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Role-specific Critical Success Factors in Incident Management

Case: Energy Management System Company

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ABSTRACT

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The main goal of the thesis is to find out the Critical Success Factors (CSF) for the roles involved in the Incident Management Process (IMP). As Incident Management is often among the first IT service management processes that organizations implement, more understanding on the process is needed. The thesis approaches the subject based on the roles involved in the process.

To define the subject matter, the emerging branch of services science is presented based on literature along with the concepts of IT service management and Service Level Agreements (SLA). The presentation of IMP is based on the IT service management frameworks of ITIL and CobiT. Even though the frameworks have increased in popularity, there is still only a limited amount of scientific research on them.

This thesis consists of two separate presentations of role-specific CSFs for IMP. The first presentation is a collection of CFSs derived from the frameworks with some additions from existing scientific research. The second presentation is based on interviews with employees working in the roles of IMP at a case study company, an energy management system company. The CSFs of the two presentations are quite similar when they are compared to each other. However, for some of the CSFs in the second presentation, the interviewees gave more specific definitions as they related to the case study company.

KEYWORDS: Incident Management, Critical Success Factor, Service Level Agreement, IT service management, Services Science

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Tietojärjestelmätieteen pro gradu -tutkielma

Tämän tutkielman päätavoitteena on määrittää kriittiset menestystekijät (Critical Success Factor) Incident Management -prosessin eri rooleille. Kyseisestä prosessista tarvitaan lisää tietoa, sillä se on usein ensimmäisiä IT-palvelunhallinnan prosesseja, joita organisaatiot ottavat käyttöön. Tutkielma tarkastelee aihetta prosessin roolien näkökulmasta.

Tarkasteltavan aiheen määrittämiseksi esitellään nouseva tieteenhaara palvelutiede (services science) ja siihen liittyvät käsitteet IT-palvelunhallinta (IT service management) ja palvelutasosopimus (Service Level Agreement) kirjallisuuteen pohjautuen. Incident Management -prosessin käsittely perustuu IT-palvelunhallinnan ITIL- ja CobiT-viitekehyksiin. Vaikka näiden suosio onkin nousussa, on niistä julkaistu vähän tieteellistä tutkimusta.

Tutkielman tulos muodostuu kahdesta esityksestä Incident Management -prosessin roolikohtaisista kriittisistä menestystekijöistä. Ensimmäinen esitys on koostettu käytetyistä viitekehyksistä ja prosessista julkaistuista tieteellisistä lähteistä. Toinen esitys pohjautuu case-yrityksen työntekijöiden haastatteluihin. Haastatellut henkilöt työskentelevät osana energianhallintajärjestelmää tuottavan case-yrityksen Incident Management -prosessia. Esitykset sisältävät samoja kriittisiä menestystekijöitä. Haastattelujen pohjalta joillekin kriittisille menestystekijöille saatiin tarkempia määritelmiä case-yritykseen liittyen.

AVAINSANAT: Incident Management, kriittinen menestystekijä, palvelutasosopimus, IT-palvelunhallinta, palvelutiede

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1 INTRODUCTION

The global economy is experiencing a significant shift from a goods-based business model to a services-based business model (Kellogg & Nie 1995, 323; Rust & Miu 2006, 50). The shift was forecasted in the beginning of the 1990s, where Peter F. Drucker predicted that

> "The single greatest challenge facing managers in the developed countries of the world is to raise the productivity of knowledge and service workers. This challenge, which will dominate the management agenda for the next several decades, will ultimately determine the competitive performance of companies." (Drucker 1991, 69)

In the worldwide branch of software business, increasing attention has focused around IT service management (Winniford et al. 2009, 154). Its main goals include defining, managing and delivering IT services that support business goals and customer needs (Winniford et al. 2009, 153). To be able to deliver high quality IT services, Niessink and van Vliet (2000, 113) suggest software businesses should refer to the best practice models of IT service management. In this thesis, two theoretical frameworks will be used as basis for presenting IT service management. The first framework is ITIL, as suggested by Niessink and van Vliet (2000, 113), and the second one is CobiT, as suggested by Bartolini et al. (2006, 45).

The emerging branch of services science will be examined as the basis for one of its subsets, IT service management. In order to clearly define the subject area, this thesis will highlight some examples of the importance of customer service in software business. Incident Management Process (IMP) will also be presented based on the IT service management best practice frameworks of ITIL and CobiT. These frameworks can be applied to examine and identify the different roles, goals, and metrics involved in the entire IMP. According to Cater-Steel (2009, 73) IMP is often among the first processes to be adopted in IT service management. Incident Management aims to return IT services to normal service operations as soon as possible after an incident (Gupta et al. 2008, 142;

McLaughlin & Damiano 2007, 253). Incident stands for any deviation in the quality of a service (OGC 2007, 35). Also of high importance to the handling and prioritizing of incidents are the Service Level Agreements (SLA), which are applied to define and measure the quality of IT services delivered (OGC 2007, 50-51).

Caldeira and Brito e Abreu (2008, 335) have noted that there is little empirical research on IMP. More specifically, IMP research on the perspective of people has been overlooked (Caldeira & Brito e Abreu 2008, 334).

The purpose of this thesis is to provide knowledge of IMP and its Critical Success Factors (CSF) as experienced by the employees, who play different roles in the process. The ultimate goal is to produce a list of the different CSFs related to each role involved in the IMP. The results will be tested against interviews of employees from a customer support organization within a case study company that is producing and maintaining an energy management system product.

The results from the thesis are expected to give new insights into improving the efficiency of IMP. It might also assist in improving the process in the case study company in which the interviews were carried out. The thesis is based on the commonly accepted de facto standard frameworks ITIL and CobiT to make the handling of the theme apply to other similar environments as well.

The ultimate research question of this thesis is: "What are the Critical Success Factors for the different roles involved in the Incident Management Process?"

The research question can be split into four lower-level questions which will also be answered in this thesis:

- How is Incident Management presented in ITIL and CobiT, and how do the presentations in these two frameworks relate to each other?

- What are the roles involved in the Incident Management Process?

- What are the Critical Success Factors for the roles involved in the Incident Management Process?

- What do employees occupying the roles in the case study company view as Critical Success Factors in the Incident Management Process?

The empirical data of this thesis is made up from the insights from employees occupying the different roles of IMP in the case study company. The CSFs as described by the employees of the case study company are similar when compared to the presentation of CSFs in the literature review. For the most part, the same CSFs are found within the literature review, albeit the interviewees have their own specific definitions as they specifically relate to IMP of the case study company. However, more research is needed to verify these results. It should also be noted that there are special limitations to the significance of the results. Only single actors, or employees, per role in the IMP were interviewed, all of which were from the same company. Future research should include a larger sample of both companies and actors sharing the same role.

In chapter 2, the background for the thesis is built by presenting the emerging branch of services science as well as the concepts of customer service, software business and Service Level Agreements.

Chapter 3 will present IMP as it is defined in the frameworks of ITIL and CobiT, the two IT service management frameworks used as basis for the literature review.

Based on the existing literature, chapter 4 defines the concept of the Critical Success Factor, the roles involved as well as the metrics of IMP. As a result of the literature review part of this thesis, this thesis connects the CSFs defined for Incident Management to the roles in IMP.

Chapter 5 describes the case study company and its specific IMP. The research method used in the empirical part of the study is also introduced. The results of

the empirical study are based on the analysis of the interviews, which are presented in chapter 5 along with the author's critical observations.

2 CUSTOMER SERVICE IN SOFTWARE BUSINESS

When discussing both IT service management and its sub-domain of Incident Management, it is necessary to examine the broader institutional context in which they are a part of. This chapter will define some of their key concepts that will be referred to later on in this thesis, as well as how they are related to each other. These concepts include customer service, software business and Service Level Agreements.

Sub-chapter 2.1 will concentrate on the emerging theory of services science which has evolved to cover the area of services and service delivery. Services have been of interest to many academic communities, but a common goal and understanding has been lacking (Chesbrough & Spohrer 2006, 36).

In sub-chapter 2.2 the concept of Service Level Agreements (SLA) will be introduced. They are an important part of service delivery and service-based business to define the quality of services.

Sub-chapter 2.3 will introduce the branch of software business. Even though it is a vast field, which is known worldwide, there have been few scientific definitions for it. This sub-chapter will describe what is to be covered by the term "software business" in this thesis.

Sub-chapter 2.4 will discuss the subset of services science called IT Service Management (ITSM). The sub-chapter will give quick introductions to the two most popular ITSM frameworks, ITIL and CobiT, as well as the process of Incident Management.

Sub-chapter 2.5 will integrate the contents of the earlier sub-chapters by examining the role of customer service in Incident Management, the part of software business that this thesis is primarily concerned with.

2.1 Customer Service in Services Science

The global economy is experiencing a significant shift from a goods-based business model to a services-based business model. Produced goods are increasingly turning into mass-produced and non-descript products. So therefore, even the most traditional goods-based businesses need to consider how to differentiate themselves from the competition through the services they offer. (Kellogg & Nie 1995, 323; Rust & Miu 2006, 50) Even looking at the employment vacancies in OECD countries, more than half of them fall under the services sector (Sheehan 2006, 43). This shift from goods to services that businesses are experiencing today was first noted at the beginning of the 1990s (Drucker 1991, 69).

Accordingly, academic research is experiencing a shift from inspecting tangible goods to inspecting the processes behind the transaction of goods (Vargo & Lusch 2004a, 15). Furthermore, the shift towards service-dominant logic is based largely on increased focus on process management (Vargo & Lusch 2004a, 10).

Rust and Miu (2006, 50-51) list the history of academic research on services as follows (see TABLE 1): In the 1970s, services differed from goods in financial transactions. During the 1980s and 1990s, customer service was developed in quality and accountability. The 1990s also introduced direct marketing, which was brought on by information technology. At the beginning of the 21st century, research has begun to place a stronger emphasis on long-term customer relations throughout the consumer's lifetime. Currently, there are many academic centers focusing on service research (Rust & Miu 2006, 50).

TABLE 1. Academic research on services over time (Rust & Miu 2006, 51)

1970s	Services are differentiated from goods
1980s	Measuring customer service and service quality
	Complaint management
1990s	Making service improvements financially accountable
	Direct marketing and Customer Relationship Management (CRM)
2000s	Managing customer lifetime value and customer equity
	Profitable long-term relationships with customers
	Basing corporate strategy on service

Despite the rise of academic research in services science, there seems to be no comprehensive and commonly accepted definition for the term "service" (Alter 2008, 71). One reason for this is because research has been divided into distinct disciplines such as marketing, operations, economics, computer science, management and engineering (Alter 2008, 71; Chesbrough and Spohrer 2006, 36; Rai & Sambamurthy 2006, 328). This unsurprisingly results in different scholars defining service to fit their own disciplinary focus. There have only been few attempts to integrate the different insights (Chesbrough & Spohrer 2006, 36).

However, the one thing the definitions do have in common is that they describe services based on what goods are not (Vargo & Lusch 2004b, 325-332): intangible, not standardized, non-storable and consumable only at the same time as they are created. Vargo and Lusch (2004b, 333) believe that services often are defined based on differences to goods because practitioners find it

hard to give up the old way of thinking and speaking of goods. For the purposes of this thesis, services are defined as:

> "the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself." (Vargo and Lusch 2004a, 2)

This definition captures almost all the processes and work that are performed within the companies. Following this view, Vargo and Lusch (2004a, 10) emphasize that while services are nothing new, they are only now becoming more apparent and more important for businesses. According to them, the main reason for this shift is due to the increasing specialization of employees.

Vargo and Lusch (2004b, 326) also suggest that service delivery has become the most important form of economic exchange. In a goods-based economy, value comes from manufacturing products with superior value, whereas in a service-oriented economy, the key is defining and developing value together with the customer (Bardhan et al. 2010, 37; Vargo & Lusch 2004a, 6). In many cases, products are seen as a means of providing services to a customer, rather than the other way around (Rust & Miu 2006, 52; Vargo & Lusch 2004a, 8-9).

