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IT SERVICE MANAGEMENT: PROCESS CAPABILITY, PROCESS PERFORMANCE, AND BUSINESS PERFORMANCE

A Thesis submitted by

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Abstract

As technology is at the core of almost every leading industry, organizations are increasingly scrutinizing their Information Technology (IT) group's performance so that it is more in line with overall business performance and contributes to the business' *bottom line*. Many IT departments are not equipped to meet these increasing IT service demands. They continue to operate as passive-reactive service providers, utilizing antiquated methods that do not adequately provide the quality, real-time solutions that organizations need to be competitive.

Organizations need efficient Information Technology Service Management (ITSM) processes in order to cut costs, but ironically, in order to implement highly capable processes, there are significant costs involved, both in terms of time and resources. A potential way to achieve better performing and higher capable processes is to employ methods to compare an organization's processes against best-practice standards to identify gaps and receive guidance to improve the processes. Many of the existing methods require large investments.

Holding back progress towards best practice for financial benefit in the IT industry is the reluctance of many IT organizations to embrace the business side (specifically Service Portfolio Management and IT Financial Management) aspects of ITSM. Service Portfolio Management (SPM) is used to manage investments in Service Management across an organization, in terms of financial values. SPM enables managers to assess the quality requirements and associated costs. IT Financial Management aims to provide information on the IT assets and resources used to deliver IT services. Providing a Service Portfolio and practicing IT Financial Management requires a high level of maturity for an organization. It seems reasonable and logical that the organization's Chief Information Officer should be able to articulate and justify the IT services provided, report the costs (by service) incurred in delivering these services, and can communicate the demand for those services, that is, how they are being consumed and projections on how they will be consumed in the future. However, a major investment in terms of time and resources may be needed to catalogue such information and report on it. The research problem that this paper addresses is the lack of a pragmatic model and method that associates ITSM process maturity (process capability and performance) with financial performance for organizations that lack mature ITSM processes.

Previous studies have reported on cost savings, but there is currently no measurement model to associate ITSM maturity with financial profitability; which in turn prompts the research question: *How can the association of ITSM process capability and process performance with financial performance of an organization be determined?* This research iteratively develops and applies a measurement model that presents a pragmatic and cost-effective method to link ITSM process capability and process performance with business performance by operationalizing Key Performance Indicators (KPIs) to support Critical Success Factors (CSFs) and associating CSFs with business risks to determine business performance.

This study employs a scholar-practitioner approach to changing/improving processes using action research and an adaptation of the Keys to IT Service Management Excellence Technique (KISMET) model to guide the process improvement initiative. This technique leads to the second research question: *How can the ITSM measurement framework be demonstrated for CSI?*

The research was based on a single case study of a global financial services firm *Company X* that had implemented the ITIL® framework to improve the quality of its IT services. The study found that the measurement framework developed can be used as a starting point for self-improvement for businesses, identifying gaps in processes, benchmarking within an organization as well as guiding an organization's process improvement efforts. The measurement model can be used to conduct *What-If* analyses to model the impacts of future business decisions on KPIs and CSFs. The measurement model presented in this study can be quickly implemented, adapted and evolved to meet the organization's needs. The research offers an example from which other organizations can learn to measure their financial return on investment in ITSM improvement.

Certification of Thesis

This Thesis is entirely the work of Suren Behari except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor: ____________________

Professor Aileen Cater-Steel

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Student and supervisors signatures of endorsement are held at the University.

Candidate's Publication List

During the course of this research, the researcher contributed to a conference, book chapter and co-authored a paper. The publication list follows.

Conference Proceedings

Behari, Suren and Cater-Steel, Aileen and Shrestha, Anup and Soar, Jeffrey (2016) *A measurement model to link process operational measures to risks associated with attainment of business critical success factors.* In: 6th International Engaged Management Scholarship Conference. Available at SSRN: https://ssrn.com/abstract=2866873, 9-10 September 2016, Paris.

Book Chapter

Behari, Suren and Cater-Steel, Aileen and Soar, Jeffrey (2016) *Data Science and Big Data Analytics in Financial Services: A Case Study.* In: Handbook of Research on Driving Competitive Advantage through Sustainable, Lean, and Disruptive Innovation. IGI, pp. 396-423. ISBN 9781522501350

Co-Authored Papers

Shrestha, Anup and Cater-Steel, Aileen and Toleman, Mark and Rout, Terry and Behari, Suren (2016) *The issue of reliability in software mediated process assessments.* In: Software Process Improvement and Capability Determination 16th International Conference, SPICE 2016, 9-10 June 2016, Dublin, Ireland.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

This research explores the association of IT Service Management (ITSM) Process Capability, Process Performance, and Business Performance. This first chapter introduces the research. The background and motivation to the research describe the context of the research and the need for the study. The background includes the description of ITIL® as the most widely accepted ITSM framework. The research problem and the research questions are then stated followed by the justification for the research in terms of contributions to knowledge and practice. The methodology for the collection and analysis of data is provided next. The definition of key terms used in the context of this research is provided, followed by the delimitations of scope and key assumptions. This chapter concludes with a description of the overall structure of this thesis.

This chapter is organized into nine sections. This section is an introduction to the first chapter. The background and motivation of the research are provided in *section 1.2*. The research problem and research questions are presented in *section 1.3. Section 1.4* presents the contribution this research makes to theory and practice. The research methodology is provided in *section 1.5*. *Section 1.6* defines the key terms used in this research. The delimitations of scope and the key assumptions of the study are presented in *section 1.7. Section 1.8 p*rovides the overall structure of the thesis. The chapter summary is provided in *section 1.9*.

An overview of the chapter is shown in Figure 1-1.

