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Quality Management for IT Support Services
- A case study of an IT helpdesk service

QUALITY MANAGEMENT FOR IT SUPPORT SERVICES

A CASE STUDY OF AN IT HELPDESK SERVICE

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Abstract

IT services are a necessary support for most business processes; therefore the quality of IT support services is a topic of high importance. The aim of this study was to analyse how an IT helpdesk service can be improved in order to align with the organisation's expectations. The study was conducted as a case study of an IT helpdesk service during spring 2013. The data collection combined a quantitative analysis of event logs data for a two-year period, with a qualitative approach conducting observations and ten interviews.

The result showed that the quality issues arose from two main areas; resolution time of requests and professionalism of IT staff. The quality issues are, according to both the quantitative and qualitative analysis, caused by high workload for one of the IT department's teams and high expectations of the organisation. Furthermore, this study emphasises that alignment between IT department and organisation is an issue of both sides, as alignment concerns mutual understanding and communication. To solve the service quality issues this study recommends starting to work with measurability and continuous improvements, for example Lean Six Sigma. The IT department can strive to increase the interdepartmental communication, share work tasks, educate internally, document competences and clarify responsibilities to decrease the workload.

Keywords: IT and Business Alignment, Quality Management, IT Service Management, IT Helpdesk Service, IT Support Services

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Abbreviations

BPR – Business Process Reengineering

CAB - Change Advisory Board

CFO - Chief Financial Officer

CIO - Chief Information Officer

CSF – Critical Success Factors

CSI - Continual Service Improvement

CSR - Corporate Social Responsibility

DMAIC – Define, Measure, Analyse, Improve, Control

ERP – Enterprise Resource Planning

ISO – International Organization for Standardisation

IT – Information Technology

ITIL – IT Infrastructure Library

ITSM – IT Service Management

JIT – Just-in-Time

KPI – Key Performance Indicator

OLA – Operation Level Agreement

RFC – Request for Change

SAM - Strategic Alignment Maturity

SLA – Service Level Agreement

SLM – Service Level Management

SOP – Standardised Operation Process

TQM – Total Quality Management

VoC – Voice of the Customer

1 Introduction

This chapter introduces the background of the study, the purpose, research questions, delimitations, disposition and terminologies used.

1.1 Background

Information technology (IT) is a vital part of business processes, IT services must satisfy the business' demands and support the business' IT systems. IT support services are a key factor for minimising IT failures and sustain the business performance. Due to the competitive environment an IT department must meet or exceed the expectations from the organisation. Thus to ensure quality of IT services, IT operations must be systematically planned and aligned to the organisation's requirements (Winniford, Conger, & Erickson-Harris, 2009).

Quality management for IT services has been a topic for decades, though there are still great possibilities for quality improvements for IT departments (Collin, 2003). An approach to quality management for IT services is IT Service Management (ITSM), which can be defined as:

> *"Implementation and management of quality IT services that meet the needs of the business."* (Cabinet Office, 2011b, p. 16)

IT Service Management provides a process framework, guidelines, and metrics; it aims to align IT and business to optimise IT services. Worldwide most IT departments have begun to implement ITSM in their organisations and the most frequently implemented part of the framework is the helpdesk service (Galup, Dettero, Quan, & Conger, 2009). An ITSM helpdesk service operates as a single-point-of-contact for users in need of assistance with an IT issue. The IT helpdesk service is the most important interface between the IT department and the business (Cabinet Office, 2011b).

IT support services, particularly the IT helpdesk service, is an obvious target for improving the customer satisfaction of an IT department (Jäntti, 2012b). The quality of a service is essentially determined when the supplier performs the service for the customer (Bergman & Klefsjö, 2004). Therefore, IT departments which prioritise improvements for support services will emphasis effects on customer satisfaction (Iden & Eikebrokk, 2013).

This study is based on a case study of an IT department for a multinational company, where the IT department is located in Sweden. The IT department operates globally and offers IT services to the business. A challenge for the IT department is to deliver an IT helpdesk service that satisfies the organisation's expectations. According to the user satisfaction survey from 2012 (see Appendix A), several quality issues surfaced and the IT helpdesk service showed low results for user satisfaction.

Several users strongly stressed the inability of the helpdesk service to deliver quick responses. The respondents also addressed issues as IT employees not being service-minded and lack of communication between IT department and business. The user satisfaction survey made the IT department realise that the service quality of the IT helpdesk service needs to be aligned to satisfy the organisation's expectations.

1.2 Purpose

Based on the description above the subsequent purpose has been developed:

The purpose is to analyse how an IT helpdesk service can be improved in order to align with the organisation's expectations.

1.3 Research questions

Three research questions have been formulated, the first research question focus on identifying challenging areas for the IT helpdesk service:

- *What areas in the IT helpdesk service are not aligned with the organisation's expectations?*

The second research question focus on identifying the causes of the not aligned areas:

- *Why is there a misalignment between the IT helpdesk service and the organisation's expectations?*

The third research question relates to improving the alignment, deriving from the answers from the previous questions:

- *How can improvements be applied in order to create alignment between the IT helpdesk service and the organisation?*

1.4 Delimitations

This case study is delimited to the internal environments of the case study company. The focus is on the IT helpdesk and its work process, handling IT requests about service or change and notifications about incidents or problems. Due to time limitations, implementation of improvements and financial impact are not parts of this case study.

1.5 Disposition

The disposition of this report is as follows:

- The first chapter introduces the reader to the context of the study, purpose, research questions, delimitation and terminologies used.
- The second chapter presents the literature review.
- The third chapter describes the methodology; research strategy, research design and data collection methods. It also discusses trustworthiness and ethical issues.
- The fourth chapter describes the context of the case study, hence in detail describes the IT department and IT helpdesk service process.
- The fifth chapter presents the empirical findings and analysis of event logs data from the IT helpdesk system, interviews and observations.
- The sixth chapter discusses and interprets the findings.
- The seventh chapter concludes the study and provides some points for future research.

1.6 Terms and terminologies

Backlog: a queue of unsolved requests, an accumulation of work that is waiting to be done.

Escalate: to forward a request to a specialised technician.

Request: a support or change inquiry to the IT department, from the organisation or a user.

Resolution time: the time from a request is announced to it is resolved and closed.

The Group: the group of companies to which the IT department belongs.

2 Literature review

The literature review begins with quality management in IT and the quality cornerstone model (Bergman & Klefsjö, 2004), the subsequent text follows the model. Thus, describes the IT support process, followed by the customer perspective and the importance of involvement and alignment, continuous improvements and measurement in IT services.

2.1 Quality management and IT

Quality management is a continuous process focused on working proactively, preventing and preparing the organisation for dealing with quality issues. Quality work can be seen in the perspective of Bergman and Kelfsjö's (2004) quality management cornerstone model (Figure 1). The cornerstones are; focus on process, focus on customers, let everybody be committed, improve continuously and base decisions on facts. Additionally, an organisation culture that is valuing quality must be supported by top management and system thinking (Bergman & Klefsjö, 2004).

Top management commitment

System thinking
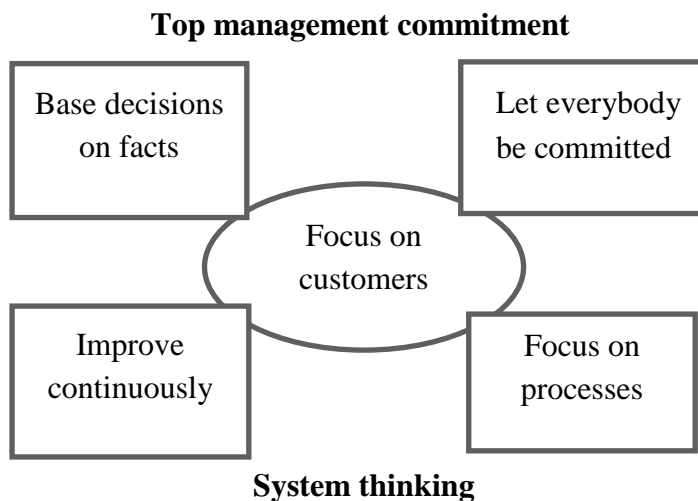
Figure 1: The quality management cornerstone model

The first step in establishing quality management principles in IT departments is to begin with measuring IT processes. The following step is to implement a continuous improvement program (Nolan, 1995). Both these steps are included in IT Service Management (ITSM) frameworks and the most recurring benefit, mentioned by researchers, of ITSM is improved service quality (Marrone & Kolbe, 2011). Service quality can be defined as:

> *"The degree of discrepancy between customers' normative expectations for service and their perceptions of service performance."* (Gorla, Somers, & Wong, 2010, p. 213)

Most businesses would not survive without IT supporting the business processes. Thus, IT is a critical factor and must be included in quality management projects (Azadnia & Fasanghari, 2008). To leverage benefits of IT by improving quality has been a topic in academia for more than a decade:

"Quality improvement is vital to companies trying to thrive in an increasingly competitive environment and IT must be a part in an organisation's efforts to institutionalise quality." (Nolan, 1995, p. 3)

The competitive business environment still forces IT departments to optimise processes and deliver high-quality services to the organisation. Hence, IT quality is a top concern of IT executives, exemplified by:

"Increased organizational dependence on information systems and losses resulting from poor IT quality drive management attention toward IT quality improvement." (Gorla, Somers, & Wong, 2010, p. 222)

Advantages for IT departments working with quality and operations management can be both economical, as decreased cost per produced unit, and organisational, for example increased customer satisfaction or more effective processes. IT service is one of the industries that have the greatest advantages to benefit from quality management (Collin, 2003). IT service accounts for 70% to 80% of the expenditure of an IT organisation (Marrone & Kolbe, 2011) and problems with IT quality can stand for up to 30% to 50% of the total costs of IT in an organisation (Collin, 2003).

2.2   IT support processes

IT departments follow an IT Service Management framework to structure the IT service processes, and to clarify responsibilities and the delivered services. An IT support process is a central function for keeping the IT services intact and for gathering information about possible improvement areas (Cabinet Office, 2011c).

2.2.1   An introduction to IT Service Management

IT Service Management is a subset of the service science and a contrast to technology oriented approaches to IT (Galup, Dettero, Quan, & Conger, 2009). ITSM is process-focused and share similarities with other frameworks for process improvement, project management, IT governance and methodologies like Business Process Reengineering (BPR) and Six Sigma (Pollard & Cater-Steel, 2009).

IT Service Management frameworks are widely used for example in companies as IBM, Microsoft and HP, which all have developed own ITSM frameworks to fit their business models (Marrone & Kolbe, 2011). The most commonly used ITSM framework worldwide is the IT Infrastructure Library (ITIL), which provides best practice and offers a body of knowledge for IT service processes (Cabinet Office, 2011b), see Section 2.2.2. Easily explained, ITSM is a concept and ITIL is a framework that IT departments can implement, which explains what IT departments should do (Iden & Eikebrokk, 2013). Another ITSM framework is CobiT (see Appendix D).

The emphasis of ITSM is defining, managing and delivering IT services to support business objectives and customers' expectations (Winniford, Conger, & Erickson-Harris, 2009). Three viewpoints are combined in ITSM, the perspectives of people, process and technology. IT

services should integrate all three perspectives to deliver an end-to-end service which satisfies the organisation (Heikkinen & Jäntti, 2012; Winniford, Conger, & Erickson-Harris, 2009).

IT Service Management facilitates the interaction between IT staff and the organisation (Pollard & Cater-Steel, 2009). Hence, a major benefit is that ITSM aim for IT and business alignment thus supports the process of IT striving to satisfy the organisation's expectations. (Marrone & Kolbe, 2011). For example outsourcing decisions can be supported by ITSM, since ITSM clarifies expectations on an outsourcing relationship (Haverblad, 2007).

Frequently mentioned benefits of ITSM are; improvement of service quality, standardisation of service, customer satisfaction and return on investment. Other benefits mentioned are reduction of downtime, benefits from benchmarking, improved financial contribution control, first call resolution rate and morale of IT staff (Marrone & Kolbe, 2011)

2.2.2   IT Infrastructure Library

The terms ITIL and ITSM are not synonymous (Winniford, Conger, & Erickson-Harris, 2009), but ITSM is often associated with the framework ITIL (Galup, Dettero, Quan, & Conger, 2009). ITIL were developed by the British Government during the 1980´s and have evolved continuously. International Organization for Standardisation (ISO) standards has strongly stimulated the development, for example the quality standards ISO 9000 and the publications covering ITSM standards ISO/IEC 20000 (Galup, Dettero, Quan, & Conger, 2009). The third version of ITIL was revised 2011 and contains five volumes (Iden & Eikebrokk, 2013).

The ITIL philosophy extends the perspective of IT beyond mere technology, and includes the perspectives of people and process; furthermore ITIL is built on ITSM best practice. The ITIL framework serves as a blueprint for IT processes, but the framework does not prescribe how to adapt, implement or adopt ITIL (Pollard & Cater-Steel, 2009). Thus, ITIL describes what IT organisations should do, but not how to do it (Azadnia & Fasanghari, 2008).

2.2.3   Critical success factors for implementing IT Service Management

An ITSM implementation is a complex project, which affects most of the IT staff and can take years (Iden & Langeland, 2010). The level of implementation progress is associated with firm size; several larger organisations have implemented ITSM (Kanapathy & Khan, 2012). A literature study from 2013 argues that there is limited research on implementation strategies, methods, measurements and alignment in the context of ITSM. However, critical success factors (CSF) and challenges for ITSM implementation projects have been covered by several researchers (Iden & Eikebrokk, 2013).

The CSFs associated to an ITSM implementation is; executive support, interdepartmental communication and collaboration, training, careful software selection and use of consultants. Additionally, organisational culture, priority of the project and customer focused metrics are common factors. In discussion forums CSFs that arise are; considering dual roles, measuring return on investment, engaging the right people and gaining support from technical staff (Pollard & Cater-Steel, 2009). Thus, CSFs are related to strategic planning, change management and continuous process improvement (Huang, Wu, & Chen, 2012).

The importance of support from senior staff is essential for project success (Tan, Cater-Steel, & Toleman, 2009). Knowledge and training is needed since competence about ITIL and ITSM is central, furthermore knowledge in process thinking can be valuable for ITSM implementation (Iden & Langeland, 2010). Two challenges appear to be recurring while implementing an ITSM framework, lack of executive sponsorship and lack of internal knowledge related to ITSM. Other challenges can be; business understanding of ITIL objectives, lack of resources, organisational resistance and maintaining progress (Marrone & Kolbe, 2011).

2.2.4   Service level management

A service level management (SLM) process is responsible for agreements between the IT service provider and the business. The service provider can be an IT department, or an external provider if the IT service is outsourced (Cabinet Office, 2011b). The SLM process negotiates operation level agreements (OLA) and service level agreements (SLA) and continuously ensures that the agreements are met. OLA's are agreements between the IT department and another parts of the organisation, or between functions inside the IT department (Cabinet Office, 2011b).

SLAs are contracts that monitor and document the business' requirements, SLAs are keys for managing risks and cost of IT services (Moreau, 2007). IT providers do often communicate with the organisation by using SLAs to discuss business requirements and service quality levels. The agreements are used as an instrument for managing expectations and ensuring adherence to the performance targets of an IT service (McNaughton, Lewis, & Ray, 2010). SLAs are usually written in business language, in contrast with interdepartmental contracts that can be written in technical terms (Winniford, Conger, & Erickson-Harris, 2009).

There are no specific standards for developing these contracts, but the structure is usually similar. The process of creating a SLA can be described in four steps:

1. Defining the organisations requirements and objectives.
2. Determine the operational needs.
3. Create a set of measurements.
4. Establish accountability.

SLAs generally contain service categories and acceptable service qualities, definitions and formulas of metrics, regulations about penalties or credits according to performance and an evaluation plan. It is important to have in mind that a written SLA can be undermined by unwritten agreements, if the two parts do not respect the formal agreement (Moreau, 2007).

2.2.5   An IT helpdesk service in IT Service Management

The main responsibility of an ITSM helpdesk service is to provide a single contact point, see Figure 2 and Figure 3, for users to report IT problems. The IT helpdesk registers, classifies and attempts to solve incidents, problems and service requests. ITIL refers to a helpdesk as a service desk (Cabinet Office, 2011b).
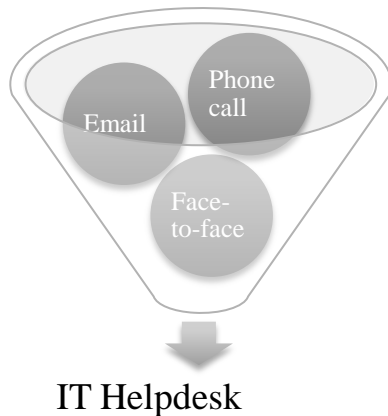
Figure 2: All modes of contacts go to the helpdesk   **Figure 3: All requests go to the helpdesk**
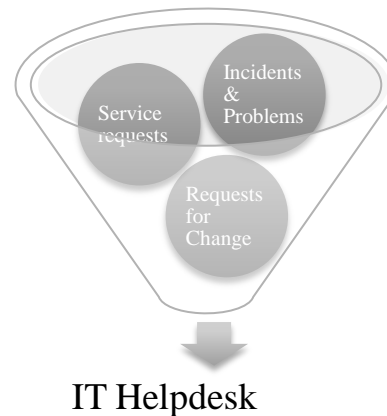
The helpdesk process starts when a user contacts the IT helpdesk, the first contact is always made to the first-line helpdesk staff. However, if the first-line technicians are not able to solve the case, the case is escalated to specialised IT staff, the second or third-line technicians (Edgington, Raghu, & Vinze, 2010). Having a single contact point gives the advantage of providing users with an easy accessible contact for all IT related problems and ensures that confusion about who to contact is minimised (Taylor & Macfarlane, 2006).

