specifically, the successful implementation of the seven-step improvement process.

In Papers I and II, the challenges related to the improvement ideas from employees and their participation in improvement work. For example, researchers observed that there is a challenge regarding how employees could give feedback to management (Paper I). The employees also reported that customer feedback should be sent to them, and based on the feedback, they may be better informed on how to correct any deficiencies in their work (Paper I). Paper II reported a point of view in employees' participation in the ITSM process improvement: *in order to get people to adopt the processes, they have to participate in the process improvement work*. Interviews, observations, and some ITSM training sessions revealed that some employees have difficulties understanding it as the benefits of process improvement. Thus, they considered it unnecessary extra work (Paper II).

Results from Papers I and II indicated that IT service provider companies need more standardised processes to support daily work. For example, the interviews showed that the processes were unclear to some of the employees and that they did not identify the process-based approach in their daily work (Paper I). In Paper II, the case organisation presented the need for clarification of roles and responsibilities to avoid extra work and the need for unified working practices. Interviewees presented that processes need harmonisation because there were a lot of customer-specific practices (Paper I). In Paper I, the interviews revealed that employees have difficulties in identifying sources of improvement ideas and defining a systematic process for handling them.

According to Van Hove and Mill (2013), in the early adoption of ITIL practices, it was common to focus on a single process and work towards the implementation of that specific practice. IT service providers with increased

maturity related to ITSM framework (e.g. there are defined inputs and outputs, and managed and controlled interfaces with other processes) understand the value of what the embedded framework could achieve (Van Hove & Mill, 2013).

Papers I and II presented challenges related to metrics and reporting. Researchers observed that the companies would have needed defined process metrics for IT service operation processes and more effective reporting practices. The system integration problems cause challenges to reporting capabilities and take time because data has to be processed manually (Paper I). Interviewees reported that the organisation would need modern technological tools to support the operation to ensure that relevant information was always available for people who needed it (Paper I). Additionally, based on our observations, it seems that organisations lack effective tools to demonstrate the benefits of ITSM process improvement (Paper II). Gacenga et al. (2011a) argued that measurement of ITSM performance is challenging, especially from the internal process perspective. The challenging areas are configuring and reporting from ITSM software and agreeing common metrics across divisions (Gacenga et al., 2011a). Kajbaf et al. (2011) proposed that the service reporting process could be implemented as a sub-process of the ITIL CSI process containing defined report templates related to the reporting requirements of the organisation.

In Paper I, we identified that improvement work is mainly performed by individual business units, which might cause challenges in developing a big picture of service improvement. Whapples (2015) indicated that if an IT service provider has silos or boundaries between functions, then employees within them do not have the authority to make changes outside these boundaries. To promote a culture of continual improvement within an organisation, there is a need to bring openness and the ability to share ideas (Whapples, 2015).

The interviews, discussions, and observation conducted in Paper II revealed that the management and integration of multiple process improvement frameworks are challenging. A large number of process improvement frameworks, models, and standards are available for

organisations seeking to improve ITSM processes. According to interviews, management considered it challenging to select an appropriate framework or a standard to carry out changes to processes, as indicated in the following comment (Paper II): "One *has to find an appropriate management model for change and service delivery, not too complex or too detailed".* Additionally, interviews, discussions, and training events revealed that ITSM standards and frameworks are often considered too complex and bureaucratic because of special jargon (Paper II). The case organisation considered it a challenge to apply the ITSM models and frameworks to its own business (Paper II).

The identified challenges increased the author's interest in exploring what impacts have resulted from the improvement of ITSM processes. In Paper II, the following impacts from the ITSM process improvement were identified based on the interviews: customer satisfaction, staff satisfaction, service management culture, higher process maturity/more standard process, improved tools and technologies, standardised services, increased service quality, increased efficiency/productivity, cost savings, and better transparency.

4.2.2 Establishing an improved CSI model

This thesis focused on exploring how service improvement be transformed into a continual and systematic organisational activity. The author of this thesis conducted a cross-case conclusion from Papers III–VI to draw the improved CSI model (Figure 9), which extends the stages of the ITIL seven-step improvement process (Step 3: Gather the data, and Step 7: Implement the improvement). The results from Papers III–VI to the improved CSI model were as follows:

- Paper III: Presented a simplified description of the CSI model aiming at increasing and deepening the understanding about the CSI activities of measuring, reporting, and managing improvements. The researcher identified that CSI needs an interface to change management and project management as a method to implement improvements (improvement actions).

- Paper IV: Identified that an IT service provider performs various activities while monitoring the services, service processes, and service management system (Measurement actions). Paper IV also showed that Improvement actions include more categories: managing customer needs, negative feedback and complaints, corrective actions from quality audits, managing improvement ideas, preventive actions (risk management), and strategic actions.
- Paper V: Studied how service improvements can be managed with ITSM software, including improvement record (ticket) and workflow.
- Paper VI: To better support the implementation of improvements related to IT services and ITSM processes, improvement frameworks should address significantly more impact on improvements. Thus, we propose a new step to the seven-step improvement process (Step 8: Evaluate the effectiveness of the implemented improvement).