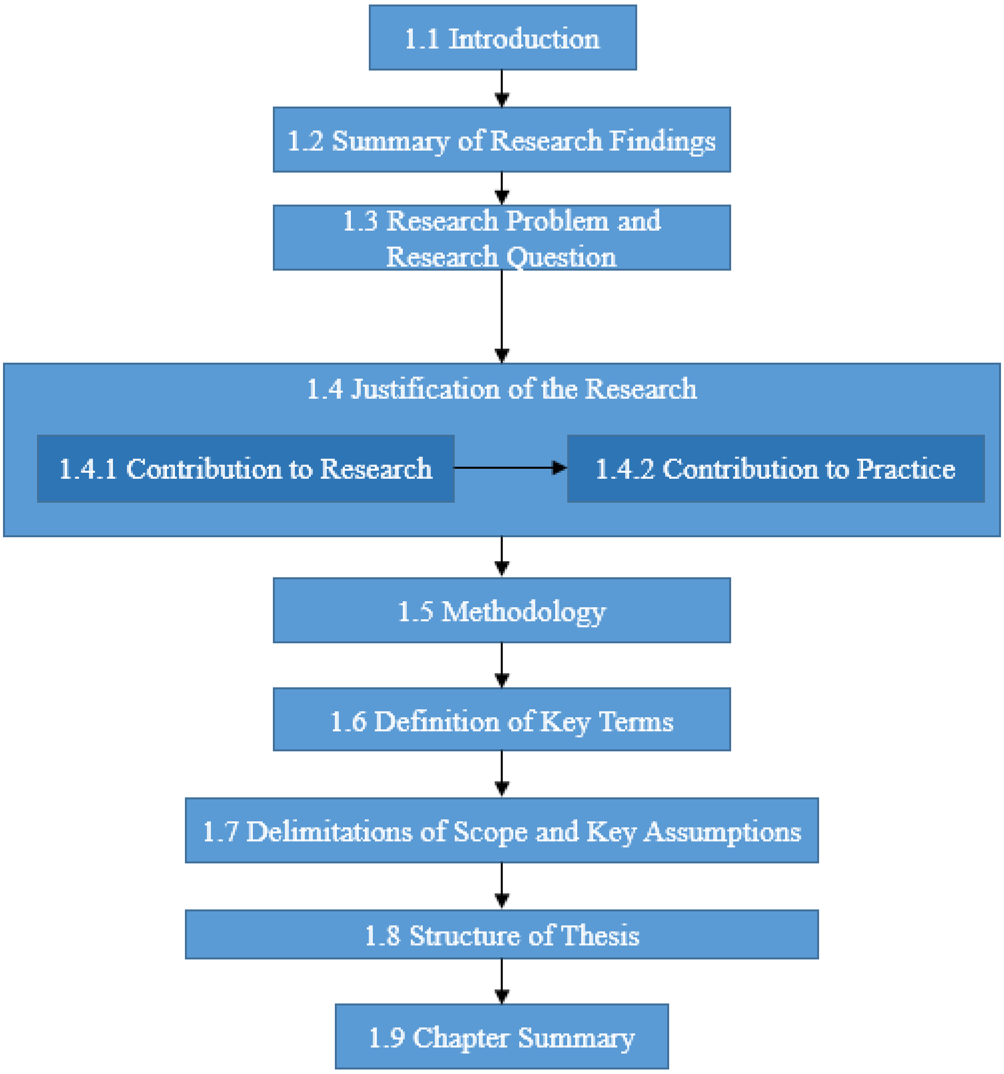

Figure 1-1 Overview of Chapter 1

1.2 Background and Motivation

Global IT spending for 2018 is projected to total $3.7 trillion versus the 2017 estimated spending of $3.5 trillion (a 4.3% increase), according to a forecast by Gartner Incorporated (Gartner 2017). The forecast foresees that enterprise software and IT services will continue to exhibit strong growth, with IT spending on target to reach $931 billion in 2017, and increase 5.3 percent in 2018 to reach $980 billion (Gartner 2017).

According to research by International Data Corporation (2017), industry spending on IT products and services will continue to be led by financial services and manufacturing, that together will generate around 30 percent of all IT revenues throughout the forecast period of 2015 to 2020 as these industries invest in IT to advance their digital transformation efforts (International Data Corporation 2017).

Academic research has shown that the cost of IT services can be as high as 60-90 percent of the total cost IT ownership (Addy 2007; Fleming 2005; Galup et al. 2009; Orlov 2005).

IT Service providers can no longer afford to only focus on technology, but instead, they now also have to consider the quality of the services they provide and their relationship with customers (Van Bon 2007). Other issues within the field of ITSM are that the cost of maintenance is too high, the speed of maintenance service is too slow and that there is difficulty in managing the priority of change requests (Marrone et al. 2014).

Many organizations are increasingly dependent on IT which is considered to be a critical enabler for transforming service industries (Chesbrough 2011; Huang, Wu & Chen 2013). Organizations expect that both internal and external IT suppliers continually improve the services provided (Galup et al. 2009; Pollard & Cater-Steel 2009) with a focus on customer service. IT Service Management (ITSM) focusses on customers as a core strategy for improving the delivery of IT services (Winniford, Conger & Erickson-Harris 2009). The benefits provided by ITSM can include an improved IT service at a lower cost with a focus on service rather than technology (Iden & Langeland 2010). ITSM is being increasingly implemented globally (Forbes 2017).

One ITSM framework often referred to as the best practice, is ITIL (Cannon 2011). See §2.4.1.3 for more details on ITIL. The ITIL framework eventually led to the creation of the international standard for ITSM: ISO/IEC 20000 (ISO/IEC 2011). Both ITIL and ISO/IEC 20000 provide a process-oriented framework to implement ITSM for organizations.

The latest version of the ITIL framework (known as ITIL 2011) includes Continual Service Improvement (CSI) as a service lifecycle stage (OGC 2011b) that stresses the importance of regularly evaluating processes to identify opportunities for improvement in ITSM processes (Bernard 2012). The emphasis on continually improving effectiveness and efficiency of IT processes and services through continual assessment is in line with the concept of continual improvement adopted in ISO/IEC 20000 (Shrestha 2015).

The principal goal of CSI is to continually align and realign IT services to changes in business practice by identifying and making appropriate improvements to ITSM processes (Shrestha 2015). CSI is vital to the business to provide relevance and responsiveness of IT services to customers, however, CSI activities are costly and resource intensive (OGC 2011b), and in addition, process improvement programs may be unsustainable over time if they are not effectively managed (Harkness, Kettinger & Segars 1996; Khurshid & Bannerman 2014). To dynamically align IT services to changes in business conditions and sustain process improvement projects, organizations have employed techniques that involve a systematic measurement of processes (Van Loon 2007).

A major challenge for organizations is to ensure that process improvement programs are cost-effective, and that assessments of processes are transparent in order to provide confidence in the assessment process and outcomes and to perform regular and consistent process assessments for CSI (Shrestha 2015).

An initial scan of the literature on ITSM and financial benefits revealed that there were no empirical studies that reported financial benefits from ITSM projects in actual monetary value. There is little academic research on the potential impact of ITSM processes to improve business performance and ultimately financial profitability (Gacenga, Cater-Steel & Toleman 2010).