Services science emphasizes the importance of examining the lucrativeness of customers (both individual and enterprise) over their whole life-times rather than just through single sales. Even though improved emphasis on customer service may increase short-term costs, good customer relations are seen as worthwhile investments to the business. (Rust & Miu 2006, 52-53) To improve long-term customer satisfaction, Rust and Miu (2006, 51) highlight the importance of rewarding employees not only based on sales, but also on the quality of the customer service they deliver. The importance of investing in customer service is also backed up by many academics, who suggest that serving existing customers is cheaper than attracting new ones. (Rust & Miu 2006, 51) Improved customer loyalty, and thereby improved customer relations, also serve as customer equity, which improves the financial accountability of

the company in question (Rust & Miu 2006, 54). Thus, it would seem that customer satisfaction is the most obvious measure of service quality.

Yet it is difficult to measure customer satisfaction, as it is purely subjective based on the deviation between a customer's own expectations and her own perception of the service (Rust & Miu 2006, 51). To be able to provide high quality services, it is essential to understand the customer. Service providers must know the business of the customers and their perceptions, attitudes and behaviors. (Rust and Miu 2006, 51; Chesbrough & Spohrer 2006, 40) Fitzsimmons and Fitzsimmons (2006, 129) define the variables on which the equation between expectations and perceived service quality is formulated. They flag the following five variables as the dimensions of service quality (listed in declining importance to customers): reliability, responsiveness, credibility, willingness to offer individual service and physical appearance of the service.

There are many ways for a company to measure and further improve the quality of its services. According to Fitzsimmons & Fitzsimmons (2006, 142-146) the two most important and most widely used methods include *benchmarking*, in which the service is compared to a service provided in a company known for its exceptional service and *walk-through audits* which is a test where the customer experience is traced throughout the entire service encounter from beginning to end.

As stated before, in service-based businesses, revenue cannot be established through mass production. Instead, service providers should look for unique ways of providing value to customers through their services offerings, or in other words, they should differentiate themselves from the competition. According to academic research, investing in service expansion has proven to be a good strategy as opposed to expanding production and cutting service costs. To be sure, many businesses may feel that it could be economically

beneficial to cut costs to customer services. But as Rust and Miu (2006, 52) point out, cutting down on customer service has the consequence of long-term losses in customer loyalty, which in turn, negatively affects profits.

2.2 Service Level Agreements in Services Science

Service Level Agreements (SLAs) are contracts between a service provider and its customer used to define what kind of service is expected (Goo et al. 2009, 120; Unger et al. 2008, 43). Additionally it states quality expectations of the non-functional properties of a service offering. They are an integral part of any service provisioning. (Unger et al. 2008, 43) Conversely, *Operational Level Agreements* (OLAs) are agreements between a service provider and another part of the same company (OGC 2007, 238).

Non-functional properties are properties of the service that are not directly defining the sequences that can be done with the service but rather the quality of them (Molina-Jimenez et al. 2004, 3). Examples of this include availability, or average response time of a service.

Typically an SLA consists of the following definitions (according to Unger et al. 2008, 45):

Parties:	The contracting parties are the service provider and its customer
Service level parameters:	Measurable properties (like the availability or average response time) of the service of which the quality is to be defined
Service level objectives:	Level of quality according to which the service is to be provided (for example, at least 99% availability or an average response time of less than 5 hours)

Consequences: The consequences for the respective partner if a service level objective is violated

To make monitoring and evaluating of SLAs effective, both service level parameters and service level objectives must be defined precisely and unambiguously. As the contracting parties agree on what to monitor and how to monitor it, they can mutually state whether the quality has adhered to acceptable levels of service, and what the consequences are if the level of service is below acceptable. (Molina-Jimenez et al. 2004, 1)

It is of special importance to agree on SLAs when a customer decides to outsource a business process that it does not consider its core business. In this case, the customer company should negotiate qualitative requirements on the particular aspects of the services sought, as the service provider may specialize in providing such services to multiple customers with varying degrees of quality. (Unger et al. 2008, 43)

Even more importantly, the service provider should be careful in agreeing on SLAs if it is to further outsource a part of the service it is offering (Unger et al. 2008, 43). For example, a service provider offering an IT system for a customer company should get the IT hosting company to agree to provide the same level of availability of IT hosting services to the service provider that the service provider has offered its customer companies.

2.3 Software Business

Software business is a fairly new area of business that has been evolving for some decades. In the early stages of this industry, computers were programmed by hand for specific needs in an ad hoc manner (Cusumano 2004, 88). In the 1950's, buyers of computer hardware saw programming as a service they should get for free (Cusumano 2004, 112). In the 1960's, the first programming entrepreneurs found out similar user needs and started developing and selling

software products to meet customer needs (Cusumano 2004, 91). By the end of the 1960's, service providers discovered a new niche market: database applications (Cusumano 2004, 95). By the mid-1980's, the launch of IBM compatible PCs attracted numerous entrepreneurs to the software business (Cusumano 2004, 102). In the late 1990's and early 2000's, the widespread use of the internet transformed the operations of traditional, in-person businesses to be conducted online (Cusumano 2004; 116,127).

The most important aspect of understanding software business is whether the business is products based or services based (Cusumano 2004, 25). A products-based company will mostly concentrate in delivering software products as mass production. As examples, Cusumano points to Microsoft and Adobe. When these companies begin to start customizing their products and implementing customer-specific features, they gradually turn into being services-based companies. Examples of these, according to Cusumano, include consultation companies such as PricewaterhouseCoopers and Accenture. These example companies are getting their revenues from customizing systems that rely on reusing partial products.

Even though it is possible to get huge profits from a best-selling software product in the short term, Cusumano (2004, 29) makes it clear that it is not easy to sustain such operations in the long run. In order to be profitable in the long run, Cusumano (2004, 27) suggests that a software company should begin to offer services, at least to complement its own products. Regular income from services can be secured in different ways, like by collecting regular license fees in the form of maintenance contracts. The annual income of such contracts may add up to between 15 and 20 percent of the software license price.

In addition to the division between services-based and products-based companies, Cusumano (2004, 28) calls these companies that offer both products and services hybrid solutions companies. They normally sell a product to which

a notable amount of customization is needed. Examples of hybrid solutions companies include SAP and Oracle. The hybrid solutions business model often results in what Cusumano refers to as "technical lock-in", where customers get tied to a service provider for a long time, making it difficult to change the provider.

Even though the hybrid solutions business model might seem the most attractive than either the products- or services-based companies, Cusumano (2004, 31) still emphasizes the importance of selecting between products and services as the main strategic concern. The reason for this is that strategies for the two options differ from bulk sales (economies of scale) to individual relationships (economies of scope).

Another important decision for a software company to make is whether to serve enterprise or individual customers (Cusumano 2004, 47). To be able to compete in the enterprise market, companies normally have to offer a solid and comprehensive package that fulfills the entire needs of the customer company in that area. These kinds of sales will usually also contain a contract for maintenance and upgrades. In the market of individuals, companies normally offer plain standardized software for customers to buy. Even though the enterprise market may show high revenue potential, there are also high risks on the cost side: large customer companies often require customized products and services from the service provider, even if there is a substantial discount in the services and products it provides. (Cusumano 2004, 49-50)

Company characteristics play an important role in the software business. Often the software products used in companies are used for important purposes, and therefore they must work as expected. However, it is not just the software quality, but also the service quality that makes up the company image in the eyes of its customers. Quality of software must match expectations and the promises given to customers must be kept in order to be a reliable partner.

After all, if a software business loses its credibility, it is likely to lose its customers too. (Cusumano 2004, 78-82)

2.4 IT Service Management (ITSM) and Incident Management

This sub-chapter will introduce the background for dealing with Incident Management: IT service management and its two most popular frameworks ITIL and CobiT. All the themes will be discussed in more detail in following chapters.

Information technology service management (ITSM) is a subset of services science (introduced in sub-chapter 2.1) (Galup et al. 2009, 124). It "focuses on defining, managing and delivering IT services to support business goals and customer needs." It also encourages process- and customer-oriented focus in business. (Winniford et al. 2009, 153) Instead of managing just IT, companies are now increasingly interested in managing IT services that are offered to both internal and external customers. One way to see the difference is that earlier IT was defined in terms of gigabytes and dropped packets, but today the SLAs are defined in terms of business goals (Winniford et al. 2009, 154). Examples of these could include goals related to the quality of delivered business information or reaction times to requests.

The main reasons for implementing an ITSM improvement include improving the focus on IT service, integrating IT and business processes and reducing costs (Cater-Steel 2009, 73) while providing improved and guaranteed quality of IT services the company offers to its customers (Zhao & Gao 2008, 1494). Some proof of the increasing attention to ITSM can be seen in the number of ITIL examinations which were taken in 2006, which jumped five-fold from the number in 2003 (Galup et al. 2009, 126). In a survey conducted by Cater-Steel (2009, 73) 70 percent of Australian IT companies answering the questionnaire responded that their customer satisfaction had risen after ITSM improvements.

The first international standard for ITSM is the ISO/IEC 20000 standard ratified in 2005 (Winniford et al. 2009, 154). The idea of the standard is to offer unified guidelines for consistent ITSM within and across companies (Galup et al. 2009, 125). According to Galup et al. (2009, 125), the guidelines of ISO/IEC 20000 are largely based on the ITIL framework. Yet Winniford et al. (2009, 154) suggest that these guidelines are not strictly based on any single framework, but rather a unified combination of the most used ITSM frameworks, like ITIL, CobiT and American Service Level Management.

IT Infrastructure Library (ITIL) is a best practice framework for ITSM originally developed by the British Government's Central Computer and Telecommunications Agency in the 1980's (Galup et al. 2009, 125). ITIL has become the de facto standard for IT service management (Caldeira & Brito e Abreu 2008, 331). *Control objectives for information and related Technology (CobiT)* is another best practice framework for ITSM developed by The Information Systems Audit and Control Association (ISACA) and the IT Governance Institute (ITGI) (Sahibudin et al. 2008, 751).

Incident is "an unplanned interruption to an IT service or reduction in the quality of an IT service" (OGC 2007, 46). Incident Management Process, which this thesis is concerned with, is the process that responds to all the phases of an incident throughout its lifecycle (McLaughlin & Damiano 2007, 253). Its primary goal is to return IT services to normal service operation as soon as possible after an incident (OGC 2007, 35; Gupta et al. 2008, 142; McLaughlin & Damiano 2007, 253). In ITIL, the term "normal service operation" is defined as operation within the SLA definition (OGC 2007, 46).

2.5 Customer Service in Incident Management

As the rest of this thesis concentrates on customer service in Incident Management Process, this sub-chapter will continue to summarize the connection between the items of previous sub-chapters. The sub-chapter will in

particular explain why Incident Management is seen as an integral part of any software business.

As a starting point of why there is a need for Incident Management, Chulani et al. (2003, 189) suggest the costs of software business must be tabulated based on the whole lifecycle of products. It is not cheaper nor practical for a company to develop a flawless product whose quality is 100 percent; after the company develops a product, it is more efficient for the company to invest in its service team to fix bugs as they emerge. The literature largely agrees that this is the most efficient method in developing software and thus underscores the importance of Incident Management.

As stated in the previous sub-chapters, Niessink and van Vliet (2000, 103) see developing software as developing products, whereas software maintenance, including Incident Management, as delivering service. Niessink and van Vliet (2000, 103-104) argue that the quality of software maintenance is actually judged on two aspects: the results of the service and the way the service is delivered. The research carried out at IBM by Buckley and Chillarege (1995, 197) shows that there is a clear relation between the key metrics of software maintenance, and thereby of Incident Management and the perceived customer satisfaction with the software product. The same research also suggests that by investing correct Incident Management services, businesses could save up to ten times the investment, as the preventive measures are in place before an incident intensifies (Buckley & Chillarege 1995, 200).

To be able to deliver high quality results with high quality processes, Niessink and van Vliet (2000, 113) suggest using the best practice models, such as ITIL. However, Bartolini et al. (2006, 45) suggest using the CobiT framework. These are the two main frameworks that will be used in this thesis to find out the role-specific Critical Success Factors in Incident Management.