Next, the improved CSI model (Figure 9) and examples of validation comments from the case organisations' representatives are presented.

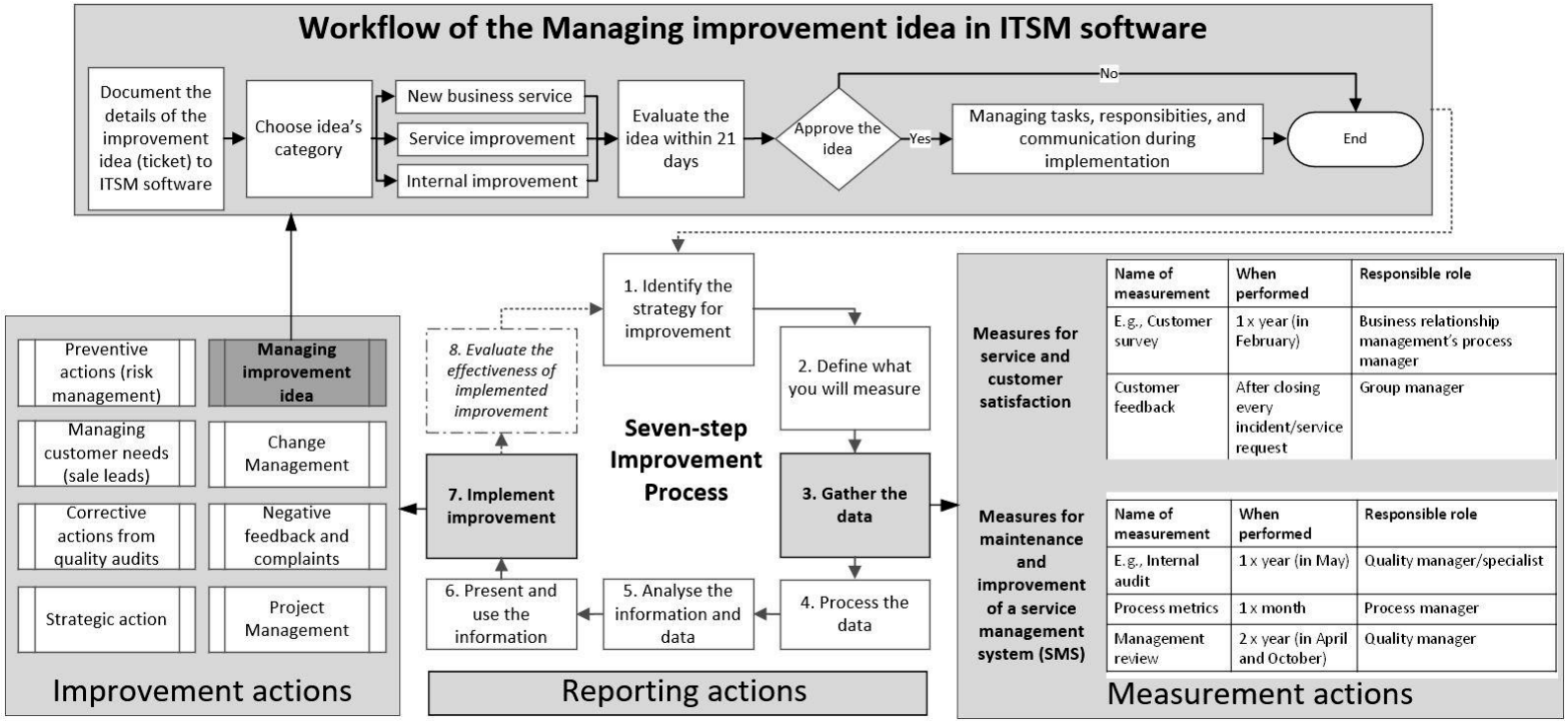

Figure 9. An improved continual service improvement (CSI) model extends the steps of the ITIL seven-step improvement process (Step 3: Gather the data, and Step 7: Implement the improvement). Additionally, to better support the implementation of improvements related to IT services and ITSM processes, a new step to the seven-step improvement process is proposed (Step 8: Evaluate the effectiveness of the implemented improvement).

The researcher conducted interviews and discussions with the representatives of the case organisations to identify how they perceive the elements of the improved CSI model. Examples of validation comments gathered (Paper III, Paper IV) are as follows:

- *"Measurement plays an important role in IT service management" (Paper III).*
- *"It is good to see interface between projects and CSI" (Paper III).*
- *"We would need unified reporting and measurement practices to our organisation"* (Paper III).
- *"We receive quite a few formal complaints. Most common causes of the complaints are unclearly documented resolutions, delays in receiving answer or service and conflicting instructions given by service desk specialists"* (Paper III).
- *"The model includes descriptions, data, and inputs that have been collected together under the umbrella of CSI. In the process manager role, one can take a part of CSI and start improving that particular part of it "* (Paper IV).
- *"The model benefits and supports the continual improvement required by standards. Continual improvement is not only processing improvement suggestions" (*Paper IV).
- *"The challenge is that we have too few people to promote and work in Continual Improvement. We should have a working group. Our management should participate and sell Continual Improvement further"* (Paper IV).
- *"The CSI model creates a good basis for a process visualisation tool. There are metrics that lead to the identification of improvement targets. From the process manager perspective, it makes my own role/share in CSI clearer and clarifies tasks"* (Paper IV).