Three types of requests are submitted to an IT helpdesk; service requests, requests for change (RFC), incidents and problems (Figure 3). A service request is a request for a standardised service, for example a new screen, change of a password or a request to open an account in an IT system. An RFC is a request for change according to the current state, for example improvement suggestions or a new function in the business system (Cabinet Office, 2011b).

Incidents are defined as unplanned interruptions or reductions of IT quality. The purpose of incident management is to restore the service to normal operation and minimise impact on business. A problem is *"the underlying cause of one or more incidents"* (Cabinet Office, 2011b, p. 97). Problem management strives to minimise the impact and the occurrence of problems by working proactively. The value of problem management is cost reduction, as proactive work creates both higher IT service productivity and availability (Cabinet Office, 2011b).

2.3 Customer focus in IT support services

The customer of an IT support service can be seen either as the users of IT services or as the organisation. Usually the user is named the customer, even if the user itself is not the paying customer, which normally is the organisation. The implication of referring to the user as the 'customer' is to create a customer-centric approach where the user is able to set the demands and be treated with respect as a valuable customer (Hero & Larsson, 2013).

IT departments operate as a service organisation with the aim of satisfying the organisation's requirements (Iden & Eikebrokk, 2013). Misalignment between the organisation's expectations and the IT services is an issue in many organisations (McBride, 2009).

Nevertheless, ITIL stresses that to ensure customer satisfaction, IT service providers should do everything in their power to guarantee that services are appropriately agreed, funded and delivered (Cabinet Office, 2011c).

2.3.1 Understand user satisfaction

The user satisfaction of an IT helpdesk service is affected by several factors. For example, the ability to deliver promised services, keeping the customer informed, showing empathy and understanding the users' situation (Haverblad, 2007). Customer satisfaction is linked to the expectations of the customers, in this case the users' and organisation's expectations. The quality of a service is determined when the person performing the service interacts with the customer. It is difficult to change the perceived service quality when the interaction is completed (Bergman & Klefsjö, 2004).

To understand the expectations the IT department must listen to the users to capture the voice of the customer (VoC). Lean Six Sigma methodology suggests several tools for understanding what customers care about, setting priorities and determine what customer needs that can profitably be met (George, Rowlands, Price, & Maxey, 2005).

Tools for collecting VoC can be annual surveys, visiting users and feedback from the helpdesk (Shaffie & Shahbazi, 2012). An IT helpdesk service is a possible gateway to capture VoC and understand user satisfaction. Input from IT support staff is valuable as their proximity to users can be a useful source of ideas (Taylor & Macfarlane, 2006). Users are normally limited in describing their needs for advanced technology and complex services (Ohlsson, Rosengren, Ertan, & Wernmo, 2011). Therefore, it is important to notice how IT service and equipment is actually used, to understand what is the normal business practice compared to the correct and valid practice (Taylor & Macfarlane, 2006).

The dimensions of a service quality can be seen as eight factors; reliability, credibility, access, communication, responsiveness, courtesy, empathy, tangibles (Bergman & Klefsjö, 2004). Another approach to service quality is the five dimensions which Chang and Su (2007) used in their IT service development study; tangibles, reliability, responsiveness, assurance and empathy. Gorla et al. (2010) argued that for measuring service quality within information systems the tangible dimension can be avoided, since the tangible dimension is difficult to measure with reliability.

The quality dimension of reliability relates to that the promise to the user is kept, for example the delivery time. Responsiveness implies the willingness of the supplier to help its users providing a quality and fast service (Chang & Su, 2007). Assurance, considers if the staff are skilled employees, which are able to gain trust and confidence from the customer. Empathy, evaluate if the customer's situation understood (Bergman & Klefsjö, 2004) and in the helpdesk case if the users treated like valuable customers (Hero & Larsson, 2013).

2.3.2 Understand business requirements

Companies are constantly developing their strategies to adapt to the changing business environment. This change of business strategy can create gaps in the alignment between IT and the organisation (Ohlsson, Rosengren, Ertan, & Wernmo, 2011). Nevertheless, an IT

service must reflect and reassess upon the organisation's changing needs (Persse, 2006) and ITSM approaches this change with continual service improvements (CSI) (Cabinet Office, 2011a).

A common language between IT and business is necessary for IT department to understand the business requirements (Ohlsson, Rosengren, Ertan, & Wernmo, 2011). The vision of the organisation must be communicated to the IT department, which creates an IT strategy that aligns to the overall strategy. The IT strategy should define how the service provider will use IT services to achieve the expected outcomes and meet objectives (Cabinet Office, 2011c).

IT departments are nowadays starting to approach environmental and corporate social responsibility (CSR) challenges, as the interest for CSR issues are increasing. Thus, a new and increasing business requirement is seen in CSR. The topic is influencing many IT strategy processes to include metrics according Green IT and sustainability in IT strategies (Dubey & Hefley, 2011).

2.4 Alignment between IT services and the organisation's expectations

IT and business alignment has been a topic since the 90´s, the starting point was the change in perspective from a strict technology IT perspective, to considering IT from the aspects of skills and process (Henderson & Venkatraman, 1993). Alignment is a relevant concern for all firms regardless of size (Gutierrez, Orozco, & Serrano, 2009), since strategic alignment has significant influence on the organisations sustainable competitive advantages (Almajali & Dahalin, 2011).

Alignment between IT and business has a positive effect on business performance (Marrone & Kolbe, 2011). Several sources argue that ITIL increases alignment (Iden & Eikebrokk, 2013) and efficient use of ITSM is a critical factor for successful enterprise strategy (Kanapathy & Khan, 2012). When McBride (2009, p. 241) explored issues with ITSM within four different IT departments, he concluded that:

> "*The theme of these problems seems to concern the relationship between the IT service and its stakeholders.*"

Two factors for misalignment between IT and business are a lack of common understanding between IT and business and the strategic business planning process not involving IT. Misalignment could lead to that the organisation lose competitive advantages, miss opportunities or have budget overruns for IT projects (Almajali & Dahalin, 2011).

2.4.1 Top management commitment to strategic IT alignment

IT and business alignment can be described as the degree to which IT strategy is supported by the organisation's strategy (Marrone & Kolbe, 2011). Thus, similar perspectives, values and beliefs between IT managers and top management are important factors for strategic alignment. IT and business alignment have mostly been driven by the business. The starting point has usually been that IT has difficulties in understanding the business requirements and is unable to deliver what the organisation wants (Ullah & Lai, 2011).

If there is a lack of communication between IT and business, this can lead to several challenges and unawareness from the IT department. The challenges are; disconnections in outcomes, internal IT, different language in different management layers and different metrics (Tarafdar & Qrunfleh, 2009). To better understand and improve IT and business alignment the Strategic Alignment Maturity model (SAM) can be used. The SAM model has six alignment criteria regarding maturity of alignment; communication, competency or value measurement, governance, partnership, technology and skills (Luftman, 2003).

However, there is no agreement on the factors which describe the IT and business alignment (Marrone & Kolbe, 2011). A second approach to measure alignment are that small organisation should focus on measuring the organisations IT sophistication, commitment to IT and top management's software knowledge (Gutierrez, Orozco, & Serrano, 2009). A third suggestion is the factors; co-ordination, influences, participation, formality and scope. A fourth framework for alignment considers: shared knowledge, success of IT implementation, connection between business planning and IT, and communication between IT and the organisation (Marrone & Kolbe, 2011).

2.4.2   Alignment between IT services and users' expectations
Lack of alignment between users and IT services could result in unresolved incidents and damage in the relationship (McBride, 2009). From the users' perspective, IT and business alignment can be for instance; organisation wide technology standardisation or standardised channels for IT and business communication. An example of a communication channel is a committee communicating at lower level, since the IT managers tend to be very busy. Alignment concerns the realised benefits of IT, as better communication between IT and business in everyday life and alignment at all level of projects (Tarafdar & Qrunfleh, 2009). A way to reduce the need of communication between IT and organisation is to have high levels of shared domain knowledge and understand each other's situation (Gutierrez, Orozco, & Serrano, 2009).

2.5   Continuous improvements in IT Service Management
IT departments need a supplement to ITSM, to provide a standardised way of measuring, reporting and managing improvement ideas (Jäntti, 2012a), since ITSM focus on what to do and not how (Azadnia & Fasanghari, 2008). For example, ITSM recommends IT organisations to work with continuous improvements with both the business and user's perspective in mind (Mesquida, Mas, Amengual, & Calvo-Manzano, 2012). By continuously undertaking proactive work, the IT department can ensure that some problems can be avoided (Haverblad, 2007). For smaller organisations, regular meetings to discuss quality management issues can be more useful than appointing special staff members to quality improvements (Taylor & Macfarlane, 2006).

Improving effectiveness in a service organisation comes with several difficulties, since the services are highly customised and the service providers differ in both skills and motivation to solve the task (Harmon, Hensel, & Lukes, 2006). Many IT departments consider improvements a challenging task. Common pitfalls for improvement projects are; high

reliance on external knowledge and consultants, using too complex tools, lack of process culture and lack of management support (Jäntti, 2012a).

The challenges for continuous improvements in ITSM can be categorised according to the three ITSM perspectives; process, people and technology. Challenges in improving ITSM are for example, communication and feedback, lack of standardised processes and responsibilities, reporting and follow-up, and challenges in integrating systems (Heikkinen & Jäntti, 2012).

There have been several different attempts to improve an IT helpdesk service, for example using a Lean Six Sigma framework (Su, Chang, & Chiang, 2006), a Six Sigma quality method (Li, Wu, Yen, & Lee, 2010), the seven step model called The Key to ITSM Excellence Technique (Jäntti, 2012b) and a normative model to analyse the keywords for requests and how they contribute to SLAs (Edgington, Raghu, & Vinze, 2010). Furthermore, Lean (Taylor & Macfarlane, 2006) and Six Sigma are suggested methods (Azadnia & Fasanghari, 2008; Jäntti, Lahtela, & Kaukola, 2010; Donko, 2012).

2.5.1 Improving IT processes with Lean Six Sigma

The Lean Six Sigma methodology provides tools and guidance for improvements in the area of process quality, speed and complexity (George, Rowlands, Price, & Maxey, 2005). Lean Six Sigma is a combination between the two methodologies Lean and Six Sigma. Synergies can be created since Lean works through continuous and incremental improvements while Six Sigma uses more an approach of immediate breakthrough improvements. Hence, Lean usually addresses day-to-day problems while Six Sigma focuses on more complex problems (Assarlind, Gremyr, & Bäckman, 2012).

Lean is used for identifying inefficiency and waste in processes, addressing issues of speed, flexibility and quality. Six Sigma is a data-driven methodology that focuses on precision and accuracy. A way to combine these methodologies into Lean Six Sigma is to follow the Six Sigma's DMAIC-phases and within each phase use either a statistical or Lean tools to solve the problems (Hilton & Sohal, 2012).

Studies has shown the value of incorporating a standardised approach to IT services (Galup, Dettero, Quan, & Conger, 2009; Kanapathy & Khan, 2012). Inefficient work processes can result from a lack of standard operating procedure (SOP) that guides the staff through the process (Su, Chang, & Chiang, 2006). SOP is a set of documents containing instructions about the routine work processes of operations. The SOP also has guidelines about what to do in an exceptional case and including security administration (Cabinet Office, 2011b).

2.5.2 Combining Lean and IT Service Management

Lean is considered a development of just-in-time (JIT), since the terms has many similarities. Tools connected with both Lean and JIT are for example Kaizen, Five S and Kanban (Näslund, 2008). Lean has four major concepts; tools and techniques, involvement in people, continuous improvement and removal of waste (Assarlind, Gremyr, & Bäckman, 2012).

According to Taylor and Macfarlane (2006), Lean is well suited for IT organisations wanting to boost delivery of service and performance. For example, a faster delivery of the service and speed advantages in the improvements cycles to pursuit perfection can be obtained by Lean (Chang & Su, 2007). Lean in the context of IT has a strong focus on eliminating waste. The aim is to eliminate tasks which generate unnecessary steps in the processes and also remove task which record data that simply is retained and never used and third task which do not contribute to fulfilling SLA (Taylor & Macfarlane, 2006).

2.5.3 Combining Six Sigma and IT Service Management

Six Sigma is related to Total Quality Management (TQM) (Näslund, 2008). Six Sigma was established as a best practice concept for optimising processes, the focus is usually on customer needs and measurability (John, Meran, Roenpage, & Staudter, 2008). Six Sigma has seven main concepts; the DMAIC cycle, Six Sigma toolbox, Six Sigma organisation, customer focus, focus on the bottom line, reduction of variation and decision based on facts (Assarlind, Gremyr, & Bäckman, 2012). Six Sigma can be combined with ITSM and provide guidance to quality improvements in IT service processes (Azadnia & Fasanghari, 2008; Donko, 2012).

Six Sigma follows a five step model (Figure 4) for problem-solving called the DMAIC (John, Meran, Roenpage, & Staudter, 2008). The cycle starts with the step *Define,* where the problem, goal and financial benefits are considered. Followed by the step *Measure*, where key performance indicators are defined and the required data and performance measures are collected. Then *Analyse*, to find the root cause of the problem and *Improve* to change the process to eliminate errors and instability. The cycle is closed by the step *Control,* to ensure the improvement is sustained (Shaffie & Shahbazi, 2012).
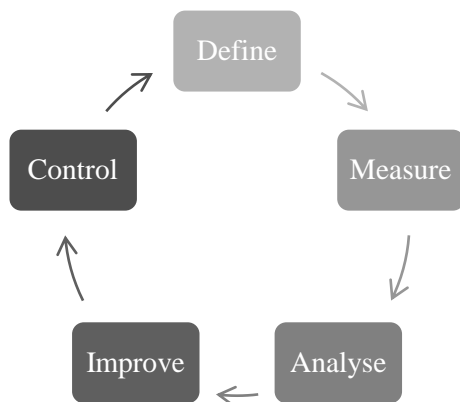
Figure 4: The DMAIC's five steps Define, Measure, Analyse, Improve and Control

The Six Sigma process DMAIC and ITIL process CSI can be combined, see Table 1, since both follow similar paths (Donko, 2012). However, more research is needed to entirely cover the DMAIC process' fit to ITSM purposes (Jäntti, Lahtela, & Kaukola, 2010).

Table 1: Relationship between the steps in CSI and DMAIC (Donko, 2012)

CSI	DMAIC
Step 1 – Identify the strategy for improvement	Define
Step 2 – Define what to measure	Define
Step 3 – Gather the data	Measure
Step 4 – Process the data	Measure
Step 5 – Analyse the information and data	Analyse
Step 6 – Present and use the information	Improve
Step 7 – Implement improvement	Improve, Control

2.5.4 Measurement in IT services

IT departments often communicate through SLA and IT services must be supported by significant and visible business metrics showing the progress for the organisation (Winniford, Conger, & Erickson-Harris, 2009; Moreau, 2007). Communicating progress to organisation can help maintain the support from top management and the organisation (Tan, Cater-Steel, & Toleman, 2009).

A challenge for IT services is measurement and a frequently asked question is *"what to measure and how?"* (Azadnia & Fasanghari, 2008, p. 147). It is essential to ensure that the evaluated metrics are factors connected to service quality and to be able to show the progress of activities (Azadnia & Fasanghari, 2008). Measures are generally created in a top down perspective, with a focus on the achievement of business measures. The business measures are resulting into IT service measures, followed by process measures and finally into technological measures (Brooks, 2012).

A good measurement system does not have to be complex, but it must reflect on business requirements and be able to demonstrate how a project is helping the business to achieve its objectives. Therefore, measures should be related to business objectives and provide meaningful information (Persse, 2006). ITSM does not provide standards for a measurement systems and it is a challenge to create a measurement system that fits all stakeholders (Jäntti, Lahtela, & Kaukola, 2010). Measures can be seen from two major perspectives, measures to monitor and measures to know. Measures-to-monitor provides a quantitative snapshot of an evolving activity and focus on metrics demonstrating progress. Measures-to-know focuses on improvement areas and these metrics reflect upon the performance. Frameworks such as ISO 9001 and Six Sigma provide models to develop sets of metrics (Persse, 2006).