This chapter introduced the theoretical background for the thesis. In sub-chapter 2.1 the emerging branch of services science was introduced. Even though there have been multiple insights into the research of services before, only recently have there been attempts to assemble the insights of different research areas into one. Most importantly the sub-chapter offered a broad definition for services.

Sub-chapter 2.2 discussed the Service Level Agreements (SLAs) that are made to agree on the quality of services between the service provider and its customer.

Sub-chapter 2.3 introduced the branch of software business. It was presented by examples of what characterizes and differentiates the companies that are competing globally.

Sub-chapter 2.4, a subset of services science, IT service management (ITSM) was introduced. It has a process- and customer-oriented focus on "defining, managing and delivering IT services to support business goals and customer needs" (Winniford et al. 2009, 153). The two most popular frameworks for ITSM, ITIL and CobiT, were introduced briefly, as they will be used as the basis of discussing Incident Management in the rest of the thesis.

In sub-chapter 2.5, the delivery of services was discussed in the context of Incident Management. It was stated that it is not profitable to produce software products with 100 percent quality, but instead invest in software maintenance, and in particular, Incident Management (Chulani et al. 2003, 189). A clear relation between the performance of software maintenance and perceived customer satisfaction with the software product was identified (Buckley and Chillarege 1995, 197).

The next chapter will more thoroughly introduce the frameworks of ITIL and CobiT, and how Incident Management is presented within them.

3 INCIDENT MANAGEMENT

This chapter will present Incident Management as it is introduced as a process in ITIL and CobiT frameworks. This chapter will also serve as framework for the rest of the thesis.

Sub-chapter 3.1 will present the de facto best practice model of ITSM, ITIL, and its process of "Incident Management".

Correspondingly, sub-chapter 3.2 will present another ITSM framework, CobiT, and its process of "Manage Service Desk and Incidents".

3.1 IT Infrastructure Library (ITIL)

This sub-chapter will introduce ITIL and its presentation of Incident Management Process (IMP). The goal is to provide an overview of the process, and to be able to compare it with the matching process from CobiT. The presentation of ITIL in this thesis is based on the newest ITIL v3 that was released in May 2007 (Pollard & Cater-Steel 2009, 165).

IT Infrastructure Library is an ITSM framework with best practices for delivering high quality IT services at affordable prices (Galup et al. 2009, 125; Zhao & Gao 2008, 1494). ITIL offers common terminology for ITSM and descriptions of core ITSM processes. The ITIL process descriptions within the framework focus on the "what" instead of going into details on the "how". (Zhao & Gao 2008, 1495)

At first, ITIL was developed by the British Government's Central Computer and Telecommunications Agency in the 1980's to respond to its dependency on IT and to address the agency's increasing efficiency needs (Galup et al. 2009, 125). Nowadays, ITIL has become the de facto standard for IT service management (Caldeira & Brito e Abreu 2008, 331).

ITIL library consists of two components (OGC 2007, 5):

- ITIL core presents best practices for organizations that offer services to other businesses, regardless of the type of industry the service provider belongs to. The ITIL core is divided into five publications: Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement. The first four publications follow the service lifecycle as presented in the ITIL framework.

- ITIL complementary guidance acts as a supplement to the ITIL core publications by providing information specific to industries, organization types, operating models and technology architectures.

This thesis will concentrate on IMP under the Service Operation publication.

3.1.1 ITIL Terminology

This sub-chapter will define some key ITIL terminology that will be used later on in the thesis:

Function: "Functions are units of organizations specialized to perform certain types of work and responsible for specific outcomes" (OGC 2007, 12).

Service Desk: Service Desk is a functional unit in which dedicated employees serve as the primary point of contact for dealing with service events, like incidents. Service Desk is often also referred to as First Line Support (OGC 2007; 15, 109-110).

Service Operation: Service Operation is the part of the ITIL library that targets the effectiveness of service delivery and

> support, to produce value for both the customer and service provider (McLaughlin & Damiano 2007, 253).

Continual Service Improvement:

> Continual Service Improvement is the part of ITIL library that concentrates on turning experiences from Service operations to the continuous improvement of service design, introduction and operation. (OGC 2007, 6-7)

3.1.2 Incident Management Process (IMP)

This sub-chapter describes the Incident Management Process, as it is described in the ITIL framework.

According to OGC (2007, 47), there are four main reasons why a good IMP provides business value to companies:

- As incidents are detected early and effectively enough, the downtime of the agreed service can be minimized.
- IT service work resources can be dynamically aligned to meet current needs according to business priorities.
- Potential improvements to services can be detected as a result of understanding the occurring incidents.
- Service Desk can identify additional service and/or training needs based on the incidents.

Largely because of these benefits, IMP is often one of the first ITIL processes to be implemented in organizations (OGC 2007, 47). This is supported by the findings of Cater-Steel (2009, 73) who observe that the function of the Service

Desk, and the processes of Incident and Change Management are among the first types of service infrastructure companies adopt.

The next paragraphs will describe in detail the process chronology of IMP, which is visualized in FIGURE 1.

IMP starts as a new incident is identified. A customer experiencing unplanned interruption usually initiates this by reporting the inconvenience to Service Desk. Among other methods, incidents can also be detected with automatic monitoring tools. (OGC 2007, 49)

All incidents must be individually logged into an Incident Management System (IMS) along with a date and time stamp. All relevant information of handling the incident must always be logged into the IMS in order to ease up further referring to and reporting of the same incident. Therefore it is important that all the employees involved in the process understand the significance of logging their work. Along with the initial logging of an incident to the IMS, all incidents must be categorized. This is done based on a pre-defined structure that usually consists of multiple levels of product categories. The structures are based on business needs related to handling and reporting incidents. (OGC 2007, 49-50)

Next, the incidents must be prioritized to determine how the incident will be handled. This is normally done based on two measures: urgency of incident (how quickly the company needs to resolve the incident) and the level of its impact. The impact is often based on the amount of users affected, but could also be increased based on other factors, such as a risk to someone's life or a negative effect on the company's reputation. In the initial definition of the priority categories, target resolution times for each category are also taken into consideration. The initial prioritization of an incident might need to be updated later on in the process, based on changing factors, such as the growth of impact of the incident or if the duration of the incident begins to exceed SLA target times. (OGC 2007, 50-51)

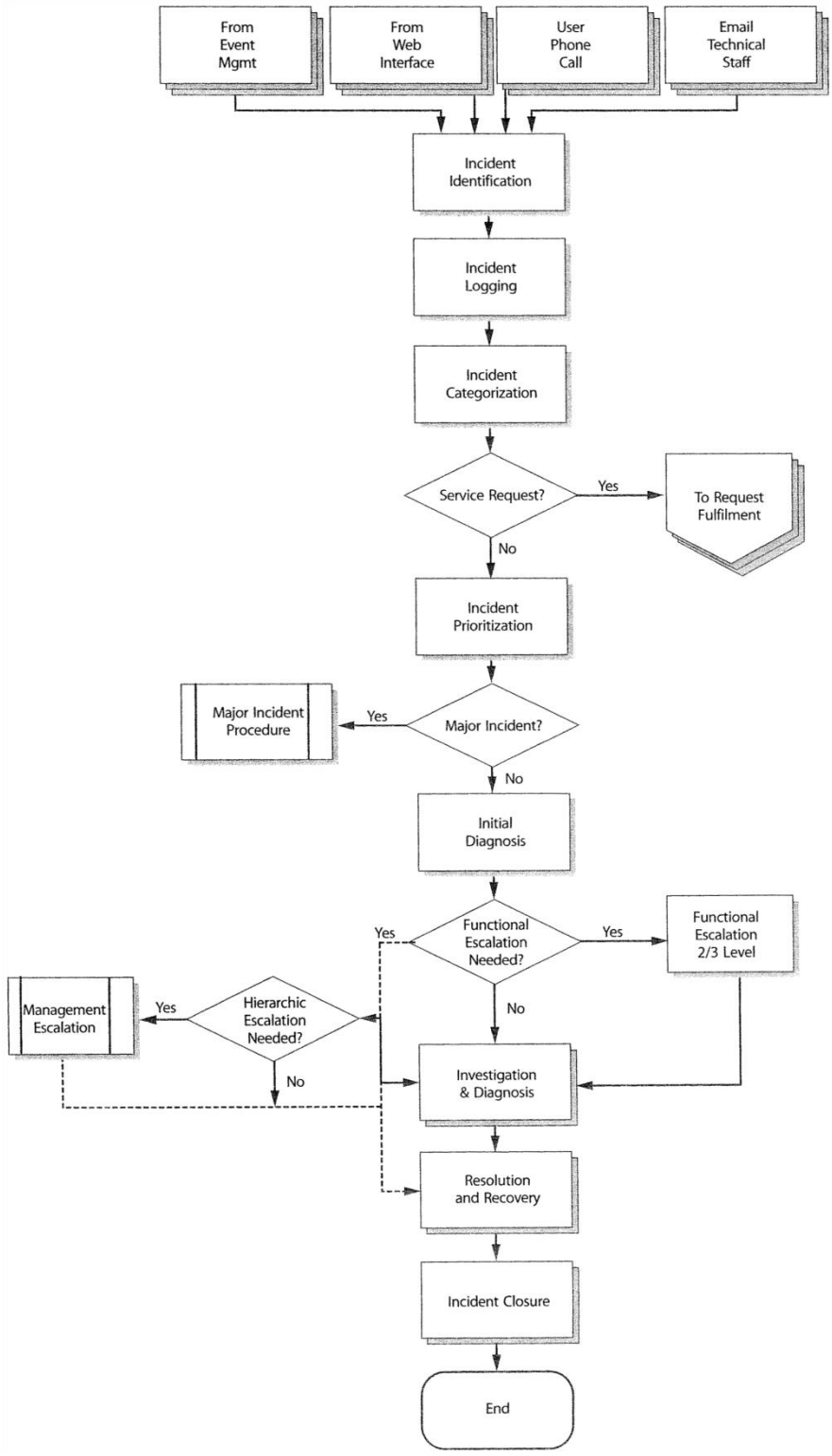


FIGURE 1. ITIL Incident Management Process chronology (OGC 2007, 48)

When the Service Desk is talking with the customer who reported the incident (if this was how the incident process was initiated), the Service Desk should also identify possible reasons why the incident occurred. Known error information and proper diagnostic scripts can be pivotal in obtaining an early and accurate diagnosis. In an ideal situation, the Service Desk is able to resolve the incident right away, thus closing the incident from the IMS. However, if the incident cannot be resolved during this initial contact with the customer, then the Service Desk should inform the customer that further action is required to resolve the incident, and then give the customer an incident reference number. Depending on the incident, the Service Desk might try to resolve the situation itself. (OGC 2007, 51)

If the Service Desk cannot resolve the incident or fails to meet the agreed target time, the incident then escalates to the next level of the IMP (OGC 2007, 51). There are two types of escalation:

- Functional escalation is the more common type of escalation, where the incident moves from the Service Desk to Second Line Support or even further on to Third Line Support if the knowledge level or resolution target time exceeds also at Second Line Support.

- Hierarchic escalation is the procedure of making senior managers, whom the incident might concern, aware of the incident. This procedure may not only help in arranging the needed resources for resolving a high priority incident, but it also serves in preparing the management in the event that the customer notifies the management.