1.3 Research Problem, Research Questions, and Contributions

As technology is at the core of almost every leading industry, organizations are increasingly scrutinizing their IT group’s performance so that it is more in line with the overall business performance and contributes to the business’ *bottom line* (Hinkelmann et al. 2016; Kappelman et al. 2016; Nicho & Khan 2017). Many IT departments are not equipped to meet these increasing IT service demands (Cater-Steel 2009). They continue to operate as passive-reactive service providers, often utilizing antiquated methods that do not adequately provide the quality, real-time solutions that organizations need at present to be competitive (Cater-Steel 2009).

Organizations need efficient ITSM processes in order to cut costs, but ironically, in order to implement highly capable processes, there are significant costs involved, both in terms of time and resources (Hochstein, Tamm & Brenner 2005). One way to achieve better performing and more capable processes is to employ methods to compare an organization's processes against best practices and standards to identify gaps and receive guidance to improve the processes (Marrone et al. 2014).

One key issue reported in the industry is that most IT organizations have not yet embraced the business side (specifically Service Portfolio Management and IT Financial Management) aspects of ITSM (Steinberg 2013). Service Portfolio Management is used to manage investments in service management across the organization, in terms of financial values, that enables managers to assess the quality requirements and associated costs (Kohlborn et al. 2009). IT Financial Management aims to provide information on IT assets and resources used in delivering IT services (OGC 2011e). Providing an optimal Service Portfolio and practicing IT Financial Management requires a high level of maturity for an organization. It seems reasonable and logical that the organization's Chief Information Officer should be able to articulate and justify the IT services provided, can report the costs (by service) to deliver these services, and can communicate the demand for those services, that is, how they are being consumed and will be consumed in the future. A major investment in terms of time and resources may be needed to catalogue such information and report on it.

The research problem that this study addresses is the lack of a pragmatic ITSM Measurement Framework that can be used to associate ITSM process capability and process performance with business performance. See §3.2.1 for a description of pragmatism research philosophy and why it was chosen for this research.

Previous studies have reported cost savings (Cater-Steel, Tan & Toleman 2009a; Jäntti et al. 2013; Pollard & Cater-Steel 2009) but there is apparently no measurement model to associate ITSM process capability and process performance with financial profitability which prompts the first research question:

RQ1. How can the association of ITSM process capability and process performance with financial performance of an organization be determined?

The research develops and applies a measurement framework in iterative cycles to present a pragmatic and cost-effective method that links ITSM process capability, process performance, and financial performance by operationalizing Key Performance Indicators (KPIs) that support Critical Success Factors (CSFs) and associating CSFs with business risks to determine business financial performance (Behari et al. 2016).

In order to test the association of ITSM process capability and process performance with business performance, a scholar-practitioner approach, based on action research principles, was followed to plan and implement a process improvement project in the case organization through active intervention. The outcome of the intervention is addressed through RQ1.

RQ2 examines the research project through a different lens, and affords the demonstration of how the intervention was conducted to answer RQ1. The Keys to IT Service Management Excellence Technique (KISMET) model (Jäntti, Lahtela & Kaukola 2010) was selected and justified to guide the application of the ITSM Measurement Framework to illustrate the efficiency and effectiveness of the method to achieve the outcomes. The output of RQ1 (the ITSM Measurement Framework) serves as input to answer RQ2. Application and evaluation of the KISMET model leads to the second research question:

RQ2. How can the ITSM measurement framework be demonstrated for CSI?

This exploratory study aims to develop and apply a pragmatic and cost-effective measurement framework for ITSM to determine the association of ITSM process capability and process performance with business financial performance, through a systematic process improvement approach that is grounded in theory.

1.3.1 Expected Contribution to Theory, ITSM Literature, and Research Methodology

1.3.1.1 Expected Contribution to Underpinning Theories

Agency Theory

By using Agency Theory as a backdrop to this research, it is expected that this research contributes to the problem of information asymmetry that is core to the principal-agent problem. It is anticipated that through collaboration of business (principal) and IT (agent) as well as the active intervention of the researcher, that this research informs theory by demonstrating how the information asymmetry gap can be bridged for the benefit of both the principal and agent.

Business-IT Alignment

It is expected that this research contributes to the literature on ITSM and Business-IT alignment by the application of a previously empirically tested process improvement framework to enable the alignment of business and IT. As a scholar-practitioner, the researcher endeavors to translate the theoretical prescriptions of the framework by using terminology more familiar in industry and practice.

Resource-Based View

This study draws on the resource-based view of the organization to demonstrate the attributes of a firm's IT capability and its relationship to organizational performance. This study contributes to the growing body of literature linking IT and the resource-based view and provides a framework for understanding how IT may be aptly viewed as an organizational capability.

1.3.1.2 Expected Contribution to ITSM Literature

ITSM Adoption, Implementation, and Benefits

This research contributes to the ITSM literature on adoption, implementation and benefits of ITSM, by providing empirical evidence of the tangible cost savings and business risk mitigation by improving ITSM process capability and performance.

ITSM Capability

A contribution to the body of knowledge on process capability and process assessments is expected from this research, by the use of a standards-based maturity model and a transparent, efficient tool for process assessments.

ITSM Performance

By using a combination of CSFs and KPIs for the ITSM performance measurement, it is anticipated that this research will contribute to the literature on using CSFs and KPIs in IT performance measurement systems.

1.3.1.3 Expected Contribution to Research Methodology

Action Research

The use of action research in a real world environment (practice), using a process improvement model to guide the cycles, is expected to contribute to research methodology.

Actor-Network Theory

As an expected contribution to research methodology, the principles of ANT are followed to address the principal-agent issue in the industry at a broad level, and the business-IT alignment issue at the case study at a more specific level. ANT is operationalized throughout the research, rather than used as a methodological lens, to bridge the gap between IT and the business at the case organization. Through action research and frequent intervention, the researcher aligns the interests of actors through establishing a social and technological foundation for ITSM process improvement at Company X.