3 Methodology

This chapter describes the research strategy, research design and data collection methods. Furthermore, trustworthiness and ethical issues are discussed.

3.1 Research strategy

The research strategy was based on triangulation, that is, both qualitative and quantitative methods. Using triangulation means studying one thing with several different methods, which may imply a higher reliability but also a more holistic view of the studied concept (Jick, 1979). The qualitative approach was oriented towards how individuals understand situations while the quantitative more follows the model of the natural science and positivism (Bryman & Bell, 2011).

The theory approach in this study was both inductive and deductive, however mainly inductive. An inductive approach views the theory as the outcome of the research and thus generates new theory. Hence, the process of induction involves drawing generalizable conclusions from the result and findings. Mintzberg (1979) explained it with two phases; first detective work and then a creative leap.

When discussing epistemological considerations, one can take two main positions for what knowledge is, thus use a positivistic or an interpretivistic approach (Bryman & Bell, 2011). The nature of this research was largely interpretive, since understanding behaviour is important to successfully recognise the expectations of the organisation. Likewise, to understand how tools for alignment could be continuously utilised in the organisation, it was important to understand the perspective of the individuals associated with the improvement process.

The study aims to understand alignment of a service, which is a continuous process as it has to adapt to changes. The organisation exists in a turbulent and changing environment, which must be considered. Sometimes individuals neither follow rules nor share the vision of the organisation and that should be remembered in such study. Therefore the view of constructionism was preferable, since objectivism would not include the individuals in the organisation nor consider the changing context (Bryman & Bell, 2011).

3.2 Research design

The research design selected for this study was a case study. A case study "*focuses on understanding the dynamics present within single settings*" (Eisenhardt, 1989, p. 534), thus it provides detailed analysis concerning the complexity of a case (Bryman & Bell, 2011). Case studies are useful when the concepts and variables studied are difficult to quantify or it is difficult to study the problem outside the natural setting (Grönhaug & Ghauri, 2005).

The case study organisation is an IT department, located in Gothenburg, delivering internal IT services to the Group. The study focused on the IT helpdesk service and its work process.

3.3 Data collection

Due to the triangulation approach both qualitative and quantitative data was used and this study combines different data collection methods, which is common for case studies

(Eisenhardt, 1989). The study was performed in an abductive process, thus data was collected, considered and combined with literature in an iterative process. The literature review was used to gain further insight in the topic of the study. The quantitative data was extracted from an internal database with event logs from the IT helpdesk system and analysed using an exploratory data analysis method.

The emphasis in the qualitative research was on understanding, using an explorative approach and seeing from the respondent's point of view (Grönhaug & Ghauri, 2005). The qualitative data was collected from both primary and secondary data sources. Primary data was collected through semi-structured interviews and observations at the case study company, secondary data derives from internal documents, such as a user satisfaction survey from 2012 and information from the Intranet called *Begin*. The author also visited a panel discussion with service support professionals, from the Swedish business life, discussing the future of service support in the Gothenburg area.

How the research questions were answered with different data collection methods is summarised in Table 2. Data were analysed and compared with theory as it was collected. Hence, the literature study was combined with the empirical data, and become the starting point for analysing the case study organisation.

Table 2: Summary of the data collection according to research question

Research question	Research strategy	Data collection methods
RQ1	Qualitative & quantitative	Review of internal documents, literature review, interviews, event logs
RQ2	Qualitative & quantitative	Literature review, interviews, observation, value stream mapping, event logs
RQ3	Qualitative	Literature review, interviews

3.3.1 Literature review

The main purpose of the literature review was to create an understanding of what is already known in the research area and avoid other researcher's mistakes (Bryman & Bell, 2011). Keywords for the literature review are; IT and business alignment, IT Quality Management, Lean Six Sigma, IT Service Management, ITIL and IT helpdesk service. The literature review covered different sources and types of literature; the intention was to use scientific and unbiased journals and books. The literature review was extended continuously during the study as new insights emerged.

3.3.2 Interviews

The interviews were held in a semi-structured manner, following interview guidelines, to collect in-depth information and create an understanding of the situation. Semi-structured interviews differ from unstructured as the method has questions determined beforehand. The questions are asked in the same wordings, nevertheless questions not in the guidelines could be asked and interesting leads followed (Bryman & Bell, 2011). The advantage of semi-

structured interviews is that they allow the interviewee to develop his or her personal reasoning, address value-laden questions and express their own attitude. Semi-structured interviews demand skills in interviewing and also social skills in interpreting the result (Grönhaug & Ghauri, 2005). The reason for using interviews in this study was to get the employees' view on the current situation and also to recognise their improvement suggestion.

The sample of interviewees was developed according to recommendations from the Chief Information Officer (CIO), the IT Helpdesk team leader and the Chief Financial Officer (CFO). Ten interviews with duration between 40-90 min were conducted, notes were taken and when possible the interviews were recorded. The interviews followed interview guidelines (see Appendix B).

Five interviewees was held with respondent with positions inside the IT department; Process Manager Forwarding Process, System Support Forwarding Systems, System Manager Shipping & Finance Systems, Team Leader IT Infrastructure, Team Leader Helpdesk and Enterprise architect.

Four interviews were conducted with individuals in the organisation, which are outside the IT department, but all have work tasks related to IT department. Hence, all interviewees have insights in IT concerns. The positions of the interviewees were; Process Improvements Manager, Finance and IT Manager, Controller and Business Area Controller. Additionally, an external expert on optimisation of IT support services in ITSM was also interviewed.

The semi-structured interviews were conducted over a three months period. Due to the abductive process, shorter follow-up interviews with respondents were also conducted as the data analysis progressed. Additionally, the first-line helpdesk staff and CIO were involved continuously for supervision and reflection.

3.3.3 Observations
Observations were used to gain knowledge about the situation by analytically interpreting data from listening and watching people's behaviour. An advantage with observations is that first-hand information can be collected in a natural setting (Grönhaug & Ghauri, 2005). Another advantage is that there might be an inconsistency and a gap between how people say they work and how they actually behave (Bryman & Bell, 2011).

The observations were conducted by being a part of the case study company's Gothenburg office and through participant observations in the IT Helpdesk team's office area. Observations were used for deepening the understanding of the helpdesks work process and also how different stakeholders perceive IT in the organisation. It shaped an understanding about the perspective on the IT helpdesk service from both IT and non-IT employees, by hearing them talk and watching them interact about IT issues. The observations work as a complement to the interview, since it allows getting another and probably less biased view.

3.3.4 Value stream mapping
The value stream map was created as a part of the context description. It was developed in an iterative process, according to descriptions and pictures from the first-line helpdesk support.

The draft was revised after feedback from Helpdesk team staff and Business Application staff. The final version was confirmed by the Helpdesk Team Manager and the Business Applications Process Manager.

3.3.5 Internal documents

Secondary data was obtained from internal documents and information from the intranet *Begin*. The most important source was the organisation's IT user satisfaction survey from 2012, which was the starting point in understanding the organisation's expectations, thus the IT quality issues (see Appendix A).

3.3.6 Event logs

The quantitative data was extracted from the IT hepldesk system, the reporting system for requests submitted to the IT hepldesk process. An event log data shows histories about each single requests, for example the requester, the time of creation and closure, the issue and the appointed technician. Normally event logs should create a new row in the database for each event, but in this case the event logs overwrote eventual changes.

The studied time period was from 1 March 2011 until 1 March 2013, the time of the data extraction was 9 April 2013. The data was first cleaned, then analysed and visualised in the statistical program JMP and Excel. The raw data did only specify the technicians, therefore to have anonymity, a gouping of technicians has been made according to the IT department's organisation chart.

During the cleaning the values "*Not Assigned*", "0" and "-" was entitled missing values. Additionally, requests where the technician and the requester field was equal were deleted from further study, as it refers to requests that are related to maintenance and governance. These non-support cases should not be registered in the IT helpdesk system according to the teamleader for the Helpdesk and the CIO.

The resoultion time was only possible to calculate for requests that has been closed, hence has both a creation time and a completion time. Hence, some requests created more recently the resolution time was not possible to calculate as the request was not solved yet during the time of the data extraction.

3.4 Trustworthiness

An alternative perspective on reliability and validity in qualitative research is trustworthiness, which discusses the integrity of the conclusions in terms of credibility, transferability, dependability, conformability (Bryman & Bell, 2011). For example, the credibility was addressed by the triangulation approach and by respondent validation for the value stream mapping and context description.

The context description was an important part in ensuring transferability, as a risk with case studies is that they describe a very individual phenomenon or that the theory is not possible to rise to a generalizable theory (Eisenhardt, 1989). The study is considered transferable for IT organisations in similar contexts; therefore it was important to describe the context of the study in a structured way.

As the event logs are quantitative secondary data, the validity and reliability of the previous recording process was considered. For example, the validity was addressed by studying the data and also patterns of missing values and incorrect data. The reliability was considered by studying how the requests were categorised by the IT staff.

3.5   Ethical issues

Four main areas of ethical principles can be defined, harm to participants, lack of informed consent, invasion of privacy and deception. Harm to participants can be extended to include psychological harm and stress, or even harm to future carrier prospects (Bryman & Bell, 2011). To ensure informed consent, the interviewees were informed that interviews are optional and anonymous. Furthermore, the topic, purpose and aim of this study were described, during observations staff were informed about the possibility to tell the researcher to leave or return later. However, respondents may still have felt forced to participate, since the involvement was encouraged by management.

Protecting anonymity is important as interviewees should feel secure that managers cannot trace comments back to a specific person (Bryman & Bell, 2011). Nevertheless, to ensure total anonymity was difficult as the studied organisation is small and the employees know each other's way of expressing thoughts.

4   Context description of the IT department

This chapter provides a description of the context of the case study organisation, the IT department, the IT helpdesk's work process and its stakeholder.

4.1   The IT department's organisational structure

The IT department is a support function for a group of companies, the Group, which is offering logistic solutions globally. The Group is divided into three divisions; freight services, liner services and shipping services. The company's headquarter and IT department is located in Gothenburg, and the organisation's offices are mainly located in the Nordic and Baltic countries, but also in Eastern Europe and China.

The IT department had a major reorganisation during 2011 and the IT organisation went from decentralised to centralised, by merging a team for each of the three divisions to one central IT department. However, the old structure is indicated by the location of the desks in the office environment and in employee's social networks. The office layout is about to change during the summer 2013, to place the IT department's staff together.

The user satisfaction survey from 2012 showed low values for the users' satisfaction for IT services and the IT helpdesk service appear to create most frustration (User Satisfaction Survey, 2012). The user satisfaction survey indicated problems regarding quality as speed of responses from the IT helpdesk. In combination with growing backlogs and insufficient staff the IT department decided to expand its team during 2012 with two first-line IT helpdesk staff and two employees to the Business Application team, an increase of staff from 11 to 15.

The IT department is divided into the CIO office and the three teams; Business Application, Infrastructure and Helpdesk (Figure 5). The Business Application team work with software applications, business system support and developing IT systems. The Infrastructure team accounts for hardware and hardware support, the team is responsible for managing internet connections, servers and desktops etc. The Helpdesk team works mainly with first-line support, for example troubleshooting printers or creating computer accounts for new employees. All teams deal with support and the handling of requests is made in the IT helpdesk system.
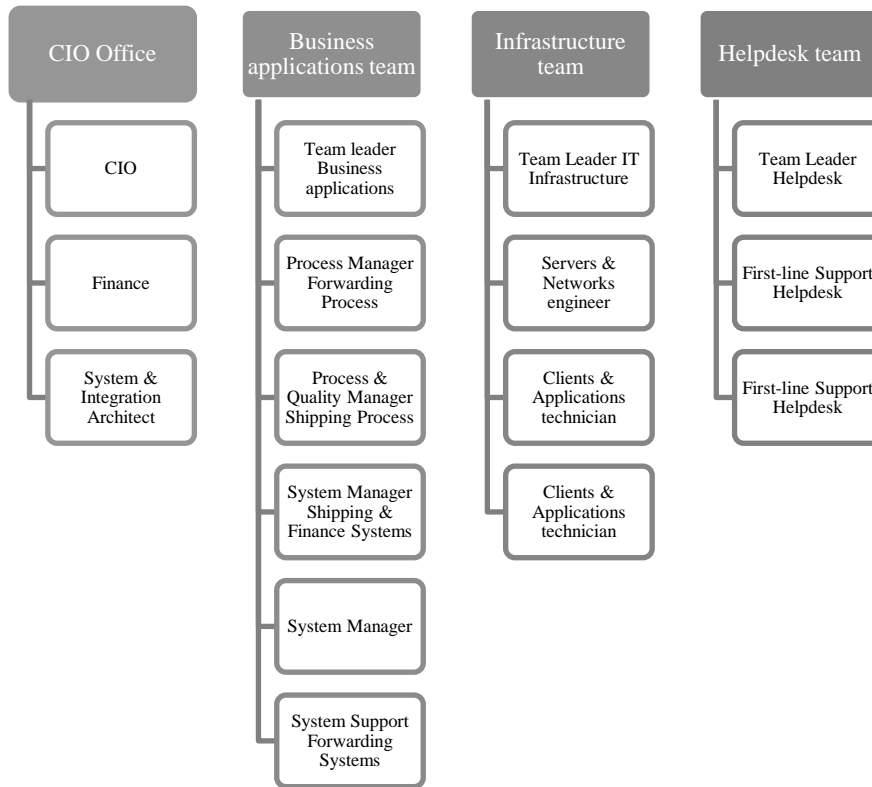
Figure 5: Organisational chart of the IT department from spring 2013

4.2 The stakeholders of the IT helpdesk service

Two interfaces exist between the users and the IT helpdesk service (Figure 6). First the request-phase, when the user contacts the IT helpdesk for assistance. Second the solution-phase when the IT helpdesk staff contact the user for feedback and provides the solution.
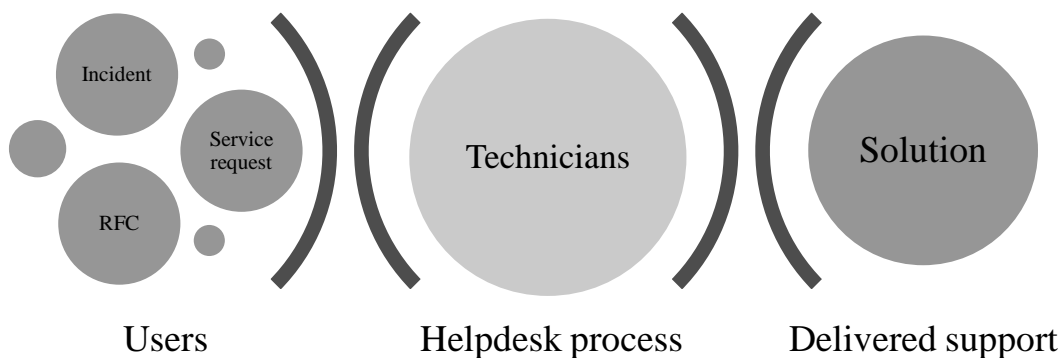
Figure 6: Contact between the users and the IT helpdesk service

The IT helpdesk service has several stakeholders (Figure 7) and the two most important are the customer perspectives, the users and the organisation. The IT department views the employees of the Group as the main customer, since the employees are the users. However, the paying customer is the organisation itself. Thus, the Group can have financial and performance requirements for the IT services. Currently the Group has only financial requirements explicitly defined for the IT department and no SLAs are used.

Additionally, external customers can be seen as the final customer, since external customers are the reason to the existence of the organisation, and hence the IT services. For example, requests from external customers about new IT services are considered important and prioritised.

Furthermore, external IT providers are important stakeholders to the IT helpdesk, as the IT department has to adapt systems to the fit the organisation's needs. Finally, the IT staff's motivation to work and keeping the right competence in the IT department is an important factor.
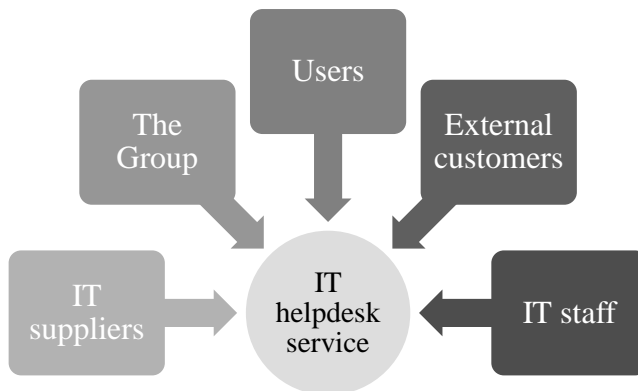
Figure 7: The IT helpdesk's stakeholders

4.3   The IT helpdesk's process

The IT helpdesk process aims to follow ITIL recommendations and operates as a single-point-of-contact for users, see Figure 8. It can be described as; new requests arrive via phone, email, face-to-face or directly submitted by the user into IT helpdesk system. The first contact between IT department and user is preferable with the first-line helpdesk staff, who accounts for registering the task in the IT helpdesk system. However, users tend to contact any member of the IT department and prefer to contact IT staff they know by email.