Next, the improved CSI model is presented via sections of measurement actions, improvement actions, and managing improvement ideas in ITSM software.

Measurement actions in the gather data step. During our study, we identified that the organisations had numerous measurement actions in use (Paper III, Paper IV, Paper V). According to Kajbaf et al. (2011), measurement and reporting are key requirements of service improvement, which in turn are required for value creation and success in a competitive market. Other ways to collect improvement ideas are the following (Paper III, Paper IV): customer complaints, staff's ideas, 3rd party improvements, survey results, trainings, weekly team meetings, service meetings, process and quality improvement meetings, ITSM maturity assessment, and internal and external audits.

As identified in Paper I, employees have difficulties in identifying sources of improvements. Increasing the transparency and utilisation of gathered measurement data for identifying improvements, the author tabulated identified measurements from case organisation practices (Paper IV). Tabulation clarifies details of measurements, such as the name of measurements, the person responsible for performing the measurements, and timetables to execute measurements (measurement actions, Figure 9).

Tabulating current measurements may enable IT service providers to evaluate the usefulness and effectiveness of measurements, for example, whether the processed information still enabled decision-making (Paper IV). When measurement dates are known, it helps to allocate the resources of responsible people to use time for measurement actions, help ITSM process managers and IT service managers to prepare analysis from measurements, and plan improvement actions to pay attention to the big picture of parallel improvements instead of single improvements (Papers III and IV). This may lead to more transparent, systematic, and managed improvements.

Kajbaf et al. (2011) argued that it could be beneficial if reporting activities use different automatic tools that help employees in measurement and reporting, decrease human errors, and ease the scheduling of reports. Related to CSI research, Trinkenreich et al. (2018) identified the following pitfalls: (a) lack of available time to work on measurement results, (b) lack of discipline to provide measurement data, and (c) lack of understanding of what to do with measurement results.

Improvement actions in the implement the improvement step. Processing and analysing results (reporting actions, Figure 9) from measurement might identify the need for improvement actions (Paper III). In this thesis, the author did not investigate the reporting actions more deeply. During the research, we observed that continual improvement is performed at many organisational levels, roles, cycles, and actions (Paper V). We identified that improvement ideas were assigned to unit leaders who will analyse them, and improvement ideas are discussed on hallways, emails, and in meetings (Paper III).

A large amount of improvement work may seem difficult to manage. We address this need by identifying (Papers III, IV, and V) eight different categories of improvement actions (Figure 9): (1) preventive actions, (2) managing improvement idea, (3) sale lead, (4) change management, (5) corrective actions from quality audit, (6) negative feedback and complaints, (7) strategic action, and (8) project management, which have their own specific workflows supporting the implementation of improvement-related tasks. Lamichhane (2019) presented critical success factors for the CSI, including:

- Regular monitoring and service improvement activities.
- Willingness, initiatives, and commitment from senior management and political leaders to change for the better and to embrace IT in the value chain of service delivery.
- The culture of decision-making should be based on data and information.
- Availability of technical and skilled staff.

Lewis and Brown (2012) indicated that service quality management may depend very much on how well service process design has been made. For example, unclear service responsibilities (e.g. to improve the service related to customer negative feedback) affect the processing of the improvement ideas. The poorer the design of service, the more improvement efforts need to be placed on the service in the service operation phase (Lewis & Brown, 2012).

Workflow of the Managing Improvement idea in ITSM software. By using participant observation, the author of this thesis designed a Managing improvement idea workflow and Improvement idea record (ticket) in the ITSM software based on the ISO/IEC 20000-1:2018 Part 1: Service management system requirements on continual improvement (Clause 10.2) (Figure 9). This design may support the IT service provider in transforming IT service improvement into a continual and systematic organisational activity as follows (Paper V):

- The idea management workflow of the ITSM software provides employees a transparent channel to represent ideas related to new business service innovation, service improvement, or internal practices. This increases the visibility of ideas for employees and enables employees to make a conversation of documented ideas and support their progress.
- Idea management workflow guides employees to operate with improvement records in the same way. This type of model supports and increases quality in the management process and encourages employees to think about how ideas would benefit the services of the organisation.
- Regarding the improvement record (ticket), the organisation-wide improvement ideas can be documented with structured and informative details. The employees see this valuable because it forces them to document basic information on improvements (description, benefits, quality aspects).
- The improvement record can be used to replace the case organisation's other forms, such as financial expenditure forms, and minimise the number of emails related to processing and content of ideas. This provides the employees with better opportunities to learn and remember only one tool where they can document ideas.
- The improvement record includes, for example, the following functionalities in ITSM software: reminders, choosing the category of the idea (e.g. new business opportunity), allocating ideas to the

right group or people for evaluation, evaluation of the impact, approving, communications the decision, and status monitoring.