1.3.2 Expected Contribution to ITSM Industry and Practice

A comprehensive and empirically validated conceptualization of the factors pertaining to the association of process capability, process performance, and financial benefits is presented. Although this research presents a measurement framework based on three ITSM processes: incident management, problem management, and change management, the model and method can be extended and adapted for any ITSM process, as evidenced by Steinberg's ITSM Metrics Model that consists of an Excel Workbook with individual Worksheets for 13 of the 26 ITSM processes with at least one from each ITIL lifecycle stage plus Service Desk and Workforce Worksheets. The Worksheet presents an inventory of recommended operational metrics, KPIs, and CSFs and the associated calculations for each one. The method of entering values for operational metrics and tolerance thresholds is generic. The model then automatically calculates the KPI values, compares them to the Tolerances and derives the KPI score. Critical Success Factors (CSFs) are automatically calculated based on the KPI values, Business Risk Mitigation levels are automatically calculated based on the derived CSF scores and the scores for the ITSM Performance Pyramid are automatically calculated based on the associated Business Risks.

The measurement framework designed and applied in this research project is expected to contribute to practice by providing an efficient and cost-effective method and model to identify opportunities to reduce costs and increase efficiency in ITSM processes that can ultimately lead to increased competitiveness.

Practitioners can expect to use the framework as a means for organizational self-improvement, to identify process gaps, to benchmark processes against best-practice standards within an organization, as well as guide an organization’s improvement efforts.

A practical measurement framework is developed to link ITSM process capability and process performance with financial performance. The measurement framework may be used to determine the effects on outcomes in a spreadsheet calculation through systematic changes in the input. The measurement framework presented in this study is designed so that it could be quickly implemented, adapted and evolved to meet the any organization’s needs (see *section 3.5.2* Table 3-1 and *section 7.3.4.1* Table 7-8).

Practitioners can expect to drive continual service improvement by using the framework for process capability assessment, process perfromance measurement and financial measurement.

The practical contribution of the research is that it offers an example from which other organizations can learn to measure their financial return on investment from ITSM improvement projects. The research aims to provide an understanding of the potential degree of financial benefits realizable due to process improvements. The application of the model establishes the link between ITSM process capability, process performance, and financial measures.

The next section justifies the research in terms of contribution to knowledge and practice.

1.4 Justification of the Research

There is no single approach to IT Service Management and organizations employ a variety of frameworks or processes to support their ITSM strategies. ITIL is the most widespread approach followed by Business Process Framework (eTOM) and Control Objectives for Information and Related Technologies (COBIT) (Forbes 2017).

Organizations that implement ITIL do so with an expectation that the organization will benefit from its adoption. The expectations can be an improved IT service at a lower cost (Iden & Langeland 2010), standardized IT services (Marrone & Kolbe 2011), improved reliability and availability of IT services (Shang & Lin 2010), and cost savings (Cater-Steel, Tan & Toleman 2009a; Jäntti et al. 2013; Pollard & Cater-Steel 2009).

Implementing ITSM is costly (Göbel, Cronholm & Seigerroth 2013), and may be disruptive to an organization (Shang & Lin 2010), imposing business process changes to meet organizational goals (Tan, Cater-Steel & Toleman 2009).

In order to cut costs and become more efficient in ITSM related work, organizations need to use cost-effective methods to benchmark the organization's processes against standards to identify gaps and receive guidance to improve processes (Göbel, Cronholm & Seigerroth 2013). Many of the existing methods require large investments in time and resources, and there is a lack of a systematic approach to process improvement (Göbel, Cronholm & Seigerroth 2013). The literature review confirmed the lack of a pragmatic model and method that demonstrates the association of ITSM process capability and process performance with business performance.

This research addresses the requirement for research into the development and application of a cost-effective model and method to link ITSM process capability and process performance with business performance and more specifically financial cost savings.

This research also addresses the need for academic research to be applied to practice, thus providing a rigor-relevance balance (Straub & Ang 2011) to propose a cost-effective method, model and approach to improve ITSM processes.

1.5 Methodology

This section provides an overview of the methodology used to address the research problem.

The exploratory study is a single-case study that follows a pragmatic research approach, enabling methodological triangulation (Denzin 1970), to explore the research problem. The case study method is well suited to this study as it allows rich data collection on service management processes, people, services, tools, and technologies. The case study approach is appropriate because this study focusses on modern-day events in a natural setting, and there is no robust theoretical base for the research (Yin 2013).

To enhance transferability, this case study uses methods such as surveys, interactive interviews, focus group workshops, observation, and secondary data (personal and official documents, physical data, and archived research data) to explore, describe and explain a complex situation in a real-life context.

A scholar-practitioner (American Psychological Association 2007) approach, which is similar to a participant-observer (Cochrane 1972) approach, was followed in this research.

Definitions of key terms in the context of this research are provided in the next section.

1.6 Definition of Key Terms

Definitions adopted by researchers are often not uniform. Therefore, key terms that could be controversial if not explicitly defined are presented in this section for an understanding of the concepts and terminologies used in this research. The next section defines terms used in this study that are categorized based on the concepts relevant to the research questions. Appendix A.1 has a complete alphabetical listing of all terms used in the context of this research.

Terms relating to RQ1: *How can the association of ITSM process capability and process performance with financial performance of an organization be determined?*

business unit - A segment of the business that has its own plans, metrics, income, and costs. Each business unit owns assets and uses these to create value for customers in the form of goods and services (OGC 2011e).

capability - The ability of an organization, person, process, application, IT service or other configuration item to carry out an activity. Capabilities are intangible assets of an organization (OGC 2011e).

cost - The amount of money spent on a specific activity, IT service or business unit. Costs consist of real cost (money), notional cost (such as people's time) and depreciation (Van Bon et al. 2008).

critical success factor (CSF) - Something that must happen if an IT service, process, plan, project or other activity is to succeed (Rockart 1979).

first-line support - The first level in a hierarchy of support groups involved in the resolution of incidents where each level contains more specialist skills or has more time or other resources (OGC 2011d).

incident management - The process responsible for managing the lifecycle of all incidents to ensure that normal service operation is restored as quickly as possible and the business impact is minimized (OGC 2011d).

IT service - A service provided by an IT service provider that comprises a combination of information technology, people and processes (OGC 2011b).

IT service management (ITSM) - The implementation and management of quality IT services that meet the needs of the business that is performed by IT service providers through an appropriate mix of people, process and information technology (OGC 2011b).