When a request arrives, the IT staff creates a request case in the system, a case consists of a specific request or several requests according a similar topic merged into one case. Hence, the requests could be handled both separately or in a batch if many users report the same issue. The variance in requests topics is normally high; hence requests are usually supported one at a time. To enter requests into the IT helpdesk system is rather complex and many fields can be used, generally the technicians do not fill in all fields, see Section 5.2.5.

The IT staff checks if enough information is provided at the first contact to be able solve the request. If so, the next register task is not performed. Additional information is usually necessary, to either solve or categorised the request, thus the IT staff contacts the requester again for additional information. The requests are categorised according to for example type of request, office, impact and urgency. During the registration a technician is generally appointed to the specific request.

Business Application sorts their requests according to if the case is a RFC or not. RFC's are prioritised separately by the operation, the Change Advisory Board (CAB)-group. The CAB-

group consists of members from the operation and IT; the group met every second week. The Helpdesk and Infrastructure teams do not have such group for prioritising.

Solving a request is an iterative process and usually contact with the requester is necessary, at least for presenting the solution. The time to solve a request can be a few minutes to several months. The last step in the process is that a resolution is provided to the requester for approval, if the requester does not respond or by themselves close the request, it is automatically closed after two days.
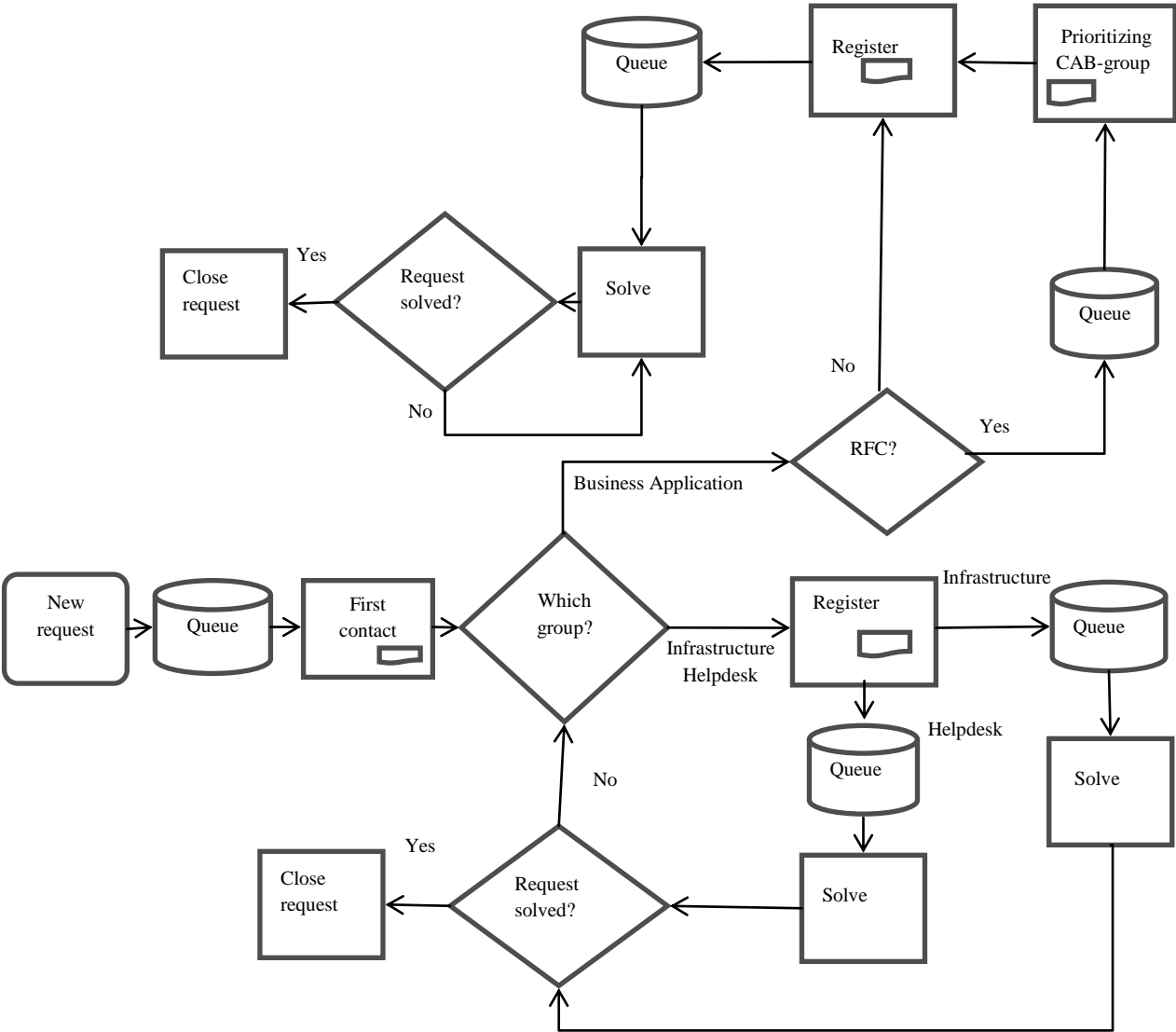
Figure 8: Value stream map of the IT Helpdesk process

5 Results and analysis

This chapter presents and analyses the results of the qualitative and quantitative data. The pre-study focuses on the problem areas that are not aligned with the organisation's expectations and create an understanding of the IT helpdesk process. The main study aims to derive the quality issues and understand how improvements are managed or can be applied.

5.1 Pre-study

According to the user satisfaction survey from 2012 the IT helpdesk service is confronted with low user satisfaction. The survey question "*Overall, how satisfied are you with the Group's IT activities?*" scored 3,24 on a scale from one to five, which was considered a low result by the IT department and the organisation (see Appendix A).

The survey showed that the low user satisfaction appears to be coming from the service delivery and especially an inability to deliver quick, accessible and detailed responses to solve upcoming and sometimes recurring IT incidents. A service minded response, both regarding response time and accessibility, is a critical success factor for the IT department in increasing user satisfaction. Furthermore, IT education of users is an issue, since half of the employees say they have not had any training in the IT systems (User Satisfaction Survey, 2012). Particularly, managers are unsatisfied and it originates from a need for better communication and alignment between IT and the organisation (Comments User Satisfaction Survey, 2012).

In this study the issues with customer satisfaction can be addressed to service quality dimensions reliability, empathy, assurance and responsiveness (Gorla, Somers, & Wong, 2010). Moreover, factors that appear to be critical to quality, but not aligned with the organisation's expectations can be summarised as the resolution times, the professionalism of the IT staff, and the alignment between IT and the organisation. Solving these issues might lead to higher service quality and increased user satisfaction.

It is important to note that the two first-line helpdesk technicians were employed after the user satisfaction survey from 2012, and employed with the intention to increase the user satisfaction. According the quality dimension of empathy and responsiveness, the IT helpdesk staff expressed a clear customer-centric approach, being service minded and used understanding of the user as a keyword in their work. Furthermore, the service quality dimension of reliability of the first-line staff can be considered acceptable. The work load for first-line helpdesk staff is low, as the current situation provides few work tasks and long waiting times between tasks for the two technicians.

The first-line staff suggested that the bottleneck creating long solution times must be after their initial contact with the user and exist for complex requests escalated to the two other teams. Data from the IT helpdesk system confirmed the first-line staff's perspective, that the Helpdesk team does not have long resolution times. During the pre-study, the beginning of March 2013, 281 requests were considered as unsolved, of these and less than 10% belonged to the Helpdesk team, approximatley 5% to the Infrastructure team and 85% to the Business Application team.

The conclusion is that the quality issues of resolution times are probably related to the entire support function, but particulary the Business Application team. Thus, the issues derive from issues with the IT department's task allocation of requests and differences in resources for managing the workload.

The quality issues of responsiveness, assurance and empathy are probably due to the high workload creating stress and low professionalism. However, a major challange is doubtlessly the alignment between the organisation and the IT department, since the user satisfaction survey demonstrated strong indications of dissatisfaction because of a lack of communication.

5.2 Results and analysis of quantitative data analysis of event logs data

The quantitative results and analysis are focused on understanding the IT helpdesk process. Particularly the distribution of resolution times, which the user satisfaction survey highlighted.

5.2.1 Distribution of request over time

During the period 1 March 2011 to 1 March 2013, 6689 requests were registered into the IT helpdesk system. The number of employees that has sent requests to the system is 565, which are approximately 70% of all employees. The requester who has submitted most requests had 264 requests (4%) registered, the second most frequent requester 157 requests (2%), and the third 155 requests (2%).

There has been approximately a 40% increase of requests during the time period, from about 250 requests per month to approximately 350 requests per month. It is possible to see seasonal fluctuation in the number of requests, notice the low number of requests during summer months and Christmas, see Figure 9.
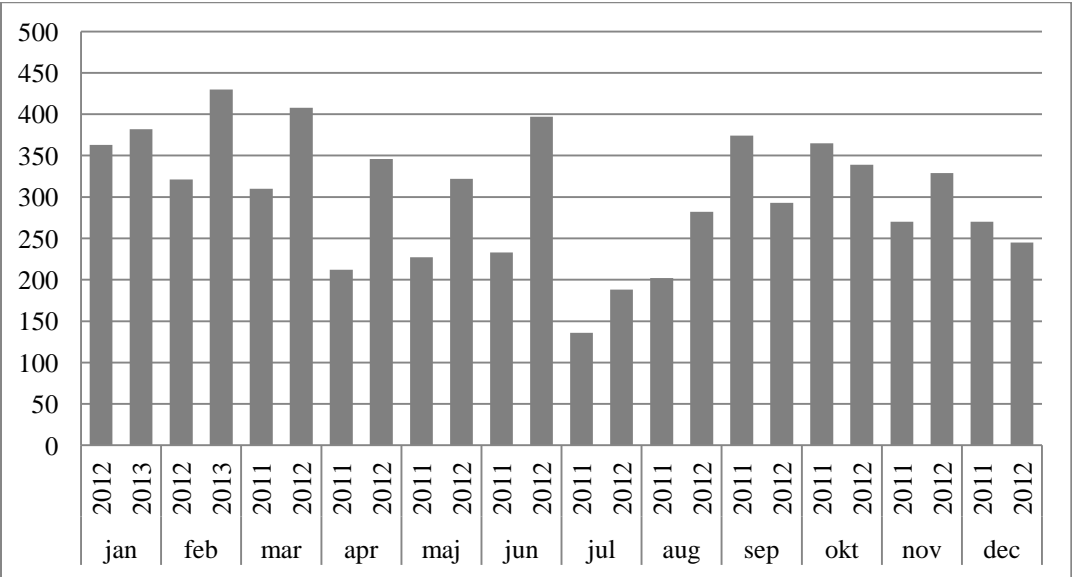
Figure 9: Distribution of requests per month

5.2.2 Distribution of requests according to team

Before the Helpdesk team was implemented the Infrastructure and Business Application team supported approximately 50% each. After the implementation Business Application still

solves 49% of the requests while the Helpdesk team has unburdened the Infrastructure team, compare the two histograms in Figure 10. The fourth team referred to as 'Others' is for technicians outside the IT department in Gothenburg, for example external consultants.

The y-axis in Figure 10 shows the number of requests and the x-axis the teams. The left picture shows the amount of requests from 2011-03-01 until 2012-07-01. The right histogram shows the period after the implementation of the IT Helpdesk team, from 2012-07-01 until 2013-03-01.
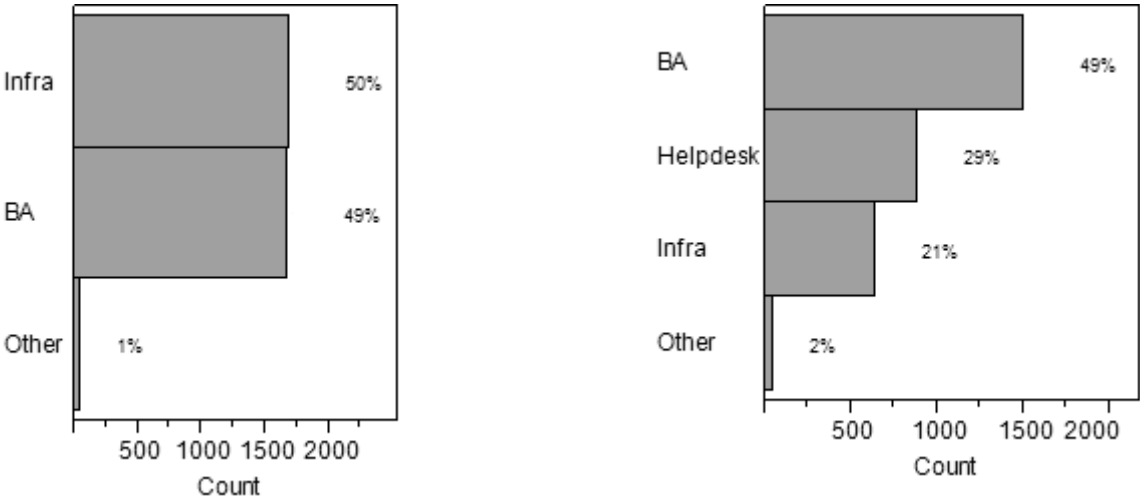
Figure 10: Histogram of the distribution of requests for each team

Figure 11, shows the implementation of the Helpdesk team and the part of the requests the Helpdesk team solve compared with the total number of requests, the percentage is fluctuating from approximately 25% to 30%. The darker colour shows the Helpdesk team's share.
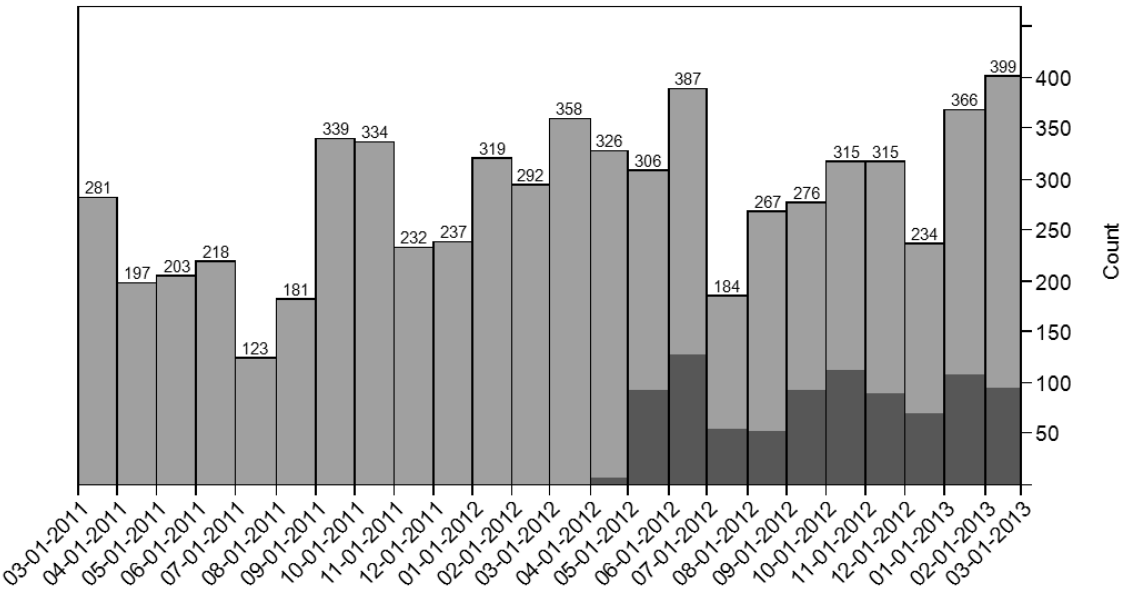
Figure 11: Histogram of the distribution of the Helpdesk team's requests for each month

It is possible to see that the Helpdesk team has taken over some of the Infrastructure team's requests by comparing the darker staples in Figure 11 and Figure 12. After the Helpdesk team

26

was introduced, during summer 2012, a lower and stable level of requests to the Infrastructure team appears in Figure 12. The darker coloured columns show the Infrastructure team's share of requests.
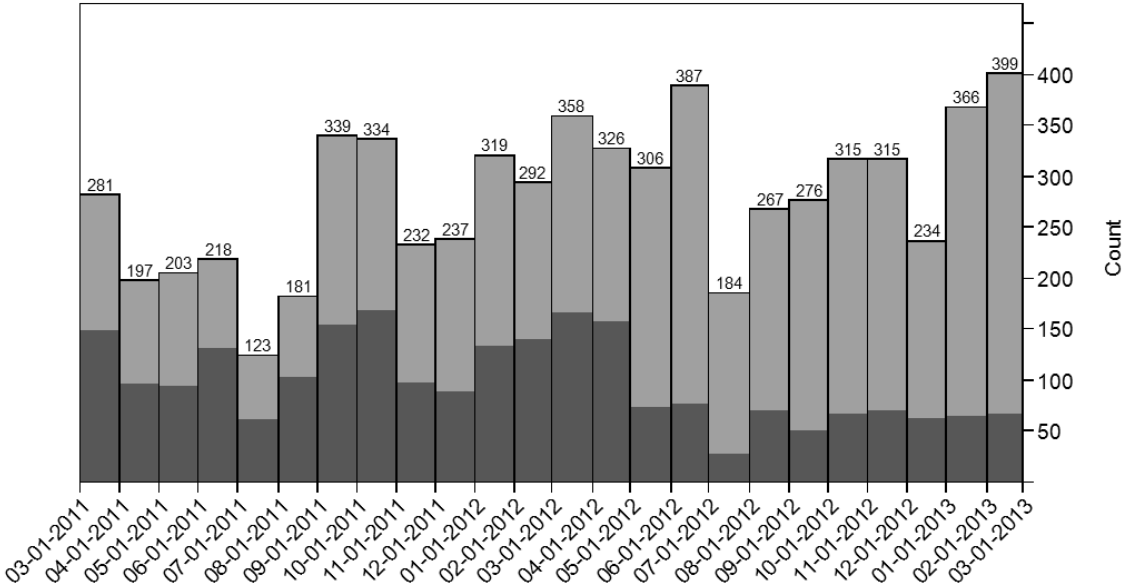
Figure 12: Histogram of the distribution of the Infrastructure team's requests for each month

5.2.3 Distribution of resolution times

The service quality issue according resolution times must be analysed from the starting point that different requests do have different complexity and urgency. Hence, the times for resolution should fluctuate, since not all requests can have highest priority or even are possible to solve directly. None of the figures can show if the complexity of a request affects resolution time, since data for complexity were not possible to extract from the database.