It is important to highlight that despite any escalation, the ownership of the incident always stays with the Service Desk. The Service Desk should also keep the customer informed of the progress on the resolution of the incident. This means that all the relevant information should always be logged into the IMS by everyone who works to resolve the incident. By doing this, the Service Desk

is always able to inform the customer of where the incident stands; regardless of which unit is dealing with the incident. (OGC 2007, 52)

On the level of escalation, where it is relevant for each incident, further investigation and diagnosis is carried out. This can include identifying events that could have triggered such an incident, searching for earlier occurrences of a similar nature and confirming the full impact of the incident. All investigation and diagnosis work which is done to understand the incident needs to be properly documented into the IMS, to prevent any work from being done twice on the different levels of escalation. (OGC 2007, 52)

Whenever a potential resolution is discovered, it should be undertaken in a methodical fashion. This includes applying and testing the resolution with all the involved parties, including the customer and, when necessary, the subcontractors. As was true for the investigation and diagnosis phases, all actions aiming to resolve the incident must be carefully documented into the IMS in order to maintain a full history record. After the resolution has been applied and tested, the incident should be passed back to the Service Desk. (OGC 2007, 52-53)

After the Service Desk has checked and confirmed together with the customer that the incident has been resolved, the incident can be closed. Closing the incident includes confirming the initial categorization of the incident, ensuring customer satisfaction, complementing any missing information on the incident record and determining if preventive actions could be taken to avoid similar incidents in the future. Even though the closure of incidents is carried out as described above, there will always be situations in which incidents have to be re-opened. For such cases, there should be clear procedures describing if the closed incident should either be re-opened, or if a new incident report should be created. (OGC 2007, 53)

3.2 CobiT: Manage Service Desk and Incidents

This sub-chapter will describe the Manage Service Desk and Incidents process as well as its control objectives as they are introduced in the CobiT framework. This will serve as another view to Incident Management as described by the ITIL process in the previous sub-chapter. The presentation of CobiT in this thesis is based on the newest CobiT version 4.1, released in May 2007 (ISACA 2009).

Control objectives for information and related Technology (CobiT) is another best practice framework for IT service management developed by the Information Systems Audit and Control Association (ISACA) and the IT Governance Institute (ITGI) (Sahibudin et al. 2008, 751). CobiT was introduced for the first time in 1992 to offer generally accepted and up-to-date IT control objectives, especially for managers and auditors (Sahibudin et al. 2008, 751).

CobiT 4.1 contains 215 control objectives categorized into four domains: Plan and Organize, Acquire and Implement, Deliver and Support, and Monitor and Evaluate (Sahibudin et al. 2008, 751). Within each domain there are some high level objectives, altogether 34, grouping the control objectives (Sahibudin et al. 2008, 751).

This thesis will concentrate on the control objectives under Manage Service Desk and Incidents Process under the domain of Deliver and Support.

3.2.1 CobiT Terminology

This sub-chapter will define key CobiT terminology that will be used later on in the thesis:

Control objective: Control objectives define the ultimate goals to assure that desired business objectives are achieved and

> undesired events are prevented or detected and corrected. (ITGI 2007, 5)

3.2.2 Manage Service Desk and Incidents Process

In the CobiT framework, there is a process called Manage Service Desk and Incidents under the domain of Delivery and Support. Sahibudin et al. (2008, 752) have published a mapping of ITIL processes to high level objectives of CobiT. In the publication, the control objectives of this process are listed to match the IMP of ITIL. However, it is worth noting that the Problem Management process of ITIL is also covered under the same control objective (Sahibudin et al. 2008, 752). In a paper mapping ITIL, CobiT and ISO20000, IT Governance Institute (2008, 52) offers a more precise mapping for ITIL Incident Management inside the Manage Service Desk and Incidents process of CobiT (see TABLE 2).

In the CobiT framework, the process of Manage Service Desk and Incidents is intended to increase productivity by providing quick resolutions of incidents. It includes setting up a Service Desk function to register, escalate and resolve incidents and to analyze trends and root causes. (ITGI 2007, 129) The analysis of trends and root causes does not match the definitions in ITIL Incident Management, but they are covered by other parts of the ITIL framework. Trend analysis is included in the Continual Service Improvement section of ITIL, whereas Root Cause Analysis is carried out in Problem Management Process (Sahibudin et al. 2008, 752).

The control objectives defined for the process consist of the ones defined in TABLE 2. These mostly correspond to the steps of ITIL IMP. TABLE 2 compares the IMPs of ITIL and CobiT, based on the findings of the IT Governance Institute (2007, 130).

TABLE 2. Mapping presentations of Incident Management in ITIL and CobiT (adapted from ITGI 2008, 52)

ITIL v3: **Incident Management,** **Continual Service Improvement**	**CobiT 4.1:** **Manage Service Desk and Incidents**
SO 4.2 Incident management	DS 8.1 Service desk
SO 4.2.5.1 Incident identification SO 4.2.5.2 Incident logging SO 4.2.5.3 Incident categorisation SO 4.2.5.4 Incident prioritisation SO 4.2.5.5 Initial diagnosis	DS 8.2 Registration of customer queries
SO 4.2.5.6 Incident escalation SO 4.2.5.7 Investigation and diagnosis SO 4.2.5.8 Resolution and recovery	DS 8.3 Incident escalation
SO 4.2.5.9 Incident closure	DS 8.4 Incident closure
Continual Service Improvement (no correspondence in ITIL Incident Management)	DS 8.5 Reporting and trend analysis

The parts of CobiT which correspond to ITIL Incident Management include the basic guidelines of the process as described in this paragraph. Both frameworks suggest that a company needs to establish a Service Desk as the contact point for Incident Management and an IMS for recording, classifying and prioritizing incidents. Monitoring and escalation procedures must be agreed to comply with SLAs so that incidents that cannot be resolved at Service Desk escalate to the appropriate level. Despite escalations, the Service Desk representative retains ownership over the incident, is responsible for the life cycle monitoring of the incident, as well as responsible for keeping customers up to date on the status of the incident. At the end of the incident lifecycle, Service Desk is responsible

for recording incident resolutions that have been resolved to the customer's satisfaction into the IMS.

Even though the steps of categorizing and prioritizing the incidents are described in more detail in the ITIL framework, the lifecycle of incidents is very similar in the two frameworks. However, it is worth nothing that CobiT has an additional control objective (Reporting and Trend analysis). In the CobiT framework, providing reports on Service Desk activity to identify trends and recurring problems is included in the Manage Service Desk and Incidents process, whereas in the ITIL framework, this is covered by the Continual Service Improvement publication instead of the IMP as this information is used as input for improving services.

There are multiple frameworks and international standards established for ITSM. This chapter presented two of them: IT Infrastructure Library (ITIL) and Control objectives for information and related Technology (CobiT). The presentations of Incident Management within these frameworks were analyzed and then compared with each other. This thesis concludes that for the basic process steps in Incident Management, the processes more or less are the same, with some minor exceptions. In the case of ITIL, there are more specific explanations for many of the process steps. In CobiT, the reporting and developing of the process is included in the same publication, whereas in ITIL they are included in a different publication.

In the next chapter, IMP will be analyzed further to identify the CSFs for the roles involved in the process.

4 ROLE-SPECIFIC CRITICAL SUCCESS FACTORS (CSFs) IN INCIDENT MANAGEMENT

This chapter will introduce the goals, metrics and roles involved in Incident Management. Eventually, role-specific Critical Success Factors for the roles in IMP will be presented. This analysis will mainly be based on the frameworks and IMP descriptions of ITIL and CobiT which were introduced in the previous chapter.

Sub-chapter 4.1 will discuss the term of Critical Success Factor (CSF), and why it is important for the purposes of this thesis.

Sub-chapter 4.2 will present the most common metrics used in measuring the efficiency of IMP.

Sub-chapter 4.3 will present the roles that are involved in IMP throughout the incident lifecycle, including escalations (see chapter 3.1.2).

Sub-chapter 4.4 will combine the information from the previous sub-chapters to present a table containing the CSFs as experienced by each of the roles involved in IMP.

4.1 Critical Success Factor

This sub-chapter will introduce the concept of CSF; Sub-chapter 4.4 will present the CSFs for the roles involved in the IMP.

Critical Success Factors were originally defined as "the limited number of areas in which results, if they are satisfactory, will insure successful competitive performance for the organization" (Rockart 1979, 85). It is therefore important to give CSFs continuous and special attention to both reach and maintain good performance levels. The CSFs are especially effective when communicating requirements to senior management (Boynton & Zmud 1984, 17) as CSFs are

often used as a common language throughout the company or organization, from the senior management level to the analyst level (Boynton & Zmud 1984, 26) or in other words, the employee.

Boynton and Zmud (1984, 17) note that personal CSFs can be found in dialogues between an analyst and her manager. In the empirical part of this thesis, the researcher will test the role-specific CSFs found in the literature review by interviewing employees working in the roles of IMP in the case study company.

4.2 Metrics for Incident Management

This sub-chapter will list some of the key metrics for the IMP. As there is little scientific material on the subject, this chapter first begins by listing metrics from the ITIL and CobiT frameworks, and is then followed up with comments from a more scientific source.

The ITIL (OGC 2007, 54-55) and CobiT (ITGI 2007, 131) frameworks list metrics by which the efficiency of Incident Management can be measured. TABLE 3 shows the most common metrics divided into two groups: incidents and Service Desk activity.

As already discussed in sub-chapter 2.2, the monitoring of the metrics on which SLAs are based should also be available for customers (OGC 2007, 55).

Barash et al. (2007, 11) note that it is hard to define precise and descriptive metrics for the performance of IMP. They see a demand for metrics that go well behind the obvious level of, for example, "How quick is an incident resolved on average" and investigate the internal working of the support organization. Instead, Barash would look for bottlenecks in the process by measuring the amount of incoming and outgoing incidents per support level and the average time spent on each support level for an incident (Barash et al. 2007, 14).

TABLE 3. Main metrics for Incident Management (based on OGC 2007, 54-55 and ITGI 2007, 131)

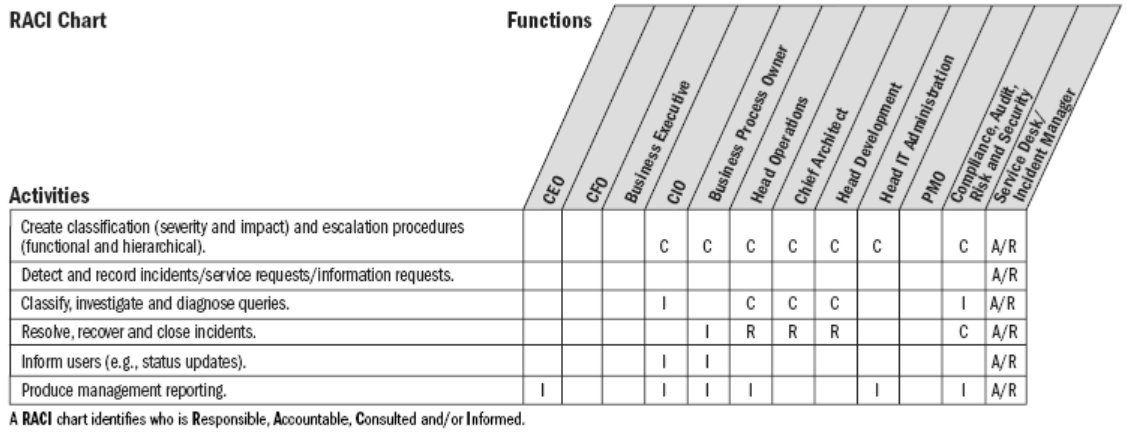
Metric	**ITIL**	**CobiT**
Incidents		
Total number of incidents	x	x
Number of incidents at each stage (e.g. logged, in progress, closed)	x	
Percent of incidents resolved within an agreed-upon (SLA) time	x	x
Average resolution time and cost	x	
Percent of incident resolved already at Service Desk	x	x
Percent of incorrectly assigned incidents	x	
Percent of incorrectly categorized incidents	x	
Percent of incidents that have been re-opened	x	x
Incident abandonment rate		x
Percent of incidents reported using automated tools		x
Percent of incidents that require on-site support	x	x
Dispersion of incidents per time of day (to adjust resourcing for peak times)	x	
Service Desk activity		
Customer satisfaction with Service Desk		x
Number of days of training per Service Desk employee		x
Number and percentage of incidents handled by each Service Desk member	x	x

4.3 Roles Involved in Incident Management

This sub-chapter will list and describe the roles in IMP. As there is little scientific material for the theme, the chapter is based on descriptions from the ITIL and CobiT frameworks.