ITIL® - A set of best-practice publications for IT service management that provides guidance on the provision of quality IT services and the processes, functions and other capabilities needed to support them (OGC 2011b)

key performance indicator (KPI) - A metric that is used to help manage an IT service, process, plan, project or other activity that is used to measure the achievement of each critical success factor (OGC 2011a, 2011c).

metric - Something that is measured and reported to help manage a process, IT service or activity (OGC 2011a).

operational - The lowest of three levels of planning and delivery (strategic, tactical, operational) that include operational activities such as the day-to-day or short-term planning or delivery of a business process or IT service management process (OGC 2011b).

operational cost - The cost resulting from running the IT services, which often involves repeating payments – for example, staff costs, hardware maintenance and electricity (OGC 2011b).

opportunity cost - A cost that represents the revenue that would have been generated by using the resources in a different way (OGC 2011e).

performance - A measure of what is achieved or delivered by a system, person, team, process or IT service (OGC 2011b).

process - A structured set of activities designed to accomplish a specific objective that takes one or more defined inputs and turns them into defined outputs. A process may define policies, standards, guidelines, activities and work instructions if they are needed (Van Bon et al. 2008).

risk - A possible event that could cause harm or loss, or affect the ability to achieve objectives that is measured by the probability of a threat, the vulnerability of the asset to that threat, and the impact it would have if it occurred. Risk can also be defined as uncertainty of outcome, and can be used in the context of measuring the probability of positive outcomes as well as negative outcomes (Van Bon 2004).

second-line support – In ITIL Service Operation the second level in a hierarchy of support groups involved in the resolution of incidents and investigation of problems (OGC 2011d).

service - A means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks (Van Bon 2004).

service management - A set of specialized organizational capabilities for providing value to customers in the form of services (Van Bon 2004).

Terms relating to RQ2: *How can the ITSM measurement framework be demonstrated for CSI?*

Continual Service Improvement (CSI) - A stage in the lifecycle of a service. Continual service improvement ensures that services are aligned with changing business needs by identifying and implementing improvements to IT services that support business processes (OGC 2011a).

ITSM Process Capability - The ability of an organization, person, process, application, IT service or other configuration item to carry out an activity (OGC 2011e).

Process improvement – actions taken to change an organization's processes so that they can more effectively and/or efficiently meet the organization's business goals (ISO/IEC 2005).

KISMET – (Keys to IT Service Management and Effective Transition of Services) is an ITSM process improvement model, coordinated as a research project by the Software Engineering Research Unit of the Department of Computer Science at the University of Kuopio at the University of Eastern Finland (Jäntti, Lahtela & Kaukola 2010).

Scholar-Practitioner - expresses an ideal of professional excellence grounded in theory and research, informed by experiential knowledge, and motivated by personal values (Distefano, Rudestam & Silverman 2004).

The next section describes the delimitations of the scope and key assumptions of this study.

1.7 Delimitations of Scope and Key Assumptions

A limitation of the study is that it depends on a single case study examining a single environment. A single case study sample limits generalizability (Myers 2008). The research is expected to make a contribution to the field through drawing attention to the details of processes and multiple stakeholder perspectives (Miles & Huberman 1994).

This study is limited to the extent that only the ITIL 2011 edition best practice framework will be used. While other best practice methodologies and related frameworks exist, such as the Microsoft Operations Framework or COBIT, this study confines the scope to only ITIL as the selected case study drives this decision. This may be seen as a limitation, as the outcome of the study may produce different results if other best practice frameworks are used.

An additional limitation is that the study will only focus on three ITSM processes: Incident, Problem and Change Management, as these are the processes currently implemented at the case organization. Studies have reported that these three processes are the most popular and are considered the highest priority (Marrone et al. 2014), as they have the least number of organizational constraints (Shrestha et al. 2012).

The survey data collection uses a pre-existing instrument, the Software Mediated Process Assessment (SMPA) tool (Shrestha 2015). This study used the SMPA tool for the process capability assessment, primarily for its transparency and convenience. A path for future research when using the SMPA approach is to further analyze the reliability of the assessment results before determining the capability rating of a process. The process attribute scores and corresponding capability level should be considered in light of the reliability measures. This study did not analyze the assessment reliability scores in detail but merely used the results at face value. Results from other process assessment methods can be easily incorporated into the measurement model by following the method outlined in Chapter 3.

This paper is based on a single case study for three ITSM processes. Using the framework developed in this research, the approach can be easily extended to other organizations and all ITSM processes. It might also be extended to work beyond ITSM (see *section 8.5.2.1* for further details and an example). Further research can be undertaken to apply the framework in different industry sectors, using different tools for data collection and methods to calculate financial measures.

As indicated by the literature review, further research can be conducted using standard accounting measures and/or market measures to fit the model developed in this paper. As a result of these efforts, improvements in the performance of IT groups should contribute to overall business performance and profitability.

The overall structure of the thesis is presented in the next section.

1.8 Structure of Thesis

The structure of the thesis is based upon the recommendations of Perry (1998) and the University of Southern Queensland PhD guidelines (USQ 2017). The language used in this thesis is United States English, as the researcher is based in the United States.

The thesis comprises eight chapters. For ease of readability, the section mark § is used to denote a chapter section of the document.

Chapter 1 (this chapter) provides the background and motivation to the research. The research problem and research questions are presented with the justification of the research. This chapter also includes the expected contributions to research and practice, an overview of the methodology, key definitions, limitations of the research and agenda for further research.

Chapter 2 consists of the review of the literature.

Chapter 3 presents the blueprint of the study, detailing the overall design and approach that is underpinned by the research philosophy, epistemology and ontology. The chapter also outlines the research method and the action research approach followed in the study. A detailed description of the research orientation, ethical considerations, trustworthiness and validity are also provided.

Chapter 4 presents the design of the ITSM measurement framework that demonstrates the association of process capability and process performance with financial costs. The conceptual model is described and applied to demonstrate how the components of the model interact with each other.

Chapter 5 presents the details of the first cycle of the action research study using the KISMET model as a guide. This chapter uses the model designed in chapter 4 to generate the results.

Chapter 6 presents the details of the second cycle of the action research study. This chapter uses and enhances the model designed in Chapter 4. The results of the first action research cycle are compared to the results of the second cycle.

Chapter 7 presents a discussion of the research findings. This chapter provides a critical examination of the research results with discussions based on the context of the research method and reviewed literature. Discussions are structured around the research questions with a reflection on research work conducted and the presentation of key themes emerging from this research.

Chapter 8 summarizes the research findings and how this research addressed the research problem. The contribution of research to the body of knowledge is discussed and implications of the research to theory and practice are presented. Then, the limitations of the research and directions for future research are presented.