The ITSM literature presents a form of CSI register to document improvement ideas (Lloyd et al., 2011a). Jäntti (2012) stated that improvement ideas regarding IT services and processes should be recorded systematically into the ITSM tool. According to Jäntti (2012), the business benefit may relate to the management of improvement suggestions becoming more systematic, which ensures that each suggestion receives attention and review. In Paper V, one of the interviewees said that although it is good to have a tool that supports the management practice, there is also a need for employees that perform the implementation of improvements in addition to their normal work.

4.2.3 Viewpoints of implementing CSI

This thesis studied how IT service provider organisation implement CSI as a part of daily ITSM. The author of this thesis conducted a cross-case conclusion from Papers IV and V to present six implementation tasks that organisations may use in the implementation of CSI.

The first task of CSI implementation is to select an ITSM process framework(s) to assist the IT service provider's current CSI activities (e.g. measurements and improvement activities) and identify how other processes support CSI (Paper IV). There are several frameworks available with different improvement purposes. ITIL provides guidelines for establishing CSI practices. ISO/IEC 20000 – Part 1 standard defines a set of requirements for continual improvement (ISO/IEC, 2018).

The second task of implementing CSI is to identify and establish dedicated CSI roles (e.g. a CSI owner, a CSI process manager) to boost continual improvement of services and service management processes and increase awareness of other roles related to CSI (Paper IV). Galup and Dattero (2010) argued that the alignment of knowledgeable employees to process activities is critical to the success of any internal IT process. From the CSI point of view,

the IT service provider may use Galup and Dattero's (2010) Dynamic Network Analysis model to provide the following information:

1. Person aspect: Identify persons in the organisation who have a specific understanding of the business (e.g. information about where to find measurement results).
2. Role aspect: Identify the person who performs a specific role (e.g., evaluate and approve an improvement idea) and what specific knowledge is required for each role (e.g. analysing improvements from gathered measurement results).
3. Knowledge aspect: Identify persons in the organisation who are the most knowledgeable (e.g. to participate in the planning and implementation of an improvement idea).

The third task is to document the CSI activities and keep presentations of the findings in the organisation to create awareness of CSI and obtain validation comments on improvement points of view (Paper IV). Lamichhane (2019) stated that changes in technology, evolution of new IT standards, or frameworks change people's thoughts and beliefs. These may identify a need to update practices.

The fourth task is to identify monitoring mechanisms of services, SMS and service processes (measurement actions) enabling continual sources of improvements (Papers IV and V). Gacenga and Cater-Steel (2011) have studied performance measurement of ITSM in an Australian university. They found that there were both internal factors (alignment of IT strategy with organisation strategy, and having a mechanism to provide feedback to IT customers) and external factors (benchmarking against others in the same industry) that influenced selection of performance metrics.

The fifth task is to identify right channel for ideas (Improvement actions) (Paper V). According to the findings, improvement requires a good cooperation with IT service provider, multiple vendors, other stakeholders and the customer involved in the improvement (Paper V). It could be possible to assign a responsible role for every category of Improvement actions to ensure that improvements are processed systematically according to agreed organisational practices.

The sixth task is to implement the improvement actions into ITSM software or other information systems that can manage the lifecycle of improvement records (Papers IV and V). Attributes of the ITSM software enable creating metrics to CSI. From technology (IT component) and cost improvement perspectives, Kubiak and Raas (2018) suggested automatisation, advanced system status analysis, or system issue prediction techniques to reduce human manual efforts maintaining an IT service. According to Hochstein et al. (2005), regular reports provide information about process cycle times and qualitative deficiencies, and by comparing these information, weaknesses and inefficiencies become transparent.

Completing the proposed tasks would enable the IT service provider to manage CSI activities in a more systematic and transparent manner.

5 Discussion

In this chapter, the contribution of this thesis is discussed, and the theoretical and practical implications are presented.

5.1 The main contribution of the thesis

Over the years, IT service providers have performed improvements to IT services, practices, processes, and software to support service-oriented IT management to respond to business, customer, and service requirements. In an era of IT system complexity, opportunities, and requirements, IT service providers are struggling to create and maintain focus and clarity on improvement efforts. Several frameworks are available to govern, deliver, manage, and improve IT services. Frameworks such as ITIL (Adams et al., 2009), COBIT (Boonen & Brand, 2007), DevOps (Ebert et al., 2016), and Scrum (Agh & Ramsin, 2021) support CSI in their own unique way.

The frameworks of this thesis consisted of the contribution of service science, process improvement, and service quality management. ITIL and ISO/IEC 20000-1:2018 were chosen as the ITSM framework for this thesis because: (1) ITIL is widely used in IT service provider organisations providing practices for continual improvement of services and processes (itSMF Finland, 2014), and (2) ISO/IEC 20000-1:2018 (ISO/IEC, 2018) is an international standard that requires systematic improvement of services from IT service providers to meet service requirements and value delivery to the customer.