In the ITIL framework (OGC 2007, 109-110; 144-145), there are four functions listed that are involved in IMP. The *Incident Manager* is the person responsible for managing the day-to-day Incident Management work and developing the processes and tools used throughout the process. *First Line Support* (also referred to as Service Desk) acts as the single point of contact for customers to report their incidents. First line also initiates the incident resolving actions. *Second Line Support* is a group with further technical skills able to investigate escalated incidents a bit further without any interference from customer telephone call interruptions or other operations carried out by First Line Support. *Third Line Support* is the highest stage of IMP consisting of different technical specialist groups like R&D and Product Management.

The CobiT framework (ITGI 2007, 131) does not provide as exact a listing of the roles involved in the process as ITIL. However, it does offer a chart for presenting which functions are **R**esponsible, **A**ccountable, **C**onsulted and/or **I**nformed (RACI) in the course of the process. This presentation concentrates mostly on management, as per the goal of the CobiT framework. These functions of the actors are presented in FIGURE 2.



RACI Chart

Activities	CEO	CFO	Business Executive	CIO	Business Process Owner	Head Operations	Chief Architect	Head Development	Head IT Administration	PMO	Compliance, Audit, Risk and Security	Service Desk/ Incident Manager
Create classification (severity and impact) and escalation procedures (functional and hierarchical).				C	C	C	C	C	C		C	A/R
Detect and record incidents/service requests/information requests.												A/R
Classify, investigate and diagnose queries.				I		C	C	C			I	A/R
Resolve, recover and close incidents.					I	R	R	R			C	A/R
Inform users (e.g., status updates).				I	I							A/R
Produce management reporting.	I			I	I	I			I		I	A/R

A **RACI** chart identifies who is **R**esponsible, **A**ccountable, **C**onsulted and/or **I**nformed.

FIGURE 2. RACI chart of Manage Service Desk and Incidents (ITGI 2007, 131)

4.4 Role-specific Critical Success Factors (CSFs) in Incident Management

This sub-chapter has two goals: first, it will present the CSFs of IMP, and second, it will map the CSFs to the roles in the process. The roles presented in the previous sub-chapter will be taken as a basis for the presentation of the role-specific CSFs. As there is little scientific material for the theme, the CSFs will mostly be based on the ITIL and CobiT frameworks. In these frameworks, the CSFs have not been presented in connection to the roles, so the mapping of roles' CSFs will be the researcher's own contribution to the discourse, which will be covered later in the chapter.

Later on in the empirical part of the thesis, the CSFs defined in this chapter will be tested against the CSFs given by the employees of the case study company.

The ITIL framework (OGC 2007, 55) presents a list of challenges critical to successful Incident Management. It includes the following:

- Ability to detect incidents as early as possible

- Commitment from all staff to record all incidents into the IMS
- Availability of all incident-related information into the IMS
- Integration of the IMS to the Configuration Management System (a system that includes information of hardware and software components of the product) in order to determine the relationships between products at the Service Desk
- Integration of the IMP and Service Level Management to monitor SLAs

In addition to this, the ITIL framework (OGC 2007, 55) defines successful Incident Management Process by:

- Effective Service Desk operation
- Clearly defined targets from SLAs
- Customer-orientation and adequate skill level at each process stage
- Integrated support tools directing the process
- Proper agreements between different parties of the process

In CobiT, the framework for the CSFs can be extracted from the control objectives defined for the Manage Service Desk and incidents process (ITGI 2007, 130):

Service Desk:	Service Desk must be established as the contact point for incident handling. Monitoring and escalation procedures must be agreed to comply with SLAs. End users' satisfaction with Service Desk must be measured.

Registration of customer queries:

The function (Service Desk) and the system (IMS) are needed for recording, classifying and prioritizing incidents. Customers must be kept up-to-date of the status of their incidents.

Incident escalation: Incidents that cannot be resolved by Service Desk are escalated according to the requirements set out by the SLA. Despite any escalations, a Service Desk representative will retain ownership over the incident and is responsible for monitoring its life-cycle.

Incident closure: Service Desk is responsible for recording incident resolutions that have been agreed on by the customer into the IMS. Unresolved incidents must be recorded and reported as known errors and workarounds to provide information for Problem Management.

Reporting and trend analysis:

Service Desk must provide reports on their activity to identify trends and recurring problems. This is used as input for improving the service.

In addition to the CSFs found in the ITIL and CobiT frameworks, there are two additions from scientific articles dealing with Incident Management: Gupta et al. (2008, 143) define the one most important CSF for Incident Management as being able to recognize the failed part of the service as fast and as accurately as possible. Barash et al. (2007, 11) emphasize the importance of categorizing and prioritizing the incidents based on the total effect to the supported business. Gupta's analysis was incorporated into the ITIL based CSF from "Clear overview of relations between different hardware/software components" to

"Clear overview of relations between different hardware/software components to identify the failed component as fast and accurately as possible". Barash's analysis expanded the CSF of CobiT from "Incidents are classified and prioritized accurately" to "Incidents are classified and prioritized accurately based on the total effect to the supported business".

To produce a framework for the empirical part containing role-specific CSFs in IMP, the CSFs presented above must be mapped to the roles presented in the previous sub-chapter. TABLE 4 consists of the definitions of the different CSFs which are based on the ITIL and CobiT frameworks, as well as the articles about Incident Management by Gupta et al. (2008, 143) and Barash et al. (2007, 11). The markings for the references in the table indicate which of the references each of the CSFs is taken from. If there is an "x" in the cell, the CSF is mentioned in the reference, whereas the CSFs marked with "½" are partially derived from the reference.

The roles listed in the table include the ones presented in the ITIL IMP and in the RACI chart of the CobiT Manage Service Desk and Incidents process (see FIGURE 2). From the roles of the standard RACI chart of CobiT, the roles of Project Management Officer, Business Executive and CFO have been removed, as there are no entries for these roles in the RACI chart of the Manage Service Desk and Incidents process. Also, the roles of Head Operations, CIO and Head IT Administration were removed, as no CSFs were found critical enough for them to be included in the mapping described later in this chapter.

TABLE 4. Role-specific CSFs in Incident Management

Roles in Incident Management										References			
Service Desk	2nd Line Support	3rd Line Support	Incident Manager	Compliance, Audit, Risk	Head Development	Chief Architect	Business Process Owner	CEO	Critical success factor (CSF)	ITIL	CobiT	Gupta et al.	Barash et al.
			x						Incidents are detected early enough	x			
x	x		x		x				All incidents are recorded to IMS	x	x		
x	x		x	x					All related information and incident resolutions are recorded to IMS	½	x		
x	x			x	x				Incidents are classified and prioritized accurately based on the total effect to the supported business		½		½
		x				x			Unresolved incidents are reported to Problem Management for root cause analysis		x		
	x	x				x			Clear overview of relations between different hardware/software components to identify the failed component as fast and accurately as possible	½		½	

(continues)

TABLE 4. Role-specific CSFs in Incident Management (continues)

Roles in Incident Management										References			
Service Desk	2nd Line Support	3rd Line Support	Incident Manager	Compliance, Audit, Risk	Head Development	Chief Architect	Business Process Owner	CEO	Critical success factor (CSF)	ITIL	CobiT	Gupta et al.	Barash et al.
							x		Support tools direct the process	x			
x	x						x		SLAs provide clear target times with clear escalation procedures agreed between the parties of the process	½	½		
			x	x					SLAs can be viewed and monitored for incidents	x	x		
							x		Customer-orientation and adequate skill level at each process stage	x			
			x						Customer satisfaction is measured		x		
x									Customers are kept up-to-date of their incidents		x		
	x								Efficient Service Desk resolves most of the incidents	x			
								x	Proper reporting of Service Desk activity		x		

(based on OGC 2007, 55; ITGI 2007, 130; Gupta et al. 2008, 143; Barash et al. 2007, 11; role mapping done by researcher)

The mapping of CSFs to the roles of IMP is based on the researcher's perceptions of which of the listed CSFs might be the most important ones for each of the roles to succeed in working as part of the process (cf. the definition of CSF in chapter 4.1). In the next paragraphs, the assumed role-specific CSFs are presented per each of the roles as presented in sub-chapter 4.3, as well as a short explanation on why each of the CSFs is assumed to be a critical for the specific role.

Service Desk:

- "All incidents are recorded to IMS", so that Service Desk has easy access to all records when a customer is asking for their status or Service Desk is searching for similar entries when a customer contacts with an incident
- "All related information and incident resolutions are recorded to the IMS", so that Service Desk can inform customer the status of her incident and investigate earlier incident resolutions when inspecting new ones
- "Incidents are classified and prioritized accurately based on the total effect to the supported business", so that Service Desk can deal with them according to the SLAs
- "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process", so that Service Desk is able to escalate incidents when needed
- "Customers are kept up-to-date of their incidents", so that Service Desk does not get loaded with customer enquiries about the incidents

Second Line Support:

- "All incidents are recorded to the IMS", so that Second Line Support can concentrate on working by the process instead of answering ad hoc queries outside the IMS

- "All related information and incident resolutions are recorded to the IMS", so that Second Line Support can apply information from investigations of earlier incidents to new ones

- "Incidents are classified and prioritized accurately based on the total effect to the supported business", meaning that Second Line Support experts are assigned the most critical incidents within the SLA requirements

- "Clear overview of relations between different hardware/software components to identify the failed component as fast and accurately as possible", so that Second Line Support can assign the incidents to right experts and efficiently look for root causes of incidents

- "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process", so that Second Line Support is able to escalate incidents when it is needed and appropriate to do so

- "Efficient Service Desk resolves most of the incidents", so that Second Line Support uses its time on inspecting only the more complicated incidents which cannot be resolved by Service Desk

Third Line Support:

- "Unresolved incidents are reported to Problem Management for root cause analysis", so that Third Line Support can proceed by analyzing root causes of incidents and thereby improving software quality and reducing the amount of incidents in the future

- "Clear overview of relations between different hardware/software components to identify the failed component as fast and accurately as possible", so that Third Line Support can assign the incidents to the right experts and look efficiently for the root cause behind the incidents

Incident Manager:

- "Incidents are detected early enough", so that Incident Manager can ensure that the incident does not grow as time goes by
- "All incidents are recorded to the IMS", so that Incident Manager gets a clear overview of the whole Incident Management work
- "All related information and incident resolutions are recorded to the IMS", so that Incident Manager has a clear overview of the status of each incident
- "SLAs can be viewed and monitored for incidents", so that Incident Manager can make sure that the process is in accordance with the SLAs
- "Customer satisfaction is measured", so that Incident Manager is aware of the performance of the Incident Management work

Compliance, Audit, Risk and Security:

- "All related information and incident resolutions are recorded to the IMS", so that Compliance, Audit, Risk and Security can view the status of any important incident when needed
- "Incidents are classified and prioritized accurately based on the total effect to the supported business", so that Compliance, Audit, Risk and Security can act to prevent further consequences on the more severe incidents

- "SLAs can be viewed and monitored for incidents" so that Compliance, Audit, Risk and Security can follow the compliance within the defined SLAs

Head Development:

- "All incidents are recorded to the IMS", so that Head Development can monitor both active and resolved incidents

- "Incidents are classified and prioritized accurately based on the total effect to the supported business", so that Head Development can monitor the different types of active and resolved incidents

Chief Architect:

- "Unresolved incidents are reported to Problem Management for root cause analysis", so that Chief Architect determines if there is a need for architectural change to the software

- "Clear overview of relations between different hardware/software components to identify the failed component as fast and accurately as possible", so that Chief Architect gets a proper description of incidents with architectural considerations

Business Process Owner:

- "Support tools direct the process" so that Business Process Owner can count on people to follow the process as planned

- "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process", so that Business Process Owner can rely on people knowing correct practices for escalations

- "Customer-orientation and adequate skill level at each process stage", so that Business Process Owner ensures the IMP works as planned

CEO:

- "Proper reporting of Service Desk activity", so that CEO is able to make the right decisions regarding Incident Management

In the mapping of the roles and their CSFs, there was an intention to minimize the number of CSFs for each role. As such, this thesis limits the definition of CSFs to only the most important ones. The numbers of CSFs per role could probably be decreased for some roles even further with more research. The goal of the empirical part of this study is to find out which factors the interviewed persons from the case study company see as the most critical for working in their roles in IMP.