Nevertheless, the speed of resolution is a critical factor for the user satisfaction and should therefore be given attention (Cabinet Office, 2011b). Obviously, the IT helpdesk process should aim to shorten resolution times to satisfy the users. Particularly, try to eliminate non-value-adding steps, as minimising the queue time of requests and the backlog, and streamlining the necessary tasks (Chang & Su, 2007).

Figure 13 shows that 50% of all requests are solved within three days and 90% of all requests are solved after approximately a month. Furthermore, some requests have resolution times longer than a year.

Per cent	Quantiles	Nr. days
100.0%	maximum	708,178
99.5%		343,157
97.5%		161,993
90.0%		32,1981
75.0%	quartile	8,23455
50.0%	median	2,95243
25.0%	quartile	2,07083
10.0%		2,01181
2.5%		0,06134
0.5%		0,01074
0.0%	minimum	0
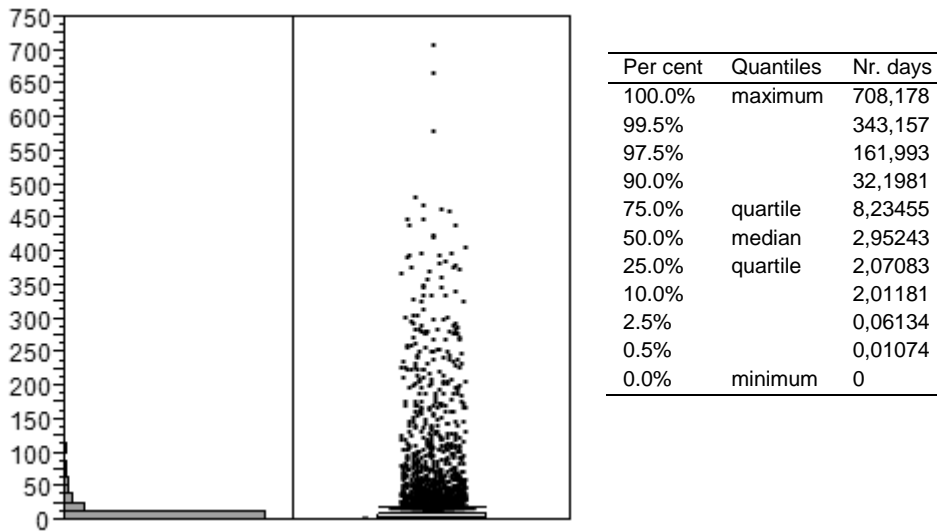
Figure 13: Distribution of resolution times for all requests

The distribution of resolution times differs among the three teams and can be compared in Figures 14, Figure 15 and Figure 16. For the Infrastructure team 90% of the requests are closed after 12 days, for the Business Application team it takes 68 days and for the Helpdesk team 90% are closed after 8 days.
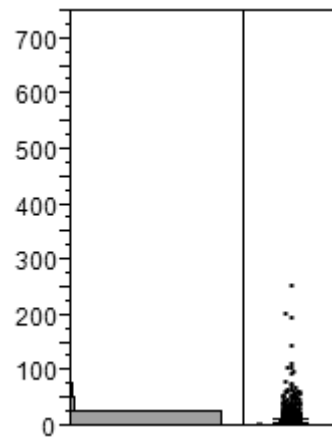
Per cent	Quantiles	Nr. days
100.0%	maximum	254,784
90.0%		12,1736
75.0%	quartile	5,03264
50.0%	median	2,37569
25.0%	quartile	2,05174

Figure 14: Distribution of resolution times for Infrastructure team
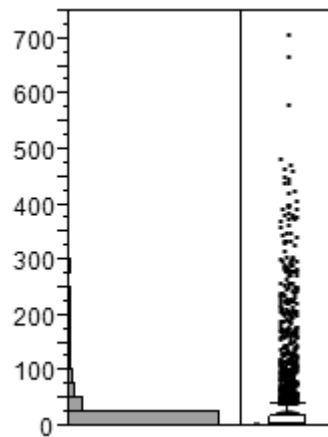
Per cent	Quantiles	Nr. days
100.0%	maximum	708,178
90.0%		67,561
75.0%	quartile	16,7545
50.0%	median	4,15139
25.0%	quartile	2,11528

Figure 15: Distribution of resolution times for Business Application team
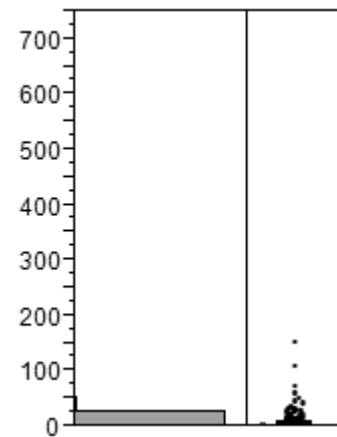
Per cent	Quantiles	Nr. days
100.0%	maximum	150,747
90.0%		8,18222
75.0%	quartile	4,01319
50.0%	median	2,21111
25.0%	quartile	2,05764

Figure 16: Distribution of resolution times for Helpdesk team

As Figure 11 showed, the Helpdesk team was implemented during summer 2012; hence no requests are solved by the Helpdesk team in the first three rows in Figure 17, 18 and 19. In Figure 17 the resolution time is divided into the four teams and to six equally long periods, the y-axis shows resolution times from zero to ten days.

Notice the gap for requests solved in zero to two days. It appears that requests have two-day lead time before getting closed. Furthermore, pay attention to the darker marks recurring for two and three days in Figure 17, which imply that most requests are closed on the second or third day for all teams. The two-day delay is probably caused by the users not closing the request by them directly. A *s*tatement from a response email for a resolved request explains the delay:

> *"If you are satisfied with the resolution, please click here to Close Request. If you do not close it, the request will be automatically closed within two days."*
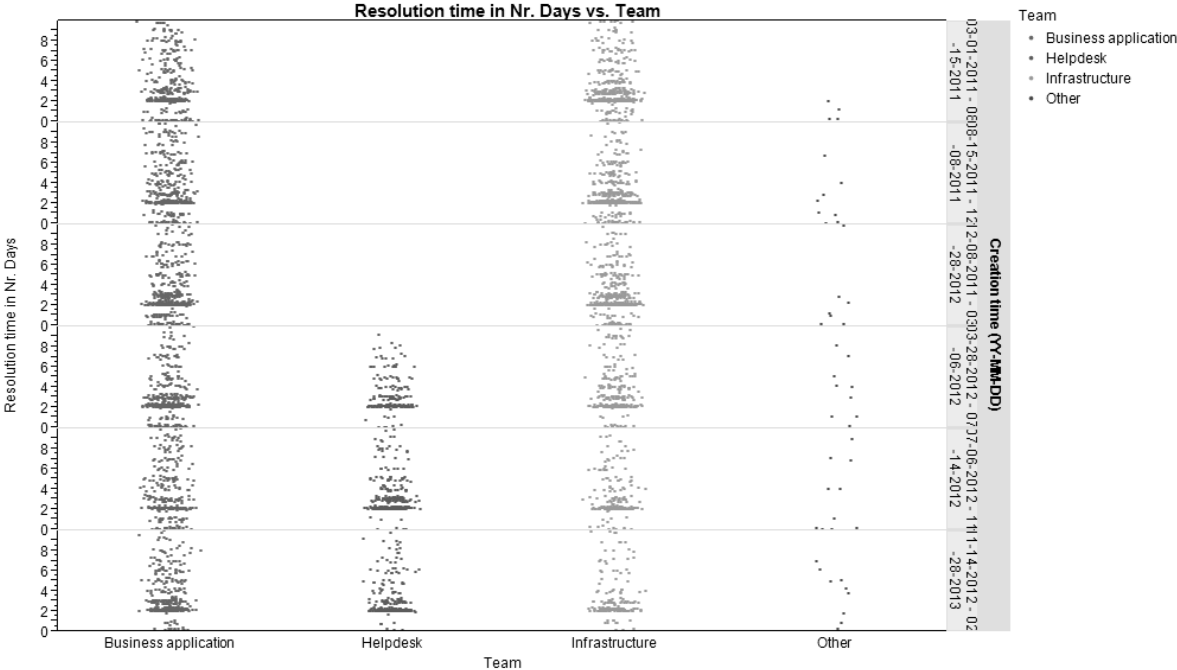
Figure 17: Distribution of requests with a resolution time of 0-10 days

In Figure 18 the y-axis shows a span from zero to 700 days, notice that it looks like the resolution time for Business Application has decreased in the lower rows. This is due to a queue of requests, a backlog. The backlog is shown since the resolution times is not yet possible to calculate because the request is still open and has no stored data for completion time.

The backlog consisted of approximately 200 requests during March 2013. This is similar with the result of qualitative results. The backlog for Business Application and the high work load is further analysed in Section 5.3.2.1.
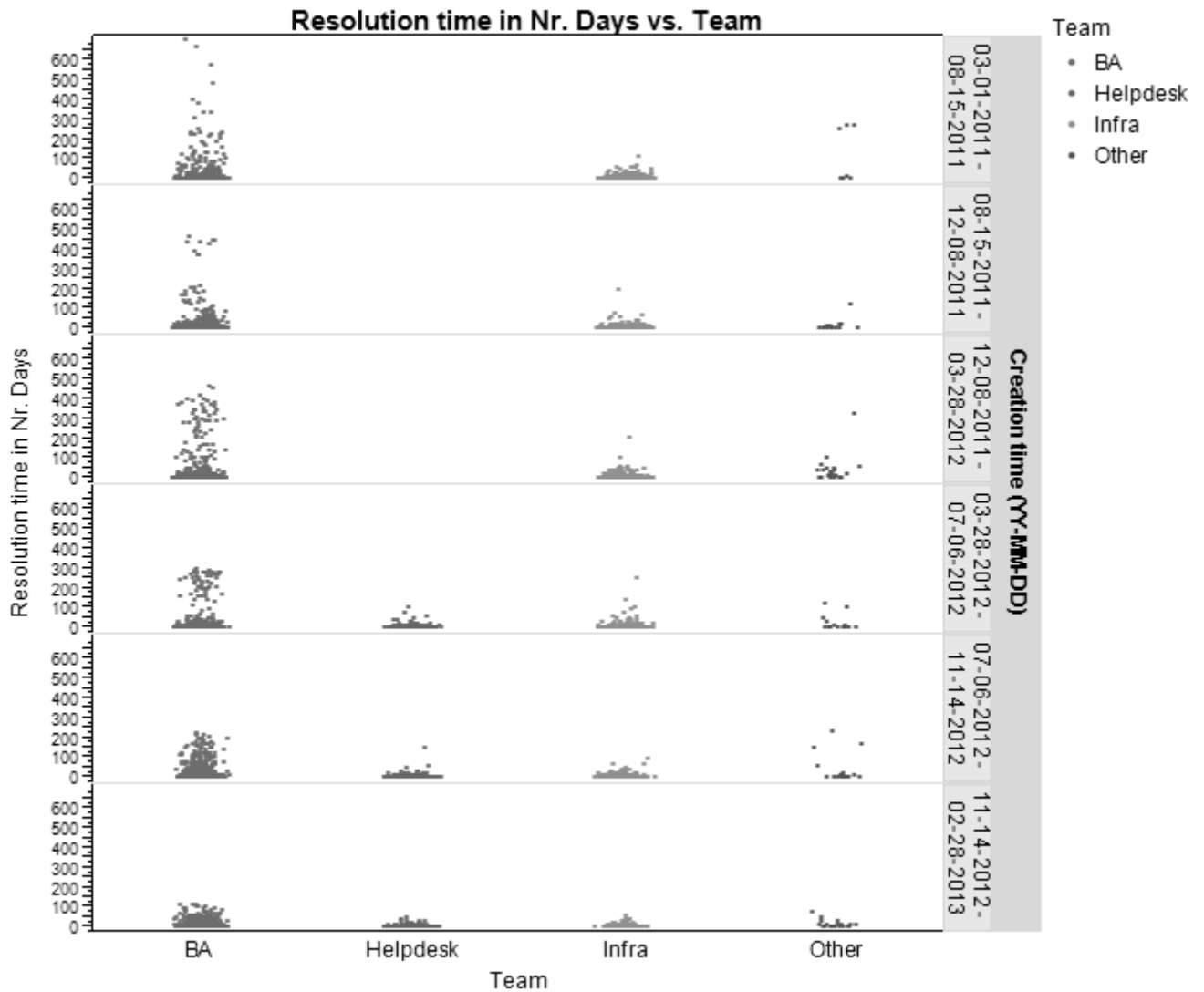
Figure 18: Distribution of requests with a resolution time of 0-700 days

In Figure 19 the x-axis shows five equal segments of requests according to resolution time. The y-axis is divided into six equally long time periods; the last row is the most recent period. The shares in the pie charts are coloured according to team.