CSI is a fruitful research target because it can speed up implementation of improvements by significantly identifying, for example, potentially new market areas and innovative IT service systems. From the continual improvement point of view, the seven-step improvement process should be applicable at any ITSM processes and organizational levels. Otherwise, it would not support improvements and increasing maturity in immature IT

service provider organizations where it is needed most. However, the researcher did not identify from practice or literature an organisation-wide model to manage CSI in a systematic way.

The research problem in this study was: *How can IT service providers systematically manage continual service improvement?* The goal of this thesis was to explore the concept of CSI to better understand how to manage continual improvement in a more systematic way. A summary of the main contributions is described below.

1. **The identified ITSM challenges in IT service provider organisations:** Research revealed multiple challenges related to ITSM in IT service providers' daily practices. The main challenges might concern CSI-related terminology and CSI activities. These need clarification and consistency both in academia and in practice to guide future CSI research, for example, in clarifying roles and improvement actions. Therefore, CSI was a fruitful research target.
2. **Improved CSI model:** The improved CSI model contributes in terms of providing structure for managing and improving the IT service from a continual basis. The current ITIL seven-step improvement process does not clarify how to perform the process in daily service management. This thesis provides an improved CSI model that extends the activities of the ITIL seven-step improvement process (Step 3: Gather the data, and Step 7: Implement the improvement). The purpose was not to create a new model but to create an improved version and link it to the existing seven-step improvement process to contribute to the identified challenges and provide viewpoints to help IT service providers implement CSI activities. The improved CSI model contributes to ISO/IEC 20000-part 1:2018 standard requirements on continual improvement (Clause 10.2 Continual improvement).
3. **Viewpoints of implementing CSI:** This research provides viewpoints for introducing CSI activities in IT service provider organisations. For example, the following points of view are

identified: select an ITSM process framework(s); identify and establish dedicated roles responsible for deploying CSI activities; document the CSI activities and responsible CSI roles keep presentations on knowledge and improvement point of view; and implement the improvement actions into ITSM software or other information system to create template for documenting improvement ideas unified way.

5.2 Theoretical implications

The presented work has theoretical foundations in the ITSM ITIL framework, ISO/IEC 20000-1:2011 for service management, ISO 9001:2015 for Quality management, and ISO/IEC 15504-8 for Process assessment. The chosen research field is interesting because it combines theories and concepts from other areas of research from service science, process improvement, and service quality management. Therefore, the research of this thesis provides new perspectives on existing practices that may be valuable not only for IT service organisations but also for service organisations in other sectors.

The following results are examples of extending the theory: (1) presented an overview of the challenges in the daily ITSM work environment, which other researchers could continue to study in more detail. For example, the interviews showed that the processes were unclear to some of the employees, and they did not identify the process-based approach in their daily work (Paper I). In Paper II, the case organisation presented the need for clarification of roles and responsibilities to avoid extra work.

2) Identified improvement actions are new openings in the field of ITSM and service quality management theory (Papers III, IV, and V).

3) ITSM software perspective for the management of improvement ideas has not appeared in the literature research. ITSM software enables management, control, and improvement of the idea management workflow (Paper V).

4) The social-technical system view of CSI provides continual improvement with a new dimension that has not been used before in the

context of CSI or service science (Paper V). Adopting the socio-technical system enables viewing the improvement as a wider and more sustainable perspective than just as a single process area of ITSM.

5. Findings from the systematic literature review showed that CSI-related terminology needs clarification to guide future CSI research (Paper VI). During the writing of the thesis, the need for better CSI conceptual models and additional case studies dealing with practical CSI practices in an IT service organisation was identified. Better conceptual models help service management researchers to use more precise concepts in their research.

Regarding implications for theory, this study can be seen valuable for the academic community because it provides insights and increased understanding about a service organisation's CSI activities. ITSM practitioners could participate more actively in writing academic ITSM case studies. This would generate wider discussion on real-world ITSM problems.

5.3 Practical implications

This study enabled the author of this thesis to focus on the aspects of CSI actions (measurement and improvement) and explore the improvement in the daily operations of various IT domains from ICT, the unit of a bank, energy, government agency, and ICTM. This thesis has been conducted with the intent of providing IT service providers with practical viewpoints for identifying and managing improvement ideas in a relevant manner. For example, managing CSI could foster the prompt delivery of IT service features to markets.

Taking a more practical approach to the management of improvements is considered important because it may result in positive impacts on IT service providers' organisational practices, such as clearer roles and responsibilities, mature interfaces to other processes, and suitable technologies for operations. The research emphasised the provision of an improved CSI model for existing challenges. IT service providers may use the results to increase awareness of CSI activities and manage improvement ideas to answer service improvements, goals settings to manage

improvements, and identify interfaces with other ITSM practices (e.g. project management, change management).