This chapter introduced the concept of CSF: the few factors which are necessary for operations, in this case the IMP, to run efficiently. The CSFs for Incident Management were identified mostly based on ITIL and CobiT. The CSFs were further mapped to the roles that are involved in IMP: Service Desk; Second Line Support; Third Line Support; Incident Manager; Compliance, Audit, Risk and Security; Head Development; Chief Architect; Business Process Owner; and CEO. In the next chapters, this framework will be tested against the interviews with employees occupying the roles presented in this chapter from the case study company.

5 RESEARCH METHODOLOGY AND CASE STUDY

This chapter will introduce the background, goals and research methodology of the empirical part of the thesis.

Sub-chapter 5.1 will describe the background and goals for the empirical part, including a description of the business and IMP of the case study company. Sub-chapter 5.2 will introduce the selected research method. Data collection and analysis methods will be presented in sub-chapters 5.3 and 5.4 respectively.

The results of the empirical part will be presented in chapter 5.

5.1 Background and Goals

The case study company sells business solutions for energy companies in managing their energy network. Its product portfolio includes both metering and control devices for their energy network, as well as related information system products. Even though the company has operations worldwide, the thesis will concentrate on the relevant business activities of its Finnish office. As this thesis is concentrating on software business, the focus is on an information system product that is being developed and supported mostly by the Finnish office of the case study company.

The information system product is primarily used for collecting energy consumption data from metering devices and remotely controlling these devices at end customers (e.g. private houses, industrial and commercial buildings, etc.). There are two business models for the product. The first model is traditional, in that it is sold and licensed to its customers for their own use. Yet the second, newer model is that the case study company offers the system as a service maintained or even administrated by the case study company for the customer companies. Seemingly, the shift from offering products to offering

services (cf. chapter 2.1) can also be noticed in the business of the case study company.

Furthermore, the case study company is responsible for maintaining the energy management system product they produce. The support organization of the case study company consists of local First Line Support organizations (Service Desks) in each market area, backed up by centralized Second Line Support organizations and eventually by research and development (Third Line Support) departments. For the information system on which the empirical part of this thesis concentrates, both Second Line Support and research and development are centralized in the Finnish office of the case study company.

The literature review in the previous chapters provided suggestions of role-specific CSFs in the IMP. The goal of the empirical part of the thesis is to collect insights of the role-specific CSFs from the employees of the case study company working in the corresponding roles of the defined IMP. This thesis will use both supporting and conflicting insights, which are then collected and compared to the findings of the literature review.

5.1.1 Incident Management Process at the Case Company

This sub-chapter will provide a brief introduction to IMP at the case study company. The information is based on official process description of the case study company.

The Microsoft CRM (Customer Relationship Management) system is used as the IMS of the case study company. All incidents must be recorded in this system for monitoring and reporting purposes. All the information related to incidents is saved in English, so that everyone throughout the company can read and understand it.

The process steps are defined as follows (with correspondence to the ITIL process steps as displayed in FIGURE 1 in brackets):

1. The customer reports an incident to the Service Desk or group company/sales team. [Incident identification]

2. Service Desk records the incident to the IMS along with the categorization and prioritization as described later in this sub-chapter. [Incident logging, Incident categorization, Incident prioritization]

3. Service Desk checks the support contract of the customer, and determines whether the customer needs to pay to resolve the incident, or if it is covered by the SLA.

4. Service Desk tries to close the incident by itself, possibly by utilizing old records in the IMS. [Initial diagnosis]

5. In the case that Service Desk cannot resolve the incident, it will be assigned to the respective Second Line Support queue. [Functional escalation]

6. Second Line Support looks for similarities with previous incidents and connects them where possible. It tries to solve the incident, possibly with some help from R&D. [Investigation & diagnosis]

7. In case Second Line Support determines that the incident requires the management's attention (probability of spread along customers, severity), it escalates the incident to quality team. [Management escalation]

8. In case Second Line Support cannot resolve the incident, they will assign it to Third Line Support, which is the R&D queue or in case of a Change Request, the incident then escalates to the Product Management representatives. [Functional escalation]

9. In R&D, the incident is handled by Fault Management Board (in case of an urgent incident by FMB chairman) and assigned to a suitable developer with a target schedule. In Product Management, the Product Manager responsible for the product evaluates the Change Request and if possible, produces an implementation plan. [Investigation & diagnosis, Resolution and recovery]

10. After R&D/PM has resolved the incident, it is assigned back to the respective Second Line Support queue. [Resolution and recovery]

11. After Second Line Support has resolved the incident or checked the resolution provided by Third Line Support, it assigns the incident back to the respective Service Desk incident owner or Service Desk queue if one exists. [Resolution and recovery]

12. Service Desk communicates incident resolution back to the customer and closes the incident. Later on it is possible to re-open the incident if needed. [Incident closure]

The process description of the case study company states that the ownership of an incident always stays with the Service Desk employee who records the incident into the IMS. This also means that she is responsible for customer communication and actively setting and communicating deadlines towards other personnel involved in the incident resolution process.

Incidents are categorized by the type of request (Change Request, Fault Report, Technical Query) and by the type of product to which the incident is related. Prioritization is based on a four-level selection (urgent, high, normal, low). Urgent priority incidents are defined as incidents that affect a critical part of the service in more than 50% of the customer's network. The incident is given high priority when there is degradation or a loss of critical part of the service of less than 50% of the customer's network. Neither urgent nor high priority incidents

have a known workaround. Based on the prioritization, there are pre-determined response times for each support level and overall target resolution times.

In the following, there are some key figures of the process to give an overview of the Incident Management work at the case study company. The following information is based on company statistics from December 2009. The statistics include only the incidents related to the energy management information system.

Altogether, the number of open incidents in the IMS has stabilized around 500 during the last six months. In one month, around 150 new incidents are recorded into the IMS, and around the same amount are resolved. Most of the open incidents originate from Scandinavian countries, with only some 25 percent of them originating from Central European market area. Almost half of the open incidents are at the Service Desk level, while Second Line Support, R&D and Product Management are responsible for about 100 open incidents each. By the time of writing this thesis, around 330 of the 540 open incidents have been categorized as Technical Queries, whereas there are 150 incidents categorized as Fault Reports and 60 as Change Requests. Of the open incidents, 94 have been prioritized as being urgent, 162 on high priority and 276 on normal priority.

As reporting and Continual Service Improvement were found to be important parts of IMP in chapter 3.2.2, it is valuable to point out that reports can be produced using the current IMS of the case study company. There are various types of reports:

- Incidents per customer report, to get a detailed overview of incidents per customer including work time and billable time and to provide an overview of the service with the customer

- Incident overview report, to get an overview of an incident in a short time and to prepare for meetings (e.g. with a customer)

- Incident list report, to list incidents with the most important fields, including a list of all involved products and the summed duration of all closed activities against the incident

- Account overview report, to get a customer overview in a short time and to prepare for a customer meeting

- Incident statistics report, to get an overview of Incident Management and build basis for decisions

5.2 Introduction to Research Method

The research method for the empirical study is mostly adapted from phenomenography. This sub-chapter will present phenomenography to the extent in which it applies for conducting the empirical study of the thesis. The data collection and analysis methods that were used in conducting the empirical study will be described in the next two sub-chapters.

According to Metsämuuronen (2008, 34), a researcher who uses phenomenography is especially interested in getting to know perceptions of individuals. He points out that perceptions of people may vary greatly based on their educational background, age, gender and experiences. Even the perceptions of an individual may change, as perceptions can be seen as dynamic phenomena (Metsämuuronen 2008, 35). This means that the results of phenomenographical research are not intended to represent absolute truths, but the ways in which individuals "experience, interpret, understand, apprehend, perceive or conceptualize" the phenomena (Marton 1981, 178).

Phenomenography has been criticized because it is difficult to generalize the results: the insights given in interviews for research may not actually reflect the

actions taken in real problem-solving situations. For example, an employee may say she performs one type of action in the IMP, but in a real-life situation, she may do another. All perceptions are dependent on the person in question, and are related to a specific context and situation, and are therefore not generalizable. Whereas people have different views to phenomena, it is also possible that individuals change their views. This makes it hard to know which of the results are "correct" or "best". (Metsämuuronen 2008, 36)

The goal of a phenomenographical research is to create a theory of a phenomenon (Metsämuuronen 2008, 36). The results are supposed to constitute a systematized form of thought in terms of how people interpret the surrounding phenomena (Marton 1981, 180). This thesis aims to develop an understanding of what people acting in different roles of IMP believe are the specific CSFs for their work. This will give us an insight with which to answer the research question: "What are the CSFs for the roles involved in Incident Management?" Taking into account the criticism addressed to phenomenography, the results are not totally generalizable to other environments and will only represent the insights of certain individuals. As such, the results will serve as a starting point for similar research. To increase the generalizability of the results, the thesis has been built around ITIL and CobiT, the frameworks to which the IMP of the case study company fits for the most.

5.3 Data Collection Methods

Data for the empirical part of this thesis was collected by conducting nine interviews. They were conducted in February 2010 as semi-structured interviews. The persons for the interviews were selected based on the roles specified for IMP in the literature review (see TABLE 4 for the listing of the roles for which CSFs were found). The following roles were covered in the interviews:

- Service Desk representative
- Second Line Support representative
- Third Line Support representative
- Incident Manager
- Compliance, Audit, Risk and Security (as there was no direct match for the role as such, the best match, the quality manager was interviewed)
- Head Development
- Chief Architect
- Business Process Owner
- CEO

A common pattern was developed as a guide in conducting all the interviews. The pattern led the interviewees to share their insights of working as part of the IMP. The questions were defined broad based on personal experiences of the interviewees, so that they can speak of the matters that they feel important. The whole interview pattern is presented in APPENDIX 1 (along with Finnish translations in APPENDIX 2). The interviews were carried out in the language that the interviewee preferred. Four of the interviewees preferred Finnish, whereas the remaining five interviews were conducted in English. The duration of the interviews varied between 20 minutes and one hour.

At the beginning of each interview, the researcher told the interviewees about the purpose of the interviews (as part of this thesis) and why they were chosen to be interviewed (their role in the process). The researcher also presented the interviewees short descriptions of the IMP in the case study company. Although all interviewees were already familiar with the process, this was done to ensure their understanding was in line with this thesis' understanding of

IMP. While some of the interviewees also have different roles in other operations of the company, it was of particular importance to focus their attention on the correct process.

Throughout the course of the interviews, the interviewees were encouraged to freely express their opinions and own insights. The interviewees were told that the interviews will be processed anonymously, wherever possible. This means that for the roles in which there are multiple employees (e.g. Service Desk, Second Line Support), the interviewees are not identifiable. For the roles in which there is just one person working (e.g. Business Process Owner) this was naturally not possible.

5.4 Data Analysis Methods

All the interviews described in the previous sub-chapter were recorded and transcribed. The transcripts were written in the same language that was used in the interviews. As there were some expressions on the recordings that could not be interpreted entirely, the transcripts were not written completely word by word in all the cases. However, the precision of expressions and opinions of the interviewees was conserved as much as possible. In order to verify the complete understanding of the interview, and to decrease the probability of misinterpretations, the transcripts were sent to interviewees for reading and possible corrections.

After receiving verifications of the transcripts from the interviewees, the following procedures were followed to analyze them: the interviews were read through looking for quotes in which the interviewee represents important matters of her work in the IMP. All of these types of quotes were marked with highlighters. To ease the analysis of quotes from the interviewees, the researcher decided to categorize them. Based on the CSFs found from literature (see TABLE 4), the researcher defined the categories listed in TABLE 5. Whenever a relevant quote was found in any of the interviews, it was marked

with the color dedicated to the category which best fits the quote. The categorization helped in the subsequent phases of the analysis.