1.9 Chapter Summary

This chapter laid the foundations for the thesis. The research background and motivation were presented for an overall understanding of the research context. Then the research problem and research questions were identified. Justification of the research and the research methodology was then briefly introduced. Key definitions and scope delimitations were provided before an outline of the thesis chapters. Upon this groundwork, the thesis can proceed with a detailed description of the research.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Chapter 1 introduced the research topic: *IT Service Management: Process Capability, Process Performance, and Business Performance*. This chapter presents a review of the academic literature and practitioner knowledge to support the research problem as described in chapter 1. *Section 2.1* introduces the chapter. *Section 2.2* presents the literature review strategy used in this research and *section 2.3* provides the literature review protocol. *Section 2.4* presents the theoretical framework of the study and *section 2.5* discusses the theories specific to the research problem. *Section 2.6* summarizes this chapter. Figure 2-1 illustrates an overview of chapter 2.

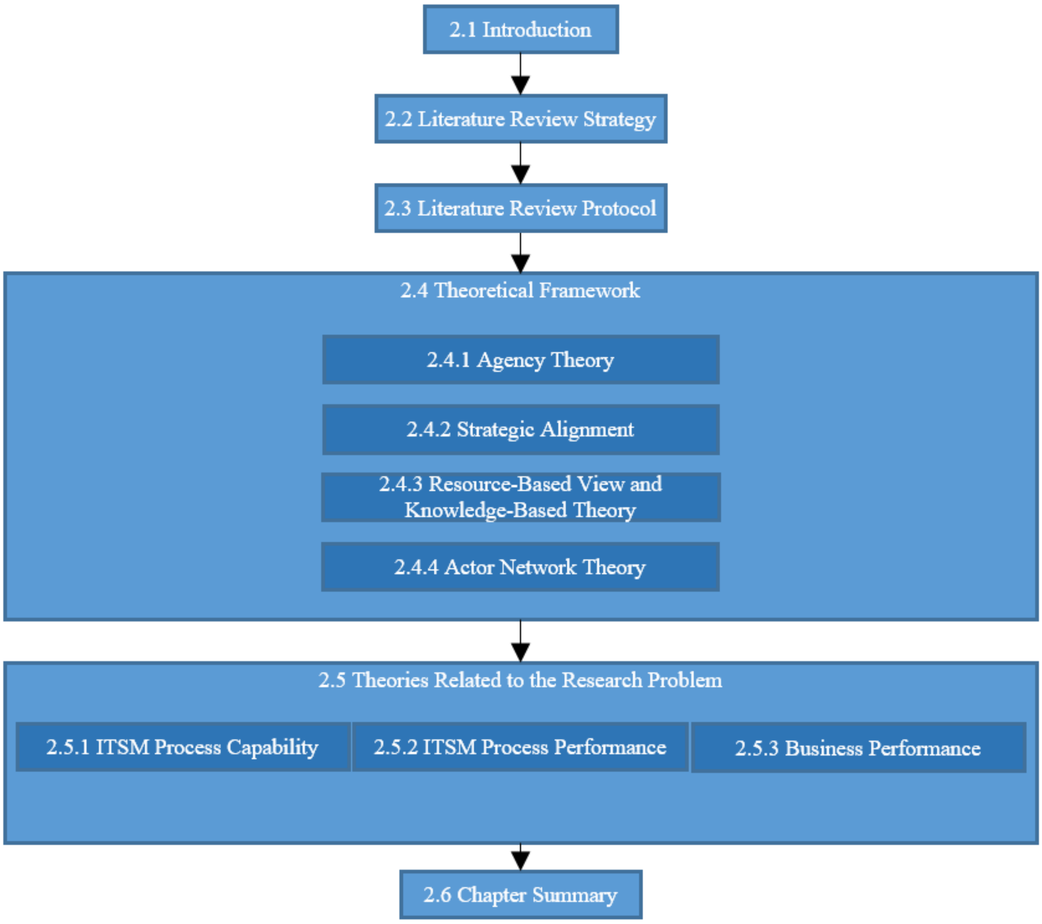

Figure 2-1 Overview of Chapter 2

2.2 Literature Review Strategy

The literature review applied the Systematic Mapping (SM) methodology (Peersman 1996) as opposed to the Systematic Literature Review (SLR) (Cochrane 1972) approach. This decision to utilize the SM method instead of an SLR is in line with the views of Kitchenham et al. (2009).

Systematic mapping is a literature review methodology that has been neglected in Information Technology research but is common in medical research but (Petersen et al. 2008). A systematic mapping study delivers a structure of the type of research studies and results that have been published by categorizing them and providing a visual map of the results (Petersen et al. 2008). Systematic mapping requires less effort than the SLR and allows the evidence in a domain to be mapped at a high level of granularity. Systematic mapping studies have previously been recommended mainly for research areas where there is a lack of relevant, high-quality primary studies (Kitchenham & Charters 2007). The systematic map of the literature review forms the basis for this chapter (see Appendix A.2).

The number of journal articles and conference papers selected for further analysis are charted in Figure 2-2 showing their years of publication.

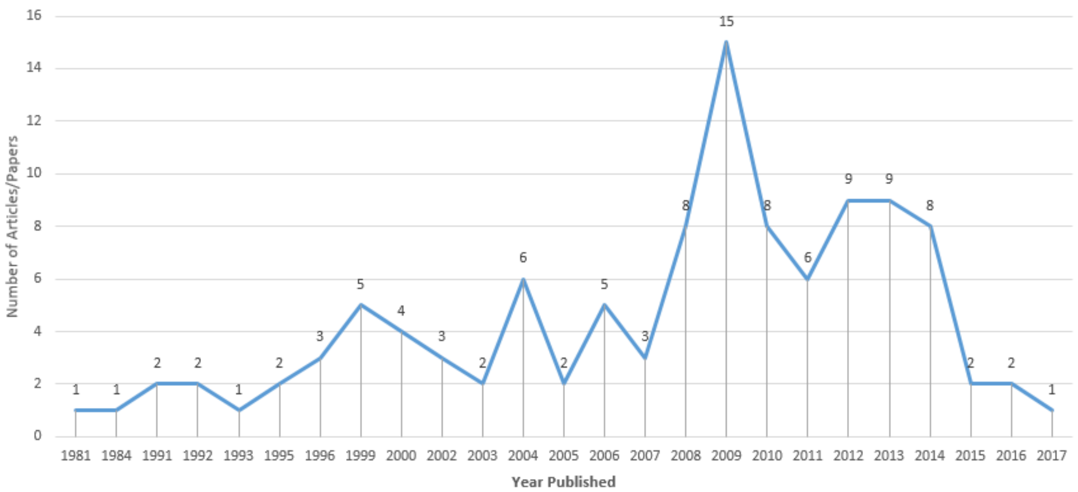

Figure 2-2 Number of journal articles and conference papers

The next section discusses the literature review protocol.