The Helpdesk team has a trend of increasing the amount of resolved requests. The last row shows that the Helpdesk team solves approximately 50% of all requests with resolution time shorter than two days, this implies that the goal mentioned in Section 5.3.1.3 can be seen as partly fulfilled. Figure 19 also clarifies that the Helpdesk team has unburdened the Infrastructure team. Furthermore, it shows that Business Application is responsible for the majority of requests with the longest resolution times; notice the white share in the pie charts to the right.
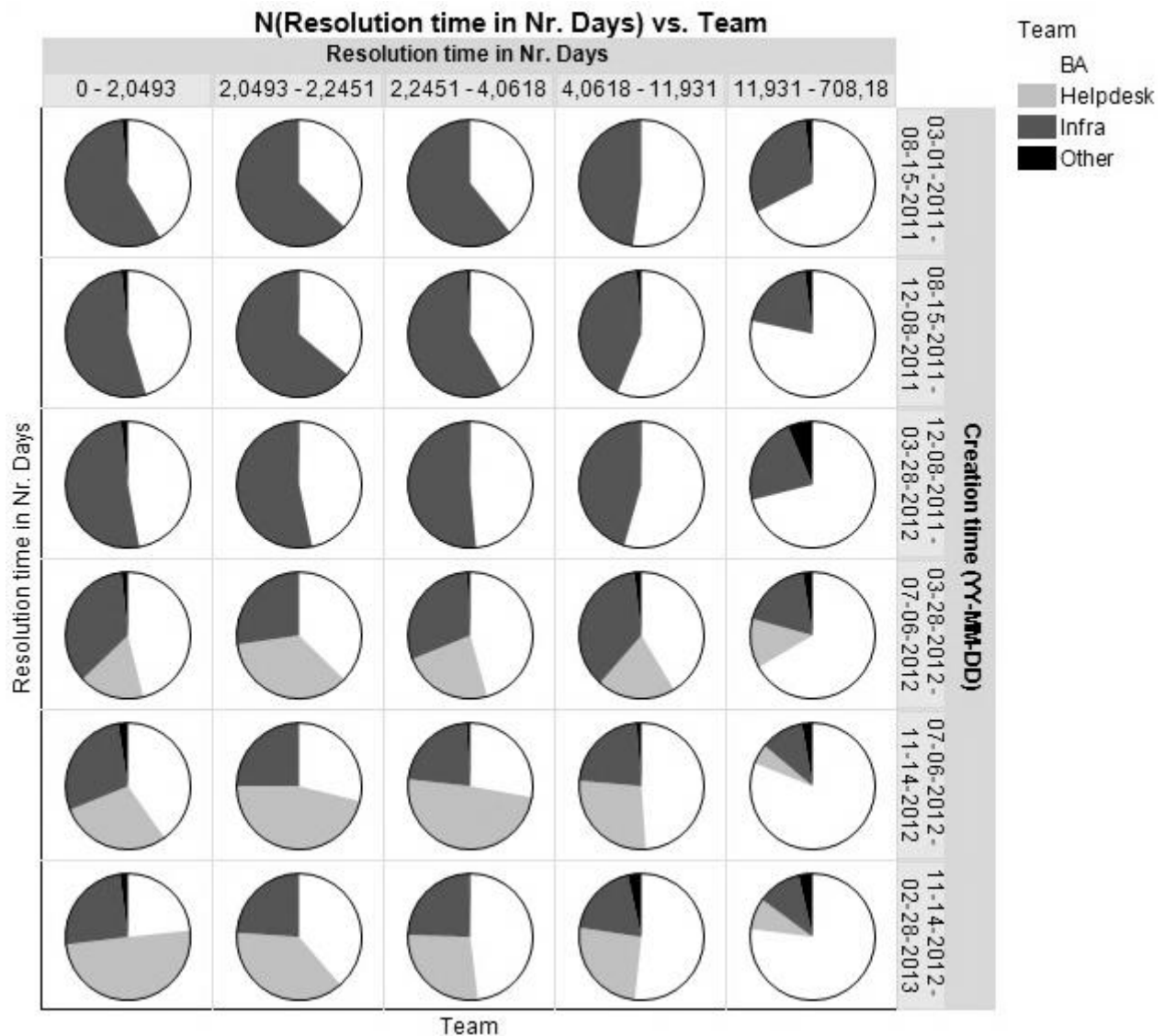
Figure 19: Pie charts with the share of each team's contribution to the amount of resolved requests

5.2.4 Distribution of requests according to office and country

The distribution of request according to country and office was hypothetically thought to be closely related to the number of users. However, by comparing Figures 20 and Figure 21 one can see that there is no strong link between the number of users and numbers of request.

Figure 20 shows that the majority of the 817 users are from Sweden (40%) followed by Norway (14%) and Finland (10%). The number of employees in Norway and Sweden are actually equally, approximately 240 employees, but the major part of the Norwegian offices use a Norwegian helpdesk; hence these employees are removed in the Figure 20. Furthermore, Poland is not included as the country also has own IT technicians, outside the Swedish helpdesk system.
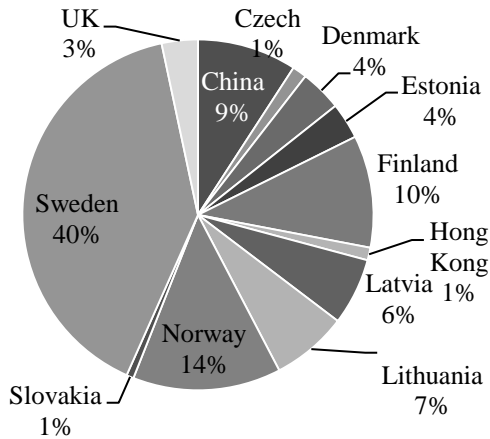
Figure 20: Percentage of users for each country
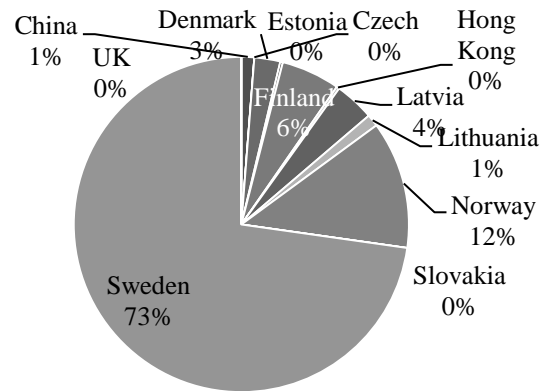
Figure 21: Percentage of requests from each country

The majority of requests come from Sweden (73%), which has considerably higher level of submitted requests than the 40% of the users which belongs to Sweden. The distribution of requests from each office and country, see Figures 21 and Figure 22, describes unmistakably that Sweden and the office in Gothenburg is the most frequent requester. The second most frequent requester is Norway and the Oslo office, followed by Finland and the Helsinki office.

The Baltic and Asian countries do not seem to send as many request per user as the users in the Scandinavian countries. The data analysis showed that a few offices and even countries have not sent any, or very few, requests during the two-year period. This can indicate that there is not enough communication between the IT department and the organisation. Thus, countries with low number of employees or countries with non-Scandinavian languages might not be informed about or use the IT helpdesk even if they need assistance. By analysing the language used in the subject of requests it is evident that Swedish, Norwegian and English are common for writing requests.

The IT helpdesk is located in the head quarter in Gothenburg and that could describe the higher amount of requests from the Gothenburg office. Another possibility to explain the distribution of requests can be that Gothenburg has most employees of all offices. However, only 17% of the users belong to the Gothenburg office.
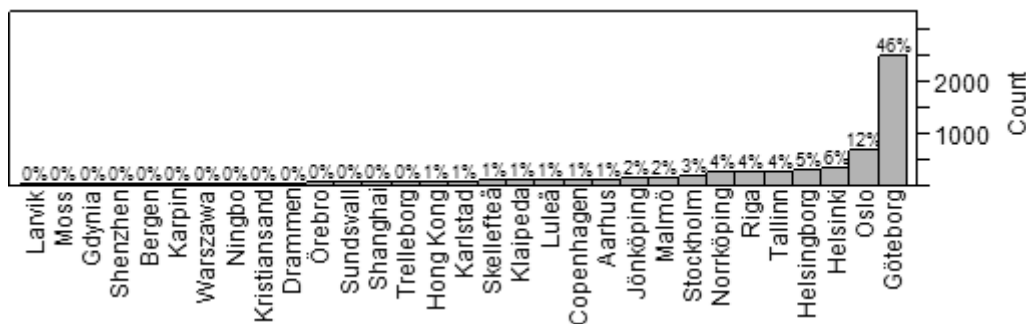
Figure 22: Distribution of number of requests according to offices

5.2.5 Missing data patterns

The data analysis uncovered that 16 technicians have used the IT helpdesk system for time reporting, as they have sent request assigned to them. Normally one does not send a request for assistance if one can solve the request by oneself. However, this could be necessary for some cases as for reporting a request that many technicians must collaborate to solve. Nevertheless, 555 requests have the same requester as the technician; of these 37% and 35% belonged to two technicians.

The most frequent missing data pattern for the studied categories is that 1424 requests are categorised to neither urgency nor impact. The second most frequent missing pattern, 1094 requests, is that both office and country is undefined.

5.3 Results and analysis of qualitative interviews and observations

The qualitative findings are analysed according to two aspects, to understand the primary causes of the IT helpdesk's quality issues and to consider the application of improvement in order to align with the organisation's expectations. Most interviews were conducted in Swedish; citations are translated by the author (see Appendix C).

The three sections follow the ITSM's three viewpoints; people, process and technology. All three viewpoints are necessary to ensure an IT service aligned to the organisation (Winniford, Conger, & Erickson-Harris, 2009).

5.3.1 The perspective of process

The last decade the number of users that belong to the Group has grown from 70 to more than 800 users, the IT budget has not grown as much in relative numbers. The growth has increased the work load for the IT department, as an increase of requests, see Figure 9 Section 5.2.1. To manage the expansion the IT department had to reorganise and employ new staff. Respondents explain:

> *"The company has grown so much and not really had time and think, before it was perhaps possible for a technician to fix everything." [C.1]*

> *"This is a small company which has grown very large ... (the IT department) operates without real structures, undocumented processes and a great person-dependence." [C.2]*

The Helpdesk service is considered to handle less complex requests well, for example *"it works appropriately for PC support and printers etc." [C.3]*. Respondents outside the IT department say that that requests to the infrastructure and Helpdesk team usually are solved rather quickly, but issues regarding the business system usually take longer time. These statements have quantitative support, see Figure 19 Section 5.2.2.

5.3.1.1 Misalignment between the IT helpdesk service and the organisation's expectations

Respondents from the IT department describe that the organisation's expectations on IT helpdesk service are too high; most respondents say that it is impossible to satisfy the expectations without considerably more resources. The IT department struggles to deliver

acceptable services with the resources they got. This is exemplified by a respondent in the organisation:

> *"The helpdesk is willing to help but they obviously lack resources from time to time." [C.4]*

And from the IT department:

> *"The customer perspective is skew when the customer (the organisation) both can choose what is delivered and the price tag. I think that it is difficult to talk about improvements without considering this perspective." [C.5]*

Furthermore, a respondent outside the IT department argues that the expectations on the IT helpdesk service from most employees in the Group are very high. The respondent says that the Group can be better in understanding the limitations and resources of the IT department. IT employees express that they have an unclear vision of the business requirements, since the expectations of the Group are not explicitly defined. Hence, there is no written agreement or SLA about what is perceived as a satisfying performance for the IT helpdesk service. The relationship is exemplified by:

> *"Until 'recently' was the operations demands from 'a division' that IT should always deliver everything they wished for to a budget that is 30-40% under the industry standard. The effects are visible in the number of requests submitted to the IT helpdesk system that can be related to 'the division' and the work load for the team member dealing with those requests. For the 'another division' a more defined collaboration is established, but the problem is somewhat seen also there." [C.6]*

The IT helpdesk service struggles with the customer perspective which is usual for IT helpdesks, according to the interviewed expert. A common view of the IT department is that the users are the customer (Hero & Larsson, 2013). The IT department attempts to measure and understand the users' expectations and therefore conducts a yearly user satisfaction survey (see Appendix A). However, respondents say:

> *"A lot of the support cases have also been about the business systems Jeeves and Uniteam to which there are no satisfactory user guides and people simply don't know how to use the systems. This creates a lot of frustration and it certainly affects to any IT related survey results." [C.7]*

> *"Although the situation has improved people have long memory and recent better support might not be seen as improvement in the surveys." [C.8]*

A lack of common understanding and a confused relationship by having both the users and the organisation as customer can be factors creating misalignment (Ullah & Lai, 2011; McBride, 2009; Almajali & Dahalin, 2011). To create better alignment, shared beliefs and perspective between the IT department and the organisation are important factors (Ullah & Lai, 2011). Research mentions better communication to increase alignment, common language and shared

domain knowledge are ways to simplify the communication (Gutierrez, Orozco, & Serrano, 2009; Tarafdar & Qrunfleh, 2009). A better communication of business requirements can be achieved by using SLAs (Moreau, 2007; McNaughton, Lewis, & Ray, 2010).

Hence, the Group needs to define its expectations and explicitly communicate business requirements to the IT department. The second step is to negotiate an agreement, which satisfies both the IT department and the Group. The IT department can then in the future communicate according to terms in the agreement, and provide metrics to show how the expectations are continuously satisfied by using a SLM process (Moreau, 2007).

5.3.1.2 Improving the process

Metrics can be a tool for communication between the IT department and the organisation, showing performance and tracking progress (Winniford, Conger, & Erickson-Harris, 2009). According to Nolan (1995) measuring IT processes is a first step in establishing quality management in IT departments. The second step would be to implement continuous improvements and for example follow a quality management method as Lean Six Sigma.

The IT department does not work explicitly with either measurement or continuous improvement. According to Bergman and Klefsjö (2004) quality management is a continuous process with the concepts working proactively, preventing and preparing the organisation for managing quality challenges. In this study the proactive and preventing work appears to be put aside to deal with urgent issues.

> *"They extinguish fires, it will be half finished. (They extinguish the fire, but not the cause of the fire.) They (the IT staff) have already thrown themselves on the next case when the final details are to be completed." [C.9]*

There appear to be a lack of incentives for suggesting improvements or working more efficiently. When asked about how to continue with an improvement suggestion the answers are vague, some refer to top management and that they should drive changes. Continuous improvements are not a part of the company culture, neither for the IT department nor in the organisation. Furthermore, metrics and KPI's are not used in the IT department to measure the performance or to find improvement areas.

However, an improvement to increase the communication between IT department and the organisation has recently been implemented. A CAB-group has started to prioritise requests for changes regarding one of the divisions business systems, see Section 4.3. The respondents who mentioned this appeared to think it is a good initiative, as the organisation must to be the owner of IT projects and prioritise changes.

One example of high user expectations affecting service quality is the possibility for all employees to submit an RFC. The requester does not always carefully consider the RFC, which results in unnecessary, inefficient or costly changes have been implemented. To prevent this, a document for evaluating RFC's has recently been implemented to reduce unconsidered RFCs. The reactions from respondent are diversified. A respondent says that a reference group from middle management would be a better approach, that the employees

who actually work with the business systems have a better understanding of the implication of a change.

Both quantitative and qualitative results show that the longer resolution times are linked to the Business Application team. Respondents stress the urgency of dealing with the high workload for Business Application. It appears that the respondents recognise the dissatisfaction with resolution times and connect it to the high workload of the Business Application team. Several respondents think that the work load must be addressed before an improvement process for other problem areas can begin.

> *"Those who work in IT should feel focused and dedicated to do it, they should not have to take 42 additional cases of crisis." [C.10]*

5.3.1.3 Standardised processes
The IT helpdesk process generally follows ITIL (Cabinet Office, 2011b). The value stream map, see Figure 8 in Section 4.3, illustrates that there is a structured process for the IT helpdesk service. The issues is that it is not structured who are responsible for different tasks; there is confusion about responsibilities and definitions in the helpdesk processes.

When the term "helpdesk" is mentioned during the interviews a common question was about the definition; *"What do we imply with the word helpdesk?" [C.11]*. Respondent states that *"clear responsibilities and defined roles"* are needed and a respondent thinks it is an organisational issue to not use documentation as a tool to align processes and share knowledge. Additionally, respondents argue that *"an important part (in solving the problems of the Helpdesk) is to define clearly what each person should do" [C.12]*.

Several respondents say that first-line helpdesk staff too easily escalate requests and argue that the first-line helpdesk staff can learn to deal with new tasks, but might not have the necessary knowledge yet. The escalating process has only two queues, Infrastructure and Business Applications, but a technician can be appointed. However, there is no documentation of skills, therefore it is difficult for the first-line staff to manage the dispatcher role and delegate tasks to the appropriate technicians.

According to the IT managers, the first-line support should preferable solve 50% of the request. The other requests are considered complex issues or RFCs, these requests should be escalated to the Business Application or Infrastructure team. It can be argued that the 50% goal is almost achieved, see Figure 19 in Section 5.2.3, since the helpdesk solve half of the quickly resolved requests. To be able to solve more requests probably the competence level must be higher or that more experienced staff has to delegate additional tasks to the first-line staff.

> *"Many things are possible to learn if you are interested and have sufficient support for learning. I think the own organisation could be used in a better way." [C.13]*

To be able to solve more requests the first-line helpdesk staff can be involved to do administration for the Business Applications team. However, to be able to help business

applications *"it is necessary to know what the company is doing, to have an overview at least"* [C.14].

The level of standardised processes for the core business is low, for example manuals for the core business do not always describe the way employees actually work. The many different ways of operating, and using the IT systems, create difficulties for the IT department while supporting the system. However, according to a respondent, improvements are to come in standardising the business processes. Influences of unstructured processes and lack of documentation are seen also in the IT department, there is a lack of SOP's, process descriptions and SLAs. The IT department evaluates only financial measurements and the Helpdesk system does not provide sufficient information for managing the process.

5.3.2 The perspective of people

Respondents mention that the IT helpdesk service can be more service-minded and improve in treating the user as a valuable customer. These comments are coherent with the perspective on the customer according to ITIL (Cabinet Office, 2011b) and also with the results from the user satisfaction survey that the professionalism can be improved. However, none of the respondents exemplify how a more service-minded approach should be accomplished, but a respondent says that there must be a top management commitment to the change.