The results presented in this thesis extend the CSI activities to the following: (1) benefits of ITSM improvement initiatives may increase the interest of implementing improvements (Paper II); (2) identifying process and service measurements, and improvement actions the IT service provider may create a CSI year calendar enabling resources and time to analyse measurement results and implement improvements (Papers III-IV, Paper V); (3) presented improvement actions may increase smooth information sharing between various service management groups and enable identifying a bigger picture of service improvements (Papers III, IV, V).

6 Conclusion

IT service providers face challenges in managing and leading CSI. The research topic in this thesis is significant for IT service organisations. Failures to comply with CSI may result in the following problems: overlapping improvement projects, unsatisfied customers waiting for new service features, lack of transparency of improvement status, and unclear roles and responsibilities to manage improvements.

IT services play an important role in almost all domains (e.g. information and communication technology, energy, health care, and financing and insurance), supporting many work tasks that transfer data and information via systems. Customers now outsource delivering IT services to IT service providers, which allows them to solely focus on their own tasks. Therefore, more attention should be paid to understanding the relationship between the customer and the IT service provider. Many IT service providers have adopted an ITSM and service-oriented approach to managing daily IT operations. ITSM is a set of practices for directing and controlling the service provider's activities and resources for the design, transition, delivery, and continual improvement of services to fulfil customers' requirements.

Traditional improvement frameworks or methods are not suitable as is for an IT service organisation. There are many reasons for this; for example, traditional models focus on product-driven improvement, and some improvement frameworks are more philosophies than concrete models. Some models are essentially designed to optimise the production quality of industrial companies, which does not help IT service providers in the IT service type of business.

There are many frameworks and standards (e.g. ITIL, ISO/IEC 20000, and maturity models) used by IT service organisations to improve services and service processes, but they also face certain challenges in practice. There is a need for a modern model of systematic improvement that is suitable for

today's IT service organisations, which utilise the latest technologies, digital services, and innovations in their service business.

CSI is based on a seven-step improvement model, but organisations are struggling with how CSI is implemented in organisational-wide practices. According to a CSI study (itSMF Finland, 2014), the biggest obstacles to CSI are low awareness, unclear roles, and poor implementation of CSI practices.

6.1 Answer to research questions

The goal of this thesis is to explore the concept of CSI to better understand how to manage continual improvement in a more systematic way. The research problem of this thesis is: *How can IT service providers systematically manage continual improvement?* The research problem was divided into four research questions.

Regarding the first research question, *"What challenges are identified related to IT service management from the IT service provider's perspective?,* we identified several challenges related to ITMS. Highlighting these challenges can enable IT service provider organisations to analyse the current state and, if necessary, implement improvements.

Our findings from the second research question, "*What impacts have resulted from the improvement of ITSM processes?*", revealed multiple impacts of process improvement, which may encourage IT service providers to implement improvements on a continual basis.

The third research question, "*How can service improvement be transformed into a continual and systematic organisational activity?",* the researcher focused on presenting the improved CSI model, aiming at increasing and deepening the understanding about the CSI activities of measuring and managing improvements via the seven-step improvement process.

The fourth research question, *"How do IT service provider organisations implement continual service improvement as a part of daily IT service management?"* focused on presenting a point of view on how to implement CSI in practice. These points of view may help the IT service providers implement CSI effectively.

This research provided a valuable contribution to the theoretical basis of CSI, given the limited research available on the CSI phase. The main contribution of this thesis involves the identified ITSM challenges in IT service provider organisations, the establishment of an improved CSI model, and viewpoints of implementing CSI. The results might be particularly useful to quality management teams of IT organisations and managers who lead and manage IT services using ITSM practices. However, there is still a research gap that needs to be filled.

6.2 Limitations of the work

In qualitative research, four case study tactics have been commonly used to establish the quality of empirical research: construct validity, external validity, internal validity, and reliability (Yin, 2014). The internal validity is only for explanatory or causal studies and is, therefore, not relevant for this study.

Validity and reliability measure the quality of the research approach and the generalisability of the study (Kananen, 2017). *Validation* (validity) expresses how well the research approach used succeeds in examining the characteristics of the phenomenon studied (Yin, 2014). The studies must be r*eliable* (reliability) in that the results obtained are permanent, and when the study is repeated, the same results are obtained (Kananen, 2017). The objective of reliability is to demonstrate that the operations of the study can be repeated with the same findings and conclusions (Yin, 2014). Figure 10 presents the validity and reliability aspects of this study.