2.3 Literature Review Protocol

The literature review protocol specifies the research questions being addressed, methods used to perform the review, the search strategy, inclusion and exclusion criteria, information to be obtained from each primary study, and the quality criteria by which to evaluate each primary study. Table 2-1 presents the literature review protocol used in this research.

Table 2-1 Literature Review Protocol

Literature Review Criteria	Search Measures
Search Strategy	Keyword searches in ITSM and performance measurement domains. Searches performed on Google Scholar, Association of Information Systems (AIS) electronic library, Decision Sciences, ScienceDirect, Elsevier, IEEE Xplore, SpringerLink.
Search Terms	ITIL, IT Infrastructure Library, ITSM, IT service management, ITIL maturity, ITSM maturity, ITIL capability, ITSM capability, ITIL process assessments, ITSM process assessments, ITSM performance measurement, ITIL performance measurement, IT service, ITIL metrics, ITSM metrics, ITSM benefits, ITIL benefits, ITIL value, ITSM value, ITSM performance, ITIL performance, IT performance, IS performance, performance measurement design, performance measurement frameworks, BSC, Balance scorecard, Service management, Business-IT alignment, Strategic alignment, IT and Resource-Based View, IT and Knowledge-Based View, IT financial management, IT financial measures
Quality criteria for evaluating primary study	Academic books, peer-reviewed journal articles, conference papers, technical reports and electronic articles. Industry books, whitepapers, and reports.
Inclusion and exclusion criteria	Included: Academic publications: books, peer-reviewed journal articles and conference papers, and technical reports. Industry publications: books, journal articles, white papers and technical reports. Excluded: opinion pieces.

Using the literature review protocol presented in Table 2-1 a review was performed on empirical and theoretical studies covering ITSM adoption, implementation, benefits, process capability, process improvement and financial performance. Both academic and industry publications were included. The review primarily used online searches of bibliographic online databases and library catalogs. Literature searches were performed on Google Scholar as well as the Association of Information Systems (AIS) basket of eight journals (AIS 2011): European Journal of Information Systems (EJIS), Information Systems Journal (ISJ), Information Systems Research (ISR), Journal of AIS (JAIS), Journal of Information Technology (JIT), Journal of MIS (JMIS), Journal of Strategic Information Systems (JSIS) and MIS Quarterly (MISQ). Literature searches were also performed on AIS conferences, including International Conference on Information Systems (ICIS), European Conference on Information Systems (ECIS), Americas Conference on Information Systems (AMCIS), Pacific Asia Conference on Information Systems (PACIS), Australasian Conference on Information Systems (ACIS), and Hawaii International Conference on System Sciences (HICSS). The articles retrieved in the search were reviewed and literature addressing ITSM benefits, IS, ITIL and ITSM performance measurement were further analyzed Articles from peer-reviewed academic publications were supplemented with industry press books, white papers, and web pages.

The theoretical framework of the research is presented next.

2.4 Literature Review Framework

The review of empirical and theoretical studies progressed from general to specific subject areas, as depicted by the hierarchical literature review framework in Figure 2-3. High-level components of the framework are represented in shades of blue, while the green components represent the literature on IT and the orange components represent the business focus of the literature review. The numbers show the relevant sections in this chapter.