An important part in quality management is to involve people, to let everyone be committed to quality improvements (Bergman & Klefsjö, 2004). This is currently a weakness for the IT department, as there is no forum for quality management issues and employees do not know how to proceed with an improvement suggestion. The interdepartmental communication need to be improved according to several respondents. For example, the monthly meetings are not used efficiently and not recurring monthly. There are also indications that not all the concerned staff is invited to the some task meetings. Furthermore, the organisation has no Swedish fika-culture with breaks were people meet and talk informally. The lack of forums for exchanging knowledge is shown by statements as:

> *"There is no forum to discuss the question of Business Applications situation."* [C.15]

> *"Monthly meetings should be company specific meetings, after that should team- and task-specific meetings come. There are team meetings, but not everybody is invited."* [C.16]

> *"Mail groups where everyone is not involved exist. ... I thought it (the mail group) was to the whole IT department. Fooled!"* [C.17]

The organisation structure from before the reorganisation is still visible; the previous division is noticed as informal subgroups. Furthermore, several interviewees describe that communication barriers also exist within the new structure of the IT department, see Section 4.1. An improvement to decrease the splitting is about to come, the office layout will be changed to move staff together. The current situation is exemplified by:

> *"The splitting between the teams is too strong."* [C.18]

"We do have a splitting even if we have the two guys sitting over there, it is a separation ... For example, if the request is a business application it will be directly handed over to us, (the first-line helpdesk) won't touch it." [C.19]

"We must sit together and become a team." [C.20]

5.3.2.1 Work load

Business Application's high work load has created a backlog, see Section 5.2.2. A backlog is a queue of *"important requests that have not yet been done" [C.21]*, it is currently approximatley 3000 man-hours and cause high work load and increased resolution times for the Business Application team. In contrary, the first-line helpdesk staff describe their work load as usually low. One respondent says *"the work load is skew" [C.22]* and asks *"how does the job division actually look like?" [C.23]*. Members of the Business Application team express the current situation as:

"Currently it feels like we have so much to do that I do not know where to start!" [C.24]

"We have gone from four persons that knew the system, to less. Of course it is about building and gaining knowledge." [C.25]

"The demand is higher than what Business Application can deliver... there is an unbalance between the needs that are submitted and the capacity of the staff working in those areas." [C.26]

A person outside the IT department says:

"I communicated with a technician at half past eleven (at night). The light is always on."... "It makes me worried."... "Everyone knows about it but I think it is going too slowly, for health reasons." [C.27]

The current work load is too high for these technicians, who create bottlenecks and a backlog is built up. This is shown by:

"Several thousand hours are inserted in the system, which are not fixed yet. We must first sort that out. Then we must prioritise the requests and close some of them, even if there is a demand or not ... at least put some aside." [C.28]

The backlogs have developed over time and appear to be due to too high work load and reliance on single technicians with skills in complex tasks. A respondent conclude that Business Application staff has to collaborate with all members in the Business Application team, not only in subgroups, since all members have similar issues with high work load. Another resolution suggested by respondents would be to add more resources, to keep up and perhaps decrease the current backlog.

A backlog arises when the work load is too high. The suggested improvement is that *"individuals should be forced to delegate and share work tasks" [C.29]*, which can solve the problem that some technicians do rely on implicit knowledge and delegate tasks if they shared

more knowledge. The reasons to the backlog appear to be lack of resources or in some case lack of staff with sufficient skills. Furthermore, the IT department struggles with recruiting new employees with the right competence to satisfy the organisations expectations. The lack of resources is connected to that:

> *"The new employees have either been placed at new positions or with other responsibilities, at least other areas than those ones that have left had." [C.30]*

The IT department has implicit knowledge centralised around experienced staff members that have been in the organisation for many years. The sharing of information in the IT department appears to be low and new employees are not always involved. Several respondent mentions that it would be good to work project based, which would create new grouping of staff.

Another problem might be the social network of IT staff as users tend to contact the technicians they have always contacted, which might not the technician most appropriate to solve the request. In this case, technicians can be unwilling of saying no when a recognised person contacts them for help. A common approach by users is to call or email a technician directly and not through the Helpdesk and the first-line staff. This leads to that the IT employees cannot prioritise their time appropriately as the requests create interruptions. It can also start a backlog as request can build up a queue since the specialised technicians do have other prioritised things to do and do not have time to directly redirect requests sent to them personally.

Furthermore, according to respondents it is difficult to allocate tasks effectively for the IT helpdesk service as competences and skills of technicians are not documented.

> *"We have an issue with insufficient competence" [C.31]*

> *"The organisation has so many business areas and (the IT department) cannot be informed in everything." [C.32]*

> *"I trust that the people are doing their best but their professional skills aren't always adequate." [C.33]*

The comments show that there appear to be important to for management to support a service-minded approach and manage the staff's skills, which relates to the quality dimension of assurance (Gorla, Somers, & Wong, 2010). Hence, if the users are not comfortable with contacting the IT staff, there is a risk that the users will not return with new requests or improvement ideas. An example from the user satisfaction survey, a user expressed that a too complicated language was used by the IT staff, which made the users feel uncomfortable.

5.3.3 The perspective of technology
Several respondents argue that quality issues can be linked to the IT helpdesk system, which is inflexible and does not support the way IT staff work. A difficulty with the IT helpdesk system is that the system does not support feedback, monitor process time and queue time in an efficient way.

"For example, the alarm system, it is not built for what we are doing. ... Everybody has turned it off since it generates too many email alerts." [C.34]

"Shortcomings as in how we can allocate technicians." [C.35]

Another issue connected to the system is that not all staff members do document every single request and register everything into the IT system. A respondent expressed that if one helps a person face-to-face or goes to the user's desk one usually do not register it as a request. However, another respondent says that if not everything is registered and described the system loses its value as the overview get lost and the process is difficult to manage. Thus, the habit of not registering everything creates frustration:

"The benefit (of registering in a synchronised way) is that we can get an overview, are able to manage the IT operations and have a dialog with the organisation. To manage the resources, an overview of the situation is necessary." [C.36]

Measurability is an important part for monitoring and finding areas for improvements (Persse, 2006). Nevertheless, since the staff do not follow a similar structure for registering requests the system is not possible to use as a tool for measurement, even if it has measurement functions.

To summaries, the technological aspect has two challenges according to respondents; purchasing new systems and considering prerequisites carefully, and implementing fewer special and ad hoc solutions. A respondent conclude that systems must be built:

"It shall be according to (the company's) specifications about how they should operate, well-defined and limited where they are present and dependencies." [C.37]

6 Discussion of identified issues within the IT helpdesk service

This chapter discusses the challenging areas and possible improvements. It interprets the findings according to the categories in the cornerstone model (Figure 1 in Section 2.1). This chapter is divided into seven sections; focus on customers, let everybody be committed, top management commitment, focus on process, system thinking, base decisions on facts and improve continuously.

6.1 Focus on customer

The customer focus is discussed in two steps. First, defining the customer in Section 6.1.1 and second, understanding the customers' expectations in Section 6.1.2.

6.1.1 Defining the customer

 A challenge for an IT helpdesk service is to define its customer; either the customer can be seen as the users or the paying organisation. In this study both parts are considered equally important, as the organisation do not provide a set of business requirements including the user's perspective to the IT department. One can argue that it is the organisations responsibility to analyse and define the needs of the users. In that case the organisation would manage the user satisfaction survey, with the aim of understanding the user's demands of IT services. The results and analysis show that the IT staff strives to deliver according to the organisation expectation, but appears to fail due to lack of understanding of the organisation's expectations and not having enough resources.

The Scandinavian countries are the major requesters to the IT helpdesk, both in number of users, but particularly in the number of request. This can be due to many factors, for example, the user's language or IT skills, the culture of asking for help and the knowledge sharing between countries as some employees might not know when to contact the helpdesk service. This study has not developed a deep understanding of the users; they are only divided into groups of office and country, as data stored in the IT helpdesk system.

6.1.2 Understanding the customers' expectations

The user satisfaction survey questions can be improved to better measure the service quality of IT and understand the user's expectations. The textboxes for comments were frequently used and added perspective to the survey result. The closed questions ask how satisfied the users are, questions can be improved to also define what their expectations are. An example for improvement might be to introduce a question about the definition of how short a satisfying resolution time is. If the user satisfaction survey was improved it can be used with higher precision as a tool showing both to monitor the user's expectations.

The aspect of the users' anticipated resolution time is interesting, since the Group has not explicitly communicated to the IT department what an acceptable resolution time is. Therefore, in this study the resolution times can only be compared relatively with each other. Benchmarking with other companies' IT helpdesk services could have been a possible method to find a general resolution time for similar IT helpdesks to compare with.

6.2 Let everybody be committed

Many respondents mention that there is a need for more communication within the IT department, there is a lack of forums for addressing improvement suggestions and that the department is divided into informal subgroups. To involve all employees and let everybody be committed is a central factor in quality management; therefore the management must support increased interdepartmental communication. A solution from a respondent is to have monthly meetings; others suggest working more in projects.

Another issue regarding lack of interdepartmental communication is that all concerned staff are not invited to the appropriate task meetings or included in mailing lists. This could probably be avoided if competences were documented and management showed strong commitment to involvement of everyone. However, the new layout of the office, moving the IT department together can be seen as a step towards more informal communication. If the informal communication, such as 'fika', had been more frequent the IT department would probably know each other's competences better.

An important part of alignment is the understanding of each other's situation (McBride, 2009). The users and the organisation must realise the limitations of the IT resources and set expectations from a negotiated starting point. Everyone, both IT department and organisation, must be committed to strive for alignment and has a chance to be involved in the process.

6.3 Top management commitment

Shared values and beliefs between IT managers and top managers is a key factor for creating alignment (Ullah & Lai, 2011). Furthermore, a lack of top management commitment can be a pitfall for ITSM improvement projects (Jäntti, 2012a). The organisation must share their view so the IT department can understand the organisation's expectations. Alignment is about two-way communication, thus the top management must be involved and committed to aim for alignment. For example, top management support can create a possible change towards a more service-minded culture, according to the qualitative analysis.

6.4 Focus on processes

The process of the value stream mapping showed that the first-line Helpdesk staff often is the first contact, but frequently requests are sent directly to technicians email. These inputs which do not follow the structured process can cause that the request is misclassified or not dealt with directly. To structure the process further all users must use the fist-line helpdesk staff as their single-contact-point.

To analyse the frequency of the problem of requests not following the structured process was not possible, since the Helpdesk team often has to escalate requests due to their complexity. This first contact person is not shown in the data analysis as only the last technicians name is stored in the database; the previous technician's names are overwritten. Therefore it was not either possible to track requests through the different steps of the process with for example Business Process Mining (Appendix E).

Another implication of the overwriting is that the quantitative data analysis only considers the last technician as the owner of the requests, even if it was solved by two or more technicians

working together. Furthermore, it is not possible to see how many requests that do not go through the first-line helpdesk as a first contact, thus to analyse if it really works as a single-point-of-contact and follow the guidelines of ITSM. This would be possible if the technicians names in the event logs were not overwritten.

This study shows similarities with the study by Heikkinen and Jäntti (2012) as their case studies of IT helpdesks addresses similar challenges to the three ITSM perspectives; people, process and technology. Their study identified comparable issues as this study, for example; interdepartmental communication, a need to identify measures and the challenge of integrating new IT systems. The major difference between this study and the Heikkinen and Jäntti's is that their case study organisations concern more mature ITSM implementations and larger IT departments.

6.5 System thinking

The number of IT organisations that address challenges as sustainability, CSR and Green IT issues are rising (Dubey & Hefley, 2011) this can be seen as a system thinking. Hence, IT organisations are expanding the boundaries and not only focus on optimising locally, but also addresses global consequences. Including system thinking in the IT strategy can be a future idea to recognise for the case study organisation.

6.6 Base decisions on facts

Measuring the performance is a first step to include quality management in IT services (Nolan, 1995). This is related to the customer perspective discussed in Section 6.1, both the business requirements and the user's expectations should be considered by the helpdesk service. Hence, to base decisions on facts the organisations requirements and users' expectations must be measureable and coherent with the IT helpdesk's metrics.

Both interviews and the analysis of event logs showed that there are difficulties with the categorisation of requests. To provide good metrics the IT helpdesk system requires that all requests are recorded and categorised according to a standard procedure. Then, the current helpdesk system can provide some metrics, if the settings are adjusted to fit the process.

Measurement is an important tool for management, not only to improve and analyse performance, but also to communicate IT services performance. By using metrics that both parts understand and commits to a common language can improve the alignment (Ohlsson, Rosengren, Ertan, & Wernmo, 2011). For example, resolution time appears to be a critical factor for users, therefore it should be measured and the performance communicated to the organisation. However, there is no proof for a direct connection between short resolution times and efficiency. The data in this study do not provide sufficient information to describe the efficiency of the work process, to define non-value adding steps or evaluate the amount of queue time.

The time period analysed in this study is a two-year period starting the 1st March 2011. The period was selected to be after the IT department's reorganisation, but to still cover the time period before the user satisfaction survey from summer 2012. However, the qualitative results show that users perhaps tend to have good memory and not judge the current state of the IT

helpdesk during the user satisfaction survey. Therefore, the time period studied in the quantitative analysis could be extended to include the time before the reorganisation as well.

6.7 Improve continuously

The current situation lacking continuous improvements can be seen as a negative spiral, where no improvements are undertaken, as the high workload takes all energy and therefore improvements are not considered. If the IT helpdesk had resources to work more proactively perhaps some incident would never occur, which would lower the amount of request. Collin (2003) argued that to start with quality management often takes time, but that the time is gained when the improvements are realised. The first step towards quality management for IT is to start measuring to improve and show progress, then to start working with continuous improvements (Nolan, 1995).

Using measurement can help to align the business and IT, as metrics provide a mutual language and visually shows how the IT support services perform. The respondents from the IT department have many ideas of improvements, but it appears that employees do not feel encouraged to develop their ideas further. Two reasons mentioned by respondents was a lack of incentives and low commitment from management. Furthermore, there is no forum for discussing improvement suggestions. The lack of a forum implies that ideas for improvements exist, but are not considered and developed to change the situation.

Respondents from the IT department said that they would like to work more in projects and to have recurring meetings. Recurring meeting or a quality project can both be ways to start working proactively with quality and continuously consider improvement suggestions. To become better the IT department must start to work with improvements and this study has been a starting point. A method used successfully and suggested by research is Lean Six Sigma (Su, Chang, & Chiang, 2006); it can be seen as the goal for the case study IT department.

7 Conclusion

This chapter reflects upon the purpose, brings forward the conclusions and provides points for future research.

IT support service that satisfies the customers, both users and organisation, is a key factor for all IT departments following ITSM. This implies that the organisation's expectations must be aligned with the IT helpdesk service (Cabinet Office, 2011c). The purpose of this study was to analyse how an IT helpdesk service can be improved in order to align with the organisation's expectations. The research questions identify areas of misalignment, the cause of the misalignment and describe how improvements can be applied. The research questions are answered in Section 7.1, 7.2 and 7.3, respectively.

7.1 Misaligned areas between the IT helpdesk service and the organisation's expectations

Two main misaligned areas was identified; the professionalism of the staff and the resolution time of requests, both areas were emphasised by the user satisfaction survey from 2012 (Appendix A). Professionalism regards the IT helpdesk staff not being enough service-minded and not treating the users as valuable customers. The issue of resolution times is connected to the user's expectations that the resolution times for submitted requests are too long. Furthermore, lack of communication between IT department and organisation appear to be a challenging area.

7.2 The cause of the misaligned areas between the IT helpdesk service and the organisation's expectations

The issue with professionalism is probably caused by a lack of commitment to being service-minded, a stressful situation because of high work load and lack of understanding of the organisation's expectations. The issue of resolution times can be a result of the Business Application team's high workload (Figure 15). The total number of requests has increased with 40% over the two-year time period (Figure 9). The quantitative data analysis shows that 50% the requests are solved within three days and 90% of all requests are solved within 32 days (Figure 13). The Helpdesk team solves nearly half of all requests with a resolution time shorter than two days and has unburdened the Infrastructure team, but the Business Application teams work load is unchanged (Figure 19).

According to qualitative results the expectations from the users and organisation are very high. Therefore, the service quality issues can also be derived from a lack of alignment and mutual understanding.

7.3 How to create alignment between the IT helpdesk service and the organisation

ITSM advices what IT helpdesk services should do, but not how the process can be done practically (Azadnia & Fasanghari, 2008). Hence, the literature review showed that there have been several different methods to improve IT support services (Su, Chang, & Chiang, 2006; Edgington, Raghu, & Vinze, 2010; Jäntti, 2012 A).

IT and business alignment can be increased by communication, for example a common language (Ohlsson, Rosengren, Ertan, & Wernmo, 2011) or measurement that shows performance and progress (Cabinet Office, 2011a). It is also important to see things from each other's perspective and share domain knowledge (Gutierrez, Orozco, & Serrano, 2009). To base the decisions on facts is an important part in quality management, for this case study organisation few measures exist. Thus, the first step is to define the organisation's expectations, which factors that shall be measured and evaluated (Moreau, 2007; Bergman & Klefsjö, 2004).

To improve the resolution times and the professionalism, the work load for the Business Application team must be managed. There are no easy solutions if not more resources can be added to the Business Application team. However, everybody's involvement is a cornerstone of quality management (Bergman & Klefsjö, 2004) therefore a forum where quality improvements can be addressed and everyone can be involved is necessary. Furthermore, respondents suggest that increased interdepartmental communication [C.16], be able to share work tasks [C.29], educate internally [C.13], document competences and clarify responsibilities [C.12] might decreased the work load.