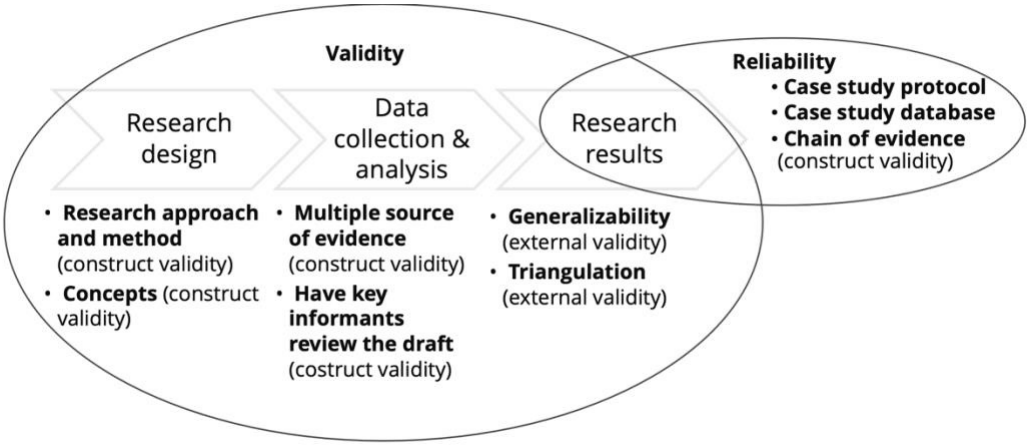

Figure 10. Validity and reliability aspects of this study. Modified from original (Kananen, 2017; Yin, 2014)

Research design. Yin (2014) defined *construct validity* as "identifying correct operational measures for the concepts being studied". Construct validity can be approached with two further questions: (1) Were research methods and approaches selected for studying CSI appropriate? (2) Were the appropriate concepts and measures selected to explore CSI? Regarding the first question, the case study research method was well suited to studying the CSI phenomenon in a given context. It allows researchers to study and increase their understanding of CSI activities in their real-world context. The construct research method was a useful method for creating the first version of the improved CSI model. For this thesis, the systematic literature review provided a very valuable picture of CSI approaches, frameworks, and challenges and enabled positioning the results of this thesis to existing studies. As a result, the chosen methods for this thesis are well suited to addressing the research problem.

In connection with the second question, the concepts of our research were selected from ITSM frameworks, such as ITIL, and standards, such as ISO/IEC 20000. ITIL practices are used for ITSM in IT companies worldwide. We observed a confusing discussion of CSI in the literature: CSI concepts, such as the CSI process, CSI activities, CSI programme, seven-step process activity items, and continuous service improvement programme, are used

without a clear definition. This has resulted in setting theoretical boundaries for CSI, which also hinders posing the right research questions. This lack of clarity in CSI terminologies was identified as a threat to construct validity. Thus, the definitions of precise concepts were challenging during the study.

Data collection and analysis. In this thesis, construct validity was improved by using multiple sources of evidence and having key informants review the draft. The research data were collected from IT service companies in Finland by qualitative methods using multiple sources of evidence, such as interviews, observation, and documentation.

In terms of a qualitative approach, research does not seek absolute or objective truth (Kananen, 2017). Data were collected from employees of IT service organisations in their daily situations, not within controlled environments such as laboratory settings. Additionally, interviewees may pose a limitation to the findings. Interviewees do not necessarily cooperate, nor do they openly share their opinions with the researcher. The researcher's behaviour, interview situations, and interview time might have an effect on the interview results.

Quantitative data, such as metrics, and measurements, would have provided a richer view of the organisations. It would be interesting to conduct a study that utilises quantitative data (e.g. the number of ideas, the throughput time of the idea, the estimated financial benefits of the idea).

A limitation that could be addressed in future studies is the inclusion of multiple organisations in the case studies to provide a richer view of the ITSM challenges, which could further improve the CSI model and offer more CSI implementation viewpoints. In the interviews, customer representatives could have been included to provide richer insights into CSI. Another limitation is the variations in the service management methods identified in the case organisations, which can be a challenge to generalising the results of the study.

The elements of the improved CSI model (Papers III, IV, and V) were reviewed with the case organisation's participants (e.g. process managers, CSI process owner, quality managers, financial manager, specialists,

development managers, group managers). We could have had validation meetings with employees, such as service desk workers, who entered the data on improvement suggestions for ITSM software. Unfortunately, the lack of time was a limiting factor (commitment of the case organisations to research and time available to the researcher). Paper IV was reviewed by the case organisation director (he also kept the role of CSI process owner), and Paper V was reviewed by the head of manager in the IT service organisation's service desk department (he previously held the role of quality manager) and two interviewed service managers.

Having key informants' reviews adds to the authenticity and accuracy of the research material and results, thus providing proof that the researcher has not invented the material herself. For example, the sources of information included interviews with various roles, such as process managers, and ITSM software main users from the case organisations. There might be a threat that the selected individuals in interviews or observation targets do not represent the target group and thus might give incorrect or misleading answers, which reduces the validity of this study.

While writing research papers, the author worked closely with the research team in the UEF's research project (Papers I, II, and III) and with colleagues in the IT service provider company (Papers IV, V, and VI) to bring up new perspectives and share viewpoints on ITSM and CSI. The research project researchers were aware of ITSM processes, and the colleagues worked with specific ITSM activities. This enabled fruitful conversations between researchers and case organisations' participants and improved the researchers' ability to validate the results in practice.