TABLE 5. Categorization of interview quotes

Category	**Description**	**Highlighter color**
Incidents	General matters on handling incidents	Purple
Interfaces	Interfaces to other processes	Orange
Tools	Tools used in the process	Brown
SLAs/OLAs	Matters related to SLAs and/or OLAs	Green
Customers	Matters related to customer interface	Pink
Service Desk	Matters specific to Service Desk	Yellow
Competence	Competence of people in the process	Blue
Organization	Organization involved in the process	Red

Once all the found quotes were categorized into one or multiple categories, each interview was read concentrating on one category at a time. Each separate reference to a category was identified and given a name as a CSF candidate. All the occurrences were compared to the CSFs of the literature review to find out if they were direct matches. In the case that there was no direct match from the literature review, the CSF candidate was listed as a new one. The naming of new CSF candidates was carried out carefully, and the new CSFs were defined broadly enough so they could be used in analyzing the rest of the interviews. It was of special interest to identify new CSF candidates, as they have the potential to complement the CSFs found in the literature review section.

Once all the occurrences belonging to the defined categories had been given names, the CSF candidates of each interview were listed. It became obvious that there were some CSF candidates to which the interviewees were referring more often to than others. In these cases, the researcher evaluated whether the CSF candidate should be listed as a CSF for the actor's role, or if it was more company-context specific. The main factor used in making this decision was if the matters were general thoughts on the actor's role in the process, or if matters were mostly raised as context-specific complaints for the case study company. The CSF candidates that were identified as company context-specific were marked with the letters "CCS" to exclude them from the analysis of CSFs.

The presentation of CSFs for each role in TABLE 6 was based on the list of CSF candidates. The CSF candidates that were to be listed as CSFs were either stressed more than the others by the interviewee, or brought up in multiple parts of the interview. In both cases, an analysis was carried out to decide if the CSF candidate had potential to be a CSF that follows the definition of a CSF presented in chapter 4.1 "the limited number of areas in which results, if they are satisfactory, will insure successful competitive performance for the organization". In other words, this means determining if the matters discussed are decisive for the performance of the process from the point-of-view of the interviewee.

This chapter introduced the case study company, its business and specifically its IMP. The last sub-chapters, 5.3 and 5.4, introduced the data collection and data analysis methods of the empirical part of the thesis. Nine interviews were conducted to find out the CSFs as felt by the employees of the case study company working as part of the IMP. The interviews were transcribed and analyzed based on CSF categories derived from the CSFs defined in the literature review. Furthermore, relevant quotes from the interviews were compared to the CSFs of the literature review. However, any new CSF

candidates were identified with precision. The CSFs found for each of the roles will be presented in the next chapter as results of the case study.

6 RESULTS OF THE CASE STUDY

This chapter will present the results and findings of the case study. The conducted interviews were analyzed as described in the previous chapter to illuminate the CSFs as perceived by the employees of the case study company working in each of the roles involved in the IMP.

Sub-chapter 6.1 will focus on presenting the results, the role-specific CSFs in comparison to the CSFs defined in the literature review part, as well as some quotes from the interviews. In sub-chapter 6.2, the researcher will analytically and critically discuss the findings. Finally, the chapter will conclude with the author's own ideas for future research.

6.1 Findings

This sub-chapter will list the findings of the interviews conducted with employees of each of the roles involved in the IMP of the case study company. Using the data analysis methods presented in the previous chapter, the following CSFs were identified for each of the roles. TABLE 6 lists the CSFs in the same way the CSFs were listed in the literature review part in TABLE 4. As described in chapter 5.4, some themes from the interviews were identified as company context-specific to the case study company. These will be presented in sub-chapter 6.1.1.

Some of the CSFs in the following table have the same name as the CSFs listed in TABLE 4, whereas some of the CSFs are new. All the listed CSFs in the case study company will be identified and then discussed in comparison to the CSFs of the literature review. Each CSF is marked as being relevant for one or more of the roles with an "x" in the section "Roles in Incident Management". The last column "Category" follows the categorization used in the analysis of the interviews as presented in TABLE 5.

TABLE 6. Role-specific CSFs in Incident Management based on the interviews

Roles in Incident Management									Critical success factor (CSF)	Category
Service Desk	2nd Line Support	3rd Line Support	Incident Manager	Compliance, Audit, Risk	Head Development	Chief Architect	Business Process Owner	CEO		
	x	x		x	x	x			Enough information on the incident and the effected environment is provided	Incidents
	x	x		x				x	Incident prioritization is accurate; urgent priority is not overused	Incidents
x									New releases are transferred to maintenance in a controlled fashion	Interfaces
		x							The number of releases in maintenance must be limited	Interfaces
		x							Defined release schedule gives deadlines for software fixes	Interfaces
							x		Unresolved incidents are reported to Problem Management for root cause analysis	Interfaces
x	x			x				x	There is a known error database	Tools
					x	x			There are test systems in which developers can re-produce customer incidents	Tools
				x					Customers can view their incidents in IMS	Tools

(continues)

TABLE 6. Role-specific CSFs in Incident Management based on the interviews (continues)

Roles in Incident Management									Critical success factor (CSF)	Category
Service Desk	2nd Line Support	3rd Line Support	Incident Manager	Compliance, Audit, Risk	Head Development	Chief Architect	Business Process Owner	CEO		
x	x			x				x	Support tools direct the process	Tools
x					x				Incidents are not bounced back-and-forth between support levels	SLAs/OLAs
	x		x						Incidents do not get stuck on any support level	SLAs/OLAs
			x						OLAs are clearly defined between support levels	SLAs/OLAs
x				x					Customers are kept up-to-date with their incidents	Customers
							x		There is customer-orientation at each process stage	Customers
								x	Efficient Service Desk resolves most of the incidents	Service Desk
x						x			There is adequate skill level at each process stage	Competence
			x				x		There are clear responsibilities between departments	Organization
	x					x			There is enough time to concentrate on analyzing more difficult incidents	Organization

The following section identifies the CSFs of the case study. Inside the quotation marks are the names of the CSF. The roles for which each of the CSFs is relevant are listed in the parentheses after the CSF.

- "Enough information on the incident and the effected environment is provided" (Second Line Support; Third Line Support; Compliance, Audit, Risk and Security; Head Development and Chief Architect). This is a more precise definition to the CSF found in the literature review "All related information and incident resolutions are recorded to IMS". For example, the Third Line Support representative saw this as important because when this information is available, "developers can begin fixing the incidents straight away".

- "Incident prioritization is accurate; urgent priority is not overused" (Second Line Support; Third Line Support; Compliance, Audit, Risk and Security; CEO). This is a more precise definition to the CSF found in the literature review "Incidents are classified and prioritized accurately based on the total effect to the supported business". The quality manager felt this was important as "otherwise, the concept of urgent priority will lose its power". In addition, the quality manager stated that having fewer urgent incidents "would also affect my work, as I could make better conclusions and reports".

- "New releases are transferred to maintenance in a controlled fashion" (Service Desk). This is a new addition to the CSFs listed in the literature review. However it could be argued that instead of Incident Management, this refers to another process in the structure Service Transition publication of ITIL: Release Management[1] Nonetheless, in the interview with the Service Desk employee, this was perceived to be

[1] "The Process responsible for Planning, scheduling and controlling the movement of releases to Test and Live Environments. The primary Objective of Release Management is to ensure that the integrity of the Live Environment is protected and that the correct Components are released." (OGC 2007, 242)

important for successful Incident Management in order to avoid "-- going forward so fast that customers are often forgotten" and "-- even we in customer support can't really keep up with all the new developments".

- "The number of releases in maintenance must be limited" (Third Line Support). This is also a new addition to the CSFs listed in the literature review, arguably belonging under Release Management. However, in the interview of Third Line Support, this was perceived to be important for successful Incident Management because having many releases in maintenance "produces a lot of extra work as fixes must be applied from the oldest release version all the way to the newest one."

- "Defined release schedule gives deadlines for software fixes" (Third Line Support). This is also a new addition to the CSFs listed in the literature review, arguably belonging under Release Management. However in the interview of Third Line Support, this was perceived to be important for successful Incident Management. As an example, the Third Line Support representative stated that "I would hope that we would release a patch for some of the releases in maintenance each month. Then it would be easier to plan deadlines for each fix."

- "Unresolved incidents are reported to Problem Management for root cause analysis" (Business Process Owner). This is a direct match to the same CSF found in the literature review. Here, the researcher assumed that it would be perceived as important by the Third Line Support and Chief Architect, but the interviews suggest it was only perceived to be important by the Business Process Owner, in order to find ways to "ensure we get problems identified".

- "There is a known error database" (Service Desk; Second Line Support; Compliance, Audit, Risk and Security; CEO). This is a new addition to

the CSF list compared to the ones found in the literature review. It could be argued that the CSF "Support tools direct the process" includes this. The researcher decided to list this as a separate CSF, as the theme was explicitly named by many of the interviewees. However, it was discovered that the case study company currently has no proper known error database, so this may have increased the urge to mention the matter. The CEO pointed this out by hoping that there would be one to "help First Level [Service Desk] to solve the problems" and help avoid facing "the same problems year after year, case after case".

- "There are test systems in which developers can re-produce customer incidents" (Head Development, Chief Architect). This is a new addition to the CSF list compared to the ones found in the literature review. It could, however, be argued that the CSF "Support tools direct the process" includes this provision. Yet even though test systems are not directly considered as support tools, they could be seen as one by understanding the term "support tool" in a broad meaning. Head Development felt this was important because by having proper test systems "we can reproduce the situations in development and testing. That's the most important as otherwise resolving [the incident] is a little bit like shooting blindfolded."

- "Customers can view their incidents in IMS" (Compliance, Audit, Risk and Security). This is a more precise definition for the CSF found in the literature review "Customers are kept up-to-date of their incidents". The quality manager felt this was important because "We currently must be proactive ourselves [in communicating statuses of incidents to customers], as we don't have a customer portal [in which customers could view their incidents]."

- "Support tools direct the process" (Service Desk; Second Line Support; Compliance, Audit, Risk and Security; CEO). This is a direct match to the same CSF found in the literature review. There were also more precise definitions around the theme that were listed as their own CSFs. It is worth noting that all interviewees were referring to tool-related matters. As many of the matters were complaints of the current capabilities of the IMS in use at the case study company, some of the themes belonging to this category will also be presented in chapter 6.1.1 as company context-specific themes.

- "Incidents are not bounced back-and-forth between support levels" (Service Desk, Head Development). This can be seen as more precise definition of the CSF found in the literature review "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process". Head Development stated that "Often incidents get left in between departments where both parties wait for more information from each other. These lengthen the resolution time."

- "Incidents do not get stuck on any support level" (Second Line Support, Incident Manager). This is a more precise definition of the CSF found in the literature review "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process". Second Line Support representative stated that sometimes "Even if the incidents are already solved, they are not transferred quickly enough."

- "OLAs are clearly defined between support levels" (Incident Manager). This is a more precise definition of the CSF found in the literature review "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process". The Incident Manager addressed concern on this theme by explaining that Second Line Support "can't

trust that we get the needed maintenance work from R&D, but we have to ask them and they make their own prioritization and decisions."

- "Customers are kept up-to-date with their incidents" (Service Desk; Compliance, Audit, Risk and Security). This is a direct match to the same CSF found in the literature review. In the literature review, the researcher assumed this was only important for the role of Service Desk, but in the interviews it was the quality manager that stressed the theme the most. The quality manager felt important that we keep customers up-to-date of their incidents and "arrange regular meetings".

- "There is customer-orientation at each process stage" (Business Process Owner). This is a part of the CSF found in the literature review "Customer-orientation and adequate skill level at each process stage". After the literature review, the researcher's assumption that this CSF would be of importance to Business Process Owner was supported. Business Process Owner stated that "Only by thinking customer-oriented, you are able to understand what are the problems [that are] needed to address."