To conclude, this study contributes with insight in how an IT department that has not yet worked with quality management for IT support services can improve. Thus, how the IT department can address areas that are not aligned to the organisation's expectations. It suggest how the first steps of quality management can improve IT support services, with the aim to create better alignment towards the organisation's expectations. Finally, the study emphasises that alignment between IT department and organisations concerns both sides, as it is due to a mutual understanding.

7.4   Future research

The next step for the case study organisation towards quality management in IT support services is to define metrics for the IT helpdesk service and development SLAs, an interesting area of future research. Furthermore, it can be interesting to analyse if the IT department, users and organisation become more satisfied by an implementation of SLA's. Another future area towards quality management is to study an implementation of a continuous improvement process, for example combining ITIL's CSI and Lean Six Sigma.

An area for further research is study an IT helpdesk process's event logs data by using BPM (see Appendix E) or exploratory data analysis (see Appendix F). If the flow of requests can be understood for example non-value adding tasks can be identified. A BPM analysis can show if some requests tend to be shuffled back and forth between technicians, which could indicate a lack of competence since nobody can solve the request quickly or poor knowledge about who has the right competence. In this study it was not possible to use BPM, as the event logs did not contain the necessary data.

Finally, the study is only performed within a single case study company, benchmarking or conducting additional case studies can provide deeper insights in the topic. For example the resolution times and linked user satisfaction can be compared between different organisations, to define what is high quality for an IT support service.

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Appendix A - Data collected from the user satisfaction survey 2012

This section summaries data collected from internal documents.

From June to August 2012 a user satisfaction survey from the IT department was sent to employees, which the users and customers of the IT department's IT services. The aim was to measure customer satisfaction. External consultants performed the user satisfaction survey with a two-step method. First a feasibility study was performed together with the IT department, followed by formulation of questions for identifying, measuring and developing the key success factors for customer satisfaction. The second step involved sending e-mail to all employees with a link to the questionnaire. The survey was sent by e-mail to 450 employees and 233 completed the survey, giving a response rate of 52%, see Table A.1.

Table A.1: Response rate for the user satisfaction survey (User Satisfaction Survey, 2012)

Position	Number of names	Number completed	Response rate
Manager	34	25	74%
Employee	416	208	50%
Total	450	233	52%

The survey contained both closed and open questions. The user satisfaction indexes were measured by 23 closed questions, shown in Table A.2 and Figure A.1, but several questions also had a text box for comments. The result showed that managers, associated with questions 17 to 22, generally were less satisfied with IT services than other employees. In total, the three questions with lowest level of satisfaction are 20, 21 and 22; all three was questions for only managers. In Figure A.1 question number 7 and 12 are not included, since these questions do not measure user satisfaction index.
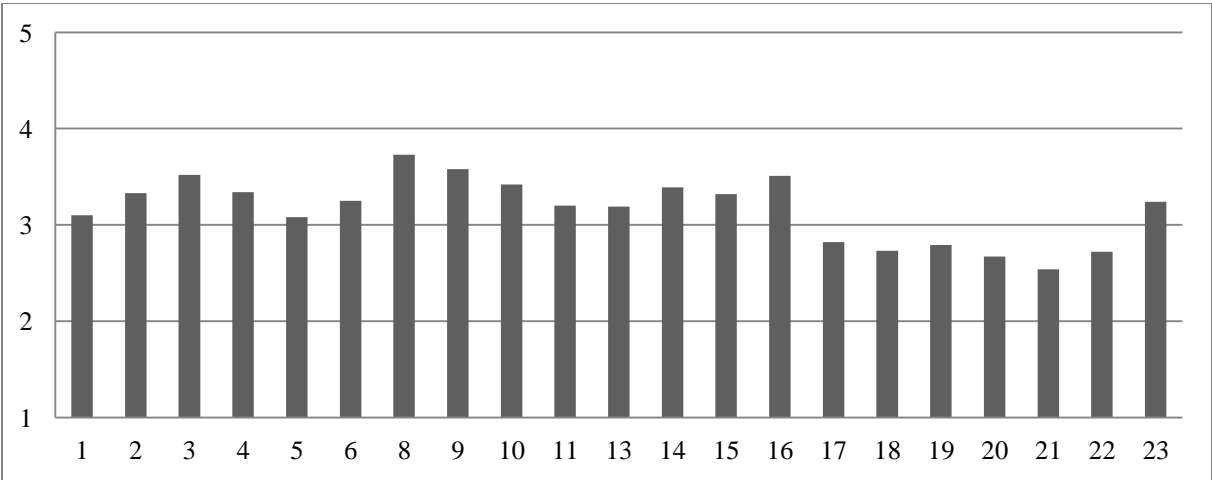

Figure A.1: The user satisfaction survey index 2012

The three questions with lowest user satisfaction all covers the delivery of service, thus asks about information flow, support and the handling of changes. In addition, negative comments from open questions in the survey develop around topics as communication, information and service attitude. Exemplified by the comments*: "Do not think they have understood what the organisation needs." "I think the attitude is not very service minded!" "The service is bad, they are not very forthcoming."*

Slow response is the opinion that arises most frequently (Comments User Satisfaction Survey, 2012). The dissatisfaction focused around response, as response time, feedback and the understanding of the response. Nevertheless, when it comes to positive comments topics as polite response and service minded is usually mentioned. Or that the respondents appreciate the current situation and perceive it as satisfying.

Suggestions from respondents of areas for improvements are: work proactively, training and communication, and focus on the delivery, thus speed of response and feedback. Comments mentioned many times are the prioritization of requests, hence most urgent should be solved first (Comments User Satisfaction Survey, 2012). The positive comments enhance responses as a critical factor for user satisfaction for the employees.

The result for question 23 *"Overall, how* satisfied *are you with (the companies)'s IT activities?"* was answered by both managers and employees, 20% were dissatisfied, 36% neither nor, 44% satisfied. Furthermore, the user satisfaction survey shows a low satisfaction with the level of training and comments describe basic and short introductions, 50% says there has been no training provided in the organisation's IT systems (User Satisfaction Survey, 2012).

The IT helpdesk service is that it is confronted with low user satisfaction, which appears to derive from three factors; response time, professionalism and lack alignment to the organisation's needs. Thus, there is an inability to deliver quick, accessible and detailed responses to solve upcoming and sometimes recurring IT incidents. Furthermore, a service minded response, both response time and accessibility, is a critical success factor for the IT department in increasing user satisfaction. Finally, communication and information is requested from the organisation and structured prioritising of request is necessary to reach high levels of satisfaction according to the survey.

In Table A.2 the indexes are on a scale from 1 to 5, where one equals very dissatisfied and five very satisfied.

Table A.2: Questions from User Satisfaction Survey 2012

Question	Total (233)	Employee (208)	Manager (25)
01: When contacting Helpdesk via web, e-mail or phone, you get a quick response	3,10	3,13	2,92
02: Helpdesk are pleasant and service minded	3,33	3,39	2,92

03: Helpdesk are competent and solve problems professionally	3,52	3,57	3,09
04: Helpdesk inform and give feedback when handling your cases	3,34	3,44	2,62
05: Helpdesk solve your problem within a reasonable time	3,08	3,10	2,92
06: Overall, how satisfied are you with (the Group)'s Helpdesk?	3,25	3,31	2,79
08: How satisfied are you with the central systems such as intranet, e-mail and Office package?	3,73	3,74	3,72
09: How satisfied are you with your computer, speed, screen quality, size?	3,58	3,57	3,64
10: (The Group)'s business systems are reliable	3,42	3,44	3,26
11: How satisfied are you with the business system you are working with?	3,20	3,24	2,81
13: How satisfied are you with these training sessions?	3,19	3,26	2,64
14: My team/offices' work processes are efficient	3,39	3,45	2,88
15: How well do the systems support the work process?	3,32	3,35	3,00
16: How well do (the company's)' systems cover your needs?	3,51	3,54	3,21
17: How well do the systems support your employee's efficiency?	2,82	-	2,82
18: Do you consider the systems to be cost efficient?	2,73	-	2,73
19: How well do the systems contribute to your profitability?	2,79	-	2,79
20: How satisfied are you with the way changes and improvements are handled?	2,67	-	2,67
21: How satisfied are you with the information you get from IT Service?	2,54	-	2,54
22: Overall, how satisfied are you with the service and support you get from IT Service?	2,72	-	2,72
23: Overall, how satisfied are you with (The Group)'s IT activities?	3,24	3,31	2,60

Appendix B - Interview guidelines

1. Jag berättar om projektet och anonymitet.

(I describe the project and informs about anonymity)

2. Skulle du kunna presentera dig själv? Intressen, ålder, familj eller vad du gjort på semestern.

(Could you please present yourself? Interests, age, family situation etc.)

3. Vad är din utbildning? Hur fick du jobbet?

(What is your education? How did you get this job?)

4. Hur länge har du arbetat på företaget?

(How long time has you worked at the company?)

5. Har du haft olika arbetsroller?

(Have you had different work roles?)

6. Berätta om din nuvarande arbetsroll.

(Please tell me about your current work role.)

7. Vad innebär arbetsrollen och hur upplever du det ditt arbete.

(What does the work role involve and how do you experience your job?)

8. I dina ögon, hur fungerar helpdesken? Supportfunktionen?

(In your opinion, how does the helpdesk operate? The support function?)

9. Vilka arbetsuppgifter tillhör helpdesken? Supportfunktionen?

i. Överensstämmer med hur den enligt din åsikt borde fungera.

(Which work processes belong to the helpdesk? The support function?

(Is this corresponding with how it in your opinion should work?)

10. Hur går du tillväga för att genomföra en förbättring/effektivisering inom avdelningen? Samt vad driver dig till att genomföra detta?

(How should you proceed to implement an improvement in your department? What drive you to proceed?)

Appendix C – Citations from interviews

[C.1] "Företaget har vuxit så mycket och inte riktigt hunnit med och tänka om, innan kunde kanske en tekniker fixa allt."

[C.2] "Det är ett litet företag som har blivit väldigt stort, växer med 100 % med två års mellan rum och utan att ha en riktigt strukturer, som mycket odokumenterade processer och stort personberoende."

[C.3] "Det funkar bra för PC support och skrivare t.ex."

[C.4] "The helpdesk is willing to help but they obviously lack resources from time to time."

[C.5] "Kundperspektivet blir skevt när kunden själv väljer både vad som skall levereras och sätter prislappen. Jag tror det är svårt att prata om förbättringsarbete utan att ha det här perspektivet med på något sätt."

[C.6] "Fram till 'nyligen' sedan så var verksamhetens krav från 'en division' att IT alltid skulle leverera allt de önskade och till en budget som ligger ca 30-40% under branschstandard. Effekterna av det kan du se på antalet case i helpdesken som relateras till 'divisionen' och belastningen på Business Application. På 'annan division' sidan finns ett tydligare samarbete som är etablerat sedan en längre tid men till viss del finns problematiken även där."

[C.7] "A lot of the support cases have also been about the business systems Jeeves and Uniteam to which there are no satisfactory user guides and people simply don't know how to use the systems. This creates a lot of frustration and it certainly affects to any IT related survey results."

[C.8] "Although the situation has improved people have long memory and recent better support might not be seen as improvement in the surveys."

[C.9] "Man släcker bränder, det blir halvfärdig. Sen så har man redan slängt sig på nästa när de sista detaljerna ska färdigställas."

[C.10] "De som jobbar i det ska känna sig fokuserade och dedikerade att göra det, de ska inte behöva ta 42 andra krisfall."

[C.11] "Helpdesk, vad menar vi med helpdesk?"

[C.12] "En viktig del är att definiera mer vad var och en ska göra."

[C.13] "Mycket går att lära sig om man är intresserad och får rätt stöd för att lära sig. Jag tror att det går att utnyttja den egna organisationen bättre."

[C.14] "Det krävs att man måste veta vad företaget gör, i stort i alla fall."

[C.15] "Det saknas ett forum för att diskutera Business Applications situation."

[C.16] "Dessa möten ska ta företagsspecifika möten, sen ska vi ha gruppmöten och task-specifika möten. Framförallt fler och kortare möten" Finns det avdelningsmöten??

[C.17] "Mailgrupp där inte alla är med… Jag trodde att det var hela avdelningen. Lurad!"

[C.18] "Uppdelningen är för stark."

[C.19] "Vi har en uppdelning, även om vi har två killar som sitter där borta, så är det en separation ... om en request rör Business Application så kommer den att direkt överlämnas till oss, de (första linjens helpdesk) rör det inte. "

[C.20] "Vi måste sitta tillsammans för att bli ett team."

[C.21] "Viktiga case som inte blivit gjorda"

[C.22] "Arbetsfördelningen är skev"

[C.23] "Hur ser arbetsfördelningen egentligen ut?"

[C.24] "Just nu känns det som att vi har så jäkla mycket att göra att jag inte vet var jag ska börja"

[C.25] "Vi har gått från fyra personer som kunde systemet till, till mindre. Givetvis handlar det om att bygga upp kunskap."

[C.26] "Kraven är större än vad man kan leverera … en obalans mellan de behov som kommer in kontra de personer som jobbar med de bitarna"

[C.27] "Jag satt och kommunicerade med en tekniker klockan halv tolv… Det gör mig mer orolig. … Jag tycker att jag sagt till alla… Alla vet om det men jag tycker att det går för långsamt, av hälsoskäl"

[C.28] "Flera tusen timmar som ligger inlagt och som inte är åtgärdade än. Vilket innebär att vi måste komma till rätta med det först vi måste prioritera de ärendena först och stänga en del som oavsett om det finns behov eller inte. … åtminstone lägga dem i malpåse"

[C.29] "Tvinga individer till att delegera och dela med sig av arbetsuppgifter."

[C.30] "De nya har ju antingen hamnat på nya ställen eller med andra uppgifter än de som de som har försvunnit hade."

[C.31] "Vi har problem med bristande kompetens nivåer."

[C.32] "Organisationen har många områden och man kan inte vara insatt i allt"

[C.33] "I trust that the people are doing their best but their professional skills aren't always adequate."

[C.34] "Larmsystemet vi har är inte heller ett system som är byggt för det vi gör. Alla har stängt av för det blir så många mail."

[C.35] "Brister i form av hur vi kan allokera tekniker och beroenden."

[C.36] "Nyttan är att man ser helheten ... kan ju styra verksamheten utifrån det i dialog med organisationen. Fördela resurserna då man får en överblick över situationen"

[C.37] "Det ska vara enligt 'företagets' specifikationer om hur det ska se ut … väldefinierade och avgränsande, var de finns och vilka beroenden (applikationerna) de har"

Appendix D - CobiT

Another ITSM framework using a more conceptual approach than ITIL is CobiT (Control Objectives for Information and related Technology). Connected to CobiT is the term IT Governance, which focuses on strategic decision making and alignment within IT (Brand & Boonen, 2010). The CobiT framework aims to create accountability and business control, while seeing IT services in terms of technology domains (Winniford, Conger, & Erickson-Harris, 2009).

Appendix E - Business process mining (BPM)

Edgington, Raghu, & Vinze (2010) use process mining and a conceptual and normative model to analyse how recorded keywords for requests in an IT helpdesk database contribute to SLAs. The model is based on coordination theory and with a process mining orientation and attempt to identify coordination patterns in an IT help desk process.

Business Process Mining, BPM, is a method for analysing data from event logs. BPM is a heuristic approach, used to find reliable causality relations even if the event logs contain noise. BPM is a tool for creating overview, as performers do not always have a deep insight in to the context of a business process (van der Aalst, o.a., 2007).

Process Mining is providing new possibilities for the analysis and monitoring of real-life processes. Thus, the researcher can look at the data from many different perspectives (Process Mining Group, Eindhoven Technical University, 2010). For example, the process approach and how events and tasks are related, or the organisation view and originator perspective creating a social network, and the case perspective what is done for example studying average time cycles (van der Aalst, o.a., 2007).

Appendix F - Exploratory data analysis (EDA)

Exploratory data analysis (EDA) is a method used in quality improvement projects as an informal, flexible and speculative tool, which builds an understanding of the nature of the problem, generate hypothesis and discover influence factors (de Mast & Trip, 2007). EDA is used for checking data for anomalies, exploring data to discover plausible models, or for exploring data to discover plausible models and communicating results to others (Cox, Gaudard, Ramsey, Stephens, & Wright, 2010).

The EDA process involved three steps: display data, identify salient features and interpret salient features. The first step, visualise data is followed by identifying salient features, which mean assuming a natural distribution reference and searching for derivations from normality (de Mast & Trip, 2007). The third step involves interpretation of salient features, this builds from mental models which the way humans store knowledge in their long-term memory. Thus, EDA needs both competence from a statistician and a context expert, as somebody must interpret the results (de Mast & Kemper, 2009). A limitation of EDA is that EDA is only suitable for discovering factors that actually varieties and must be uses in combination with other tools as interactions, observations, background knowledge (de Mast & Trip, 2007).