Research results. *External validity* deals with the generalisability of the research results (Yin, 2014). It is important to mention that as this is an exploratory study, practitioners and academics should be careful when trying to generalise the results presented in this thesis. The qualitative research did not aim to generalise the results to other IT service providers due to the limited number of cases; instead, the focus was on exploring the theory and practice of CSI. Hence, the case study does not enable us to

generalise the results to other companies. Findings may be used as a starting point for future CSI studies. For example, the improved CSI model in a research setting is only a first step but a necessary one towards increasing CSI understanding. The researcher identified the following limitations related to external validity:

- The research was conducted only in Finland and with five industry case organisations. Further studies could provide a comparison of CSI practices between different countries.
- CSI, as an emerging research topic, caused difficulties in setting theoretical boundaries and choosing key concepts.
- The studies shown in research Papers I-VI did not include communication with IT service customers. It would be interesting to ask customers' viewpoints on continual improvement and how they recognise the improvements.
- The transition from a project researcher to an employee role in an IT service provider organisation may affect the researcher's objectivity.

The results of this study are qualitative, making measurement and reproducibility challenging. However, qualitative research is an important means of identifying research topics that can be examined in more detail using quantitative methods (Yin, 2014). No similar studies were found in the literature review for this study. Thus, no confirmation of the improved CSI model or implementation viewpoints was obtained.

There may be bias caused by the fact that the author was working in the case organisation. However, this also increased the quality of inferences because the author's work role included improvement of CSI; thus, the researcher gained a deep understanding of the research subject.

Despite the above-mentioned limitations and the lack of similar studies, the study design is applicable for further studies. Additionally, the data collected for this thesis are empirical data from IT service providers, in which case, the results are at least indicative. The implementation of similar research in several organisations guarantees more generalisable results. Our findings are a valuable add-on to the existing service science and

process improvement, including detailed information on service monitoring mechanisms and types of improvement actions that can be used to extend the theory of ITSM and CSI.

In this study, the inconsistency of the interpretation was reduced using *triangulation*. Denzin (2009) extended the idea of triangulation beyond its conventional association with research methods and designs. Triangulation allows researchers to be more confident of their results. The three types of triangulation included:

- Methodological triangulation: The researcher used multiple methods to conduct this thesis, including a case study, constructive research, and a systematic literature review.
- Data triangulation: The research data of this thesis were collected from multiple sources, such as participant observation, documents, archival records, and interviews.
- Researcher triangulation: During the research, multiple participants were involved (project researchers and thesis supervisors). This enabled the sharing and use of insights from other researchers.

Additionally, researcher could have used theory triangulation (Denzin, 2009). This type of triangulation was not used in this thesis because the researcher focused on ITSM and service science while performing the studies. The researcher used a case study protocol (see Chapter 3.2.4), utilised a case study database, and a chain of evidence to increase the repeatability (reliability) of the research. Various types of documentation and material were collected from the case organisations during the research. To organise and document the data collection, creating a *case study database* is recommended (Yin, 2014). The researcher stored the data in several data stores, such as computer folders, Microsoft SharePoint, paper folders, and email folders categorised based on the case organisation's name.

Establishing a chain of evidence means that the results of this thesis should be traceable from the research questions to the results and back (Yin, 2014). Table 5 presents the chain of evidence in this thesis.

Table 5. The chain of evidence supporting the reliability of the thesis

Research question	Source of evidence	Main contribution
1 What challenges are identified related to the IT service management from the IT service provider's perspective?	Papers I, II	Multiple challenges identified related to IT service management from IT service provider's perspective
2. What impacts have resulted from the improvement of IT service management processes?	Paper II	Impacts presented from the improvement of the IT service management processes
3. How IT service improvement can be transformed into a continual and systematic organisational activity?	Papers III, IV, V, VI	An improved CSI model extends the steps of the ITIL seven-step improvement process (Step 3: Gather the data, and Step 7: Implement the improvement) to transform IT service improvement into a continual and systematic organisational activity
4. How can IT service provider organisations implement continual service improvement as part of daily IT service management?	Papers IV, V	Proposed six implementation tasks that organisations may use in implementation of CSI

In this study, conducting the same research in the same organisations may no longer produce similar results because the subject's activities have changed, interviewed people might have changed their jobs, and there has been time-based learning and progress.

6.3 Future research opportunities

Several further research ideas were identified during the study. First, it would be interesting to research the maturity of the seven-step improvement process in different ITSM organisations. This could be conducted, for example, using the TIPA process assessment framework (Barafort et al., 2009). Second, further research could focus on measuring the management of improvement ideas with the attributes provided by ITSM software, for example, to measure the volume of improvements in different categories or the implementation rate of ideas. Third, future research could study the possibility of adding a new step to the seven-step improvement process (Step 8: Evaluate the effectiveness of implemented improvement) to better support the implementation of improvements related to IT services and ITSM processes.

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PAPER VI

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SANNA HEIKKINEN

The implementation of improvements should be part of the daily operations of IT service providers. Improvement frameworks typically involve some type of improvement cycle. The goal of this thesis is to explore the concept of Continual Service Improvement (CSI) to better understand how to systematically manage continual improvement in IT service organizations. The main contribution of this thesis involves the identified ITSM challenges in IT service provider organisations, the establishment of an improved CSI model, and viewpoints of implementing CSI.

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