- "Efficient Service Desk resolves most of the incidents" (CEO). This is a direct match to the same CSF found in the literature review. In the literature review part the researcher assumed this being important for the role of Second Line Support, but in the interviews it was the CEO that stressed the theme. The CEO felt that too many incidents get escalated to Second Line Support, "and it's too expensive to handle the process in this way"

- "There is adequate skill level at each process stage" (Service Desk, Chief Architect). This is a part of the CSF found in the literature review "Customer-orientation and adequate skill level at each process stage". In the literature review, the researcher assumed this would be important for

Business Process Owner, but in the interviews it was Service Desk and Chief Architect that stressed the theme. Chief Architect raised this theme by saying "I would expect the information [of an incident] to grow along the way [from customer to Service Desk, Second Line Support and Third Line Support] in the process."

- "There are clear responsibilities between departments" (Incident Manager, Business Process Owner). This can be seen as more precise definition of the CSF found in the literature review "SLAs provide clear target times with clear escalation procedures agreed between the parties of the process". The Business Process Owner emphasized that with clear responsibilities, "we are able to start to implement and define processes with the teams."

- "There is enough time to concentrate on analyzing more difficult incidents" (Second Line Support, Chief Architect). This is a new CSF a little bit related to the CSF found in the literature review "Unresolved incidents are reported to Problem Management for root cause analysis". However this can be seen as a normal operative requirement that seems to be caused at least partly by overload on the interviewed employees. Nonetheless, this was taken as a CSF instead of a company context-specific theme, because the employees regarded this as being a normal situation at most support levels. The Second Line Support representative felt this was important as "success stories are mostly about cases where previous people have not spent enough time trying to solve the incident."

6.1.1 Company Context-Specific Findings

As described in chapter 5.4, one part in the analysis of the interviews was to decide if themes were CSFs or if they were just company context-specific.

Themes were identified as company context-specific if the matters were rather raised as complaints for the current situation than as general thoughts on the role in the process. The major company context-specific themes were related to the IMS used at the case study company. Complaints addressed the difficulty in using the IMS and automatic history creation of incidents in the IMS. It was suggested by many of the interviewees that because of these two matters, it was seen hard to follow the handling of an incident in the process. In the following there are some direct quotes from the interviews about the matter:

> "It (the IMS) just isn't functional and handy. You have to click it many times and look in different windows."
>
> "It is sad to note that I haven't got that much time to use for searching the information (in the IMS), when I get it much faster by asking from a colleague."
>
> "It should be easier to find things that have been already solved, when you are working with a certain incident. It's really hard to find, if this new incident is related to something that has been solved earlier."
>
> "-- would be good to have a separate screen or whatever place inside the incident that tells you when the incident has started, who has written the original description, and some kind of activity list to follow where the incident has been and for how long time it has been in those different places."

Based on the quotes, there could be room for development in the IMS of the case study company. This could be because the tool is not that usable or fit for the process, or it is possible that the users have not been trained properly to use all the features of the tool.

6.2 Discussion

This sub-chapter will discuss the findings from the conducted interviews. In the end of the sub-chapter the significance of the results will be evaluated. Some ideas for future research will also be discussed.

As it was stated in sub-chapter 6.1, most of the CSFs found in the interviews corresponded with the CSFs found in the literature review. Some of the CSFs found were exact matches to the literature review CFSs, while others offered

more precise definitions to deepen the CSFs of the literature review. For example, the CSF found in the literature review "Support tools direct the process" was found to cover some more precise themes, including having a known error database and maybe even maintaining proper test environments in which incident resolutions can be analyzed.

On the other hand, the interviews revealed some new themes that were not covered by the CSFs found in the literature review. Examples of this include the CSFs related to interfaces "New releases are transferred to maintenance in a controlled fashion", "The number of releases in maintenance must be limited" and "Defined release schedule gives deadlines for software fixes". These all can be seen to belong under the process of Release Management in the ITIL framework. However, these were raised as CSFs for Incident Management, as interviewees felt them important for effective operations in IMP. Another new CSF was: "There is enough time to concentrate on analyzing more difficult incidents". Second Line Support and Chief Architect felt this was critical for their roles, but also addressed it being the normal situation at most support levels. Even though this can be seen as a normal operative requirement, it is important in IMP as the idea of Second Line Support organization is to be able to analyze and try to resolve more complicated incidents without interruptions (see chapter 4.3).

The gathered and presented results may give initial ideas on the most important aspects of IMP from the perspectives of the different roles. However, it is worth noticing that the results for each role are based on a single interview. Another limitation to the relevancy of the results is that all the interviewees are working for the same company, the case study company of the thesis. As it was noted in the analysis of the interviews, the current tools and working methods of the case study company are reflected to the insights of the interviewees. Even though the researcher tried to distinguish between themes regarding the process in general and those that were company context-specific, the two types

could never be completely categorized due to the small sample size of the research, in this case, just one company.

In future research, CSFs in Incident Management could be further defined at least by two means: either by the number of roles to be examined, or by the width of area to be examined. An example of the former could be to concentrate on researching people working in the role of Service Desk at different companies. It would be interesting to see, if the same CSFs were present across all companies. An example of the latter could be to examine features of tools used in the process. One way to enlarge the research could be to conduct the same research across offices of a global company to see if there are cultural differences in the perceived CSFs.

As there has not been much research in the area, there are many ways to delimit future research, based on the means presented. In addition, more background from literature could be found by looking at other frameworks that include information on Incident Management. Capability Maturity Model Integration (CMMI) would be a good example of this.

This chapter presented the results of the empirical part of the thesis. Sub-chapter 6.1 presented the role-specific CSFs of the case study and compared them to the CSFs in the literature review part of the thesis. As part of the results, sub-chapter 6.1.1 presented company context-specific themes specific for the case study company. Sub-chapter 6.2 discussed the found CSFs. In the end, the relevancy of the results and some ideas for future research were discussed.

CONCLUSION

Attention for IT service management has been increasing among software business companies worldwide (Winniford et al. 2009, 154). The main goals of ITSM include defining, managing and delivering IT services that support business goals and customer needs (Winniford et al. 2009, 153). To be able to deliver high quality IT services, Niessink and van Vliet (2000, 113) suggest referring to best practice models of IT service management. Based on this, the frameworks of ITIL and CobiT were used as basis for presenting IT service management in the thesis.

Incident Management Process is often among the first processes to adopt for IT service management (Cater-Steel 2009, 73). Incident Management aims to return IT services to normal service operation as soon as possible after an incident (Gupta et al. 2008, 142; McLaughlin & Damiano 2007, 253). Incident stands for any deviation in the quality of a service (OGC 2007, 35). As Service Level Agreements are an important part of service delivery, the concept was presented along with IT service management. Furthermore SLAs were found to be an important factor in guiding IMP, when it comes to prioritizing and classifying incidents (OGC 2007, 50-51).

The emerging branch of services science was examined as basis for its subset IT service management. To define the subject area, some examples of the importance of customer service in software business were also discussed. IMP was presented based on the IT service management best practice frameworks of ITIL and CobiT. The presentation of IMP in both frameworks was examined to present the roles, goals and metrics of the process in a unified way.

The ultimate goal of the thesis was to present a clear framework of CSFs related to IMP. The CSFs were assessed per the roles involved in the process. The mapping between the CSFs and the roles was based on assumptions of what

must be in place for the roles to make the IMP efficient (see CSF definition in chapter 4.1).

To gain another perspective on IMP, interviews were conducted in a case study company to collect insights from employees working in the roles of IMP. By analyzing the interviews, another presentation of role-specific CSFs was compiled. By examining the different sets of CFSs and their comparisons, this thesis answered the research question: "What are the CSFs for the roles involved in Incident Management?"

The two presentations of role-specific CSFs offered quite similar results. The interviews offered some more specific definitions for some of the CSFs, along with a few new CSFs. Most of the new CSFs were related to the interface of Release Management Process. One of the new CSFs was about specialists having enough time to resolve more difficult incidents. In addition to CSFs, the IMS of the case study company was identified as a company context-specific theme that some of the interviewees felt not to be supporting their work as it should.

The results are expected to give some insights to improving the efficiency of IMP among organizations. The results may assist in improving IMP in the case study company in which the interviews are carried out. The thesis is based on the commonly accepted de facto standard frameworks (ITIL, CobiT) to make the handling of the theme apply to similar environments as well.

As the mapping of CSFs to the roles of Incident Management was based on assumptions in the literature review, it was important to compare the literature review findings with the interviews. However, the interviews gave only a preliminary view to the theme because only a single employee per role was interviewed, and all the interviewees work for the same case study company.

To conclude, the area needs more research to verify the findings. In order to delve deeper into the IMP, one would have to delimit either the amount of roles examined or the area of examination. An example of the former would be to verify the results by conducting interviews on people working in the same role in different Incident Management organizations. An example of the latter delimiting possibility would be to investigate suitable tools for Incident Management. In addition, research could be conducted across the international offices of a global company to see if there are cultural differences in the perceived CSFs.

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APPENDIX 1: INTERVIEW PATTERN

In the beginning of the interview the researcher will tell to and discuss with the interviewee to make sure the interviewee understands the subject:

1. in short of the research
2. the documentation of IMP
   (as in chapter 5.1.1)
3. why he/she is interviewed (his/her role in the process)

The questions for the interview:
(in brackets some planned extra questions to ease up the answering)

1. Tell me of your daily work in the process:
   a. What is a typical case with which you are working?
      (How do you get involved in Incident Management?)
      (What is expected from you?)
   b. What is important for you to get the job done well?
      (What do you expect from others?)
      (Is there some information that is absolutely needed?)
2. Tell me about factors that direct your work in the process:
   a. Do you know of metrics with which your work is measured and/or monitored and do you find them useful?
   b. Do you have suggestions on how to improve them?
3. Tell me of a success story in your work:
   (Please note that the only important factor is that you found it a success story for yourself.)

   a. What was the challenge all about?
      (Was there something exceptional compared to normal support cases?)

   b. What were the actions that finally solved the situation?
      (Was there something exceptional compared to normal support cases?)

4. Tell me of the problematic points in your work:

   a. What do you see as the biggest obstacles for your work in the process?
      (Are there some factors that make you underachieve?)
      (They can be related e.g. to process, tools, roles.)

   b. Do you have suggestions on how to improve them?

APPENDIX 2: FINNISH TRANSLATIONS OF THE INTERVIEW QUESTIONS

1. Kerro päivittäisestä työstäsi prosessissa:

    a. Millainen on tyypillinen tukitapaus, jonka parissa työskentelet?
    (Miten tulet osaksi Incident Management –prosessia?)
    (Mitä sinulta odotetaan prosessissa?)

    b. Mikä sinulle on tärkeää, jotta saat tehtyä työsi hyvin?
    (Mitä odotat muilta?)
    (Onko jotain informaatiota, jonka ehdottomasti tarvitset?)

2. Kerro tekijöistä, jotka ohjaavat toimintaasi prosessissa:

    a. Tunnetko metriikoita, joilla työtäsi mitataan tai seurataan, ja koetko ne hyödyllisiksi?

    b. Onko sinulla ehdotuksia, kuinka niitä voitaisiin kehittää?

3. Kerro menestystarinasta työssäsi:
    (Huomaa että oleellista on ainoastaan, että koit ko. tapauksen menestystarinaksi itsellesi.)

    a. Mistä haasteessa oli kysymys?
    (Poikkesiko tapaus jotenkin normaaleista tukitapauksista?)

    b. Mitkä toimet lopulta ratkaisivat tilanteen?
    (Poikkesiko tapaus jotenkin normaaleista tukitapauksista?)

4. Kerro työssäsi kohtaamistasi ongelmakohdista:

    a. Mitkä tekijät näet suurimpina esteinä työssäsi osana prosessia?

(Onko tekijöitä, jotka saavat sinut alisuoriutumaan?)

(Ne voivat liittyä esim. prosesseihin, työkaluihin, rooleihin)

b. Onko sinulla ehdotuksia, kuinka niitä voidaan parantaa?