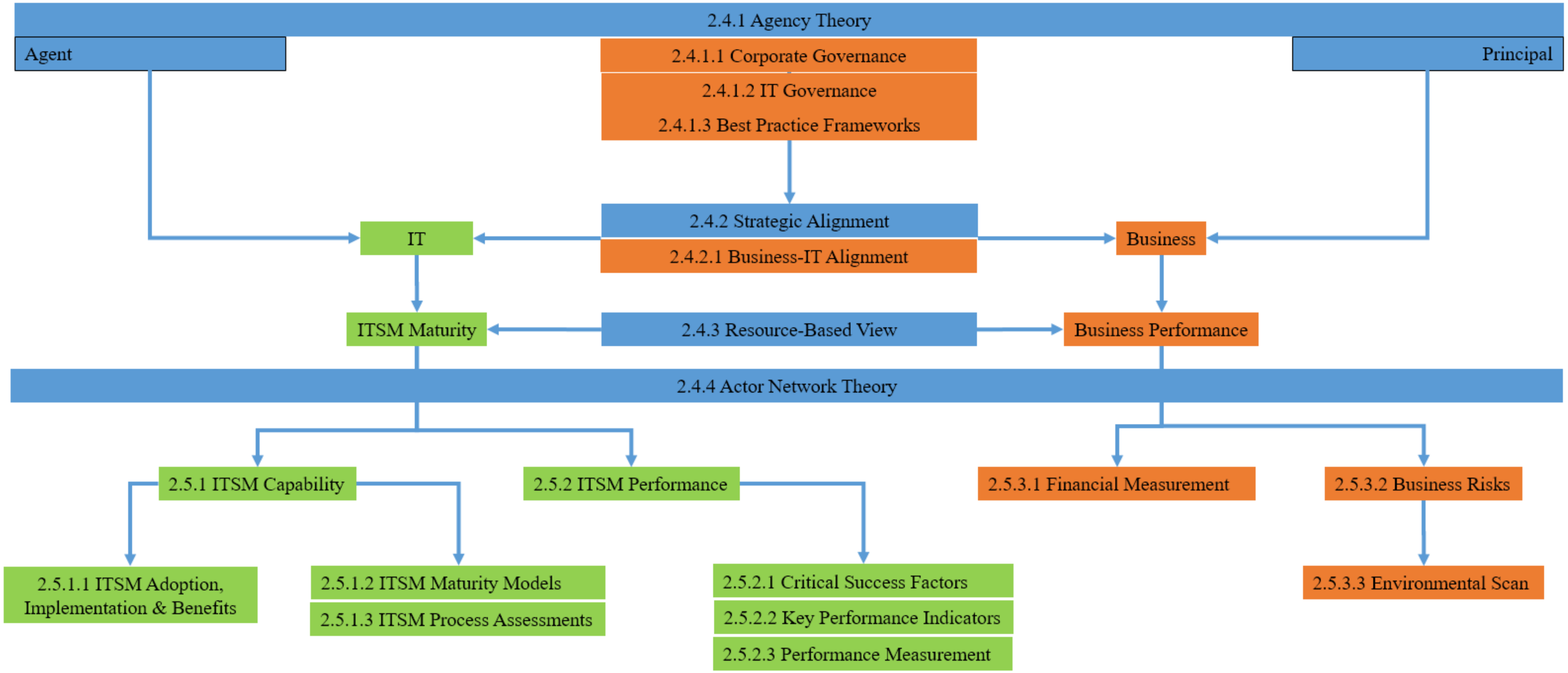

Figure 2-3 Literature Review Framework

Dichotomizing the research topic presents two main streams of literature: IT and Business. The theory that glues these streams of literature is Agency Theory- IT being the agent and business the principal. Based on the Agency theory, the literature review narrowed the focus to Strategic Alignment Theory and Business-IT Alignment. Working down the hierarchy from this level focusses the literature review on ITSM Process Maturity and Business Performance, using the Resource-Based View as a guide. Finally, all the lower levels of the hierarchical literature review framework were guided by the Actor-Network Theory.

The next two major sections of this chapter (§2.5 and §2.6) provide a review of the parent theories and focus theories. Theory in interpretive IS case studies can play different roles, that can be used as an initial guide to design and data collection; as part of an iterative process of data collection and analysis; and as a final product of the research (Walsham 1995). The theory reviewed in §2.4 was used to create an initial theoretical framework which takes account of previous knowledge to create a theoretical basis to inform the topics and approach of the early empirical work. The literature reviewed in §2.5 used theory as an iterative process of data collection and analysis, with initial theories being expanded and revised.

2.5 Parent Theories

2.5.1 Agency Theory

As the backdrop to the literature review, Agency Theory (Eisenhardt 1989a) is a view of corporate governance that endeavors to explain the shared behavior of principals (who are typically owners of firms) and agents (the managers of those firms). This theory mainly assumes that human beings are rationally bounded, self-interested and risk-averse and given the opportunity, they will further their personal self-interests in opposition to that of the firm, thus governance mechanisms should be introduced as a measure to minimize these opportunities and align the interests of the agent to that of the principal/firm through incentives (Aoki 2001; Christopher 2010; Eisenhardt 1989a; Jensen & Meckling 1976). This application of a contractual lens (principal-agent) as a primary unit of analysis has contributed to the current focus on decision-making rights, input rights, and accountability measures. A number of best practice frameworks have been created with the foundational goals of creating measures/processes to control, monitor and evaluate activity in the organization. The perceived view of IT governance is that the outcomes or focus of these measures is to create strategic alignment, risk management, performance management, delivery of business value through IT, as well as capability management (Bardhan et al. 2010; De Haes & Van Grembergen 2004; Luftman & McLean 2004; Papp 1999; Peppard & Breu 2003). Since IT governance is a form of corporate governance, §2.4.1.1 reviews the literature on corporate governance before the discussion on IT governance in § 2.4.1.2.

2.5.1.1 Corporate Governance

There has been increased scrutiny in the issue of corporate governance over the past decade, focusing on improved transparency and accountability (Subramanian 2015). The modern practice of corporate governance can be traced back to the 17th-century Dutch Republic (Frentrop 2003; Gelderblom, De Jong & Jonker 2013; Lukomnik 2016), where, in 1609, the world's first publically listed company, the Dutch East India Company (Funnell & Robertson 2013), had a corporate governance dispute between shareholders and directors (Mueller 2012). The seminal work of the legal scholars Adolf Augustus Berle and Gardiner Means in the 1930s is pivotal to an understanding of the changing role of modern corporations in society (Berle Jr & Means 1930).

The principal-agent problem was established in the 1980s as an approach to understanding corporate governance (Fama & Jensen 1983), where a corporation is seen as a series of contracts (Eisenhardt 1989a).

The 1990s saw an unprecedented rate of dismissals of CEOs of prominent US firms such as Honeywell, IBM, Kmart and Kodak, by their board of directors, causing a flurry of media attention at the time (Bianco & Lavelle 2000). According to Bianco and Lavelle (2000), one-third of CEOs appointed at 450 major corporations lasted three years or less. Additionally, one in four companies went through three or more CEOs in the 1990s (Bianco & Lavelle 2000).

The issue of corporate governance was in the spotlight again in the early 2000s, when the US firms Enron and MCI Inc. were at the center of corporate scandals. A US federal law, Sarbanes-Oxley Act was passed in 2002 to regain public confidence in corporate governance. Similarly, around the same time, the demise of Australia's HIH

Insurance and One.Tel led to the enactment of the Corporate Law Economic Reform Program Act (CLERP 9) (Lee, J & Shailer 2008).

The term "corporate governance" may be defined as the relationship between owners of corporations and the management they employ to run their companies on a day-to-day basis for them. Since these owners are isolated from the daily activities of their firms, the principal-agent issue arises between executive management (the "agent") that may have different interests and more information than shareholders (the "principals"). Current interest in corporate governance is concerned with mitigation of the conflicts of interests between stakeholders (Goergen 2012).

Corporate governance is concerned with minimizing costs and risks due to the isolation of owners from hired management and with maximizing returns to owners using the skills of employed management (Licker 2007). Current risks in corporate governance include both legal and ethical issues, making investment returns complex and not necessarily defined in monetary terms. This makes corporate governance a complex process and, given the existence of the presumed gap between owners and managers, and the specific knowledge needed in IT to understand the business value, IT governance can be more complex to control, leading to the challenges of IT governance. The next section discusses IT Governance.

2.5.1.2 IT Governance

IT governance is an integral subset discipline of corporate governance concerned with IT performance and risk management. In a study by Licker (2007), the definition of IT governance was presented by various researchers as:

- "IT Governance is the strategic alignment of IT with the business such that maximum business value is achieved through the development and maintenance of effective IT control and accountability, performance management and risk management" (Webb, Pollard & Ridley 2006, p. 7);
- "… specifying the decision rights and accountability framework to encourage desirable behaviors in using IT" (Weill & Ross 2004, p. 8);

- "the distribution of IT decision-making rights and responsibilities among enterprise stakeholders, and the procedures and mechanisms for making and monitoring strategic decisions regarding IT" (Peterson 2004, p. 7);
- "control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT" (De Haes & Van Grembergen 2004, p. 1).

Although definitions of IT governance vary, there has largely been a consensus in the literature regarding the perceived purpose of IT governance: to ensure the best utilization of IT resources for the purposes of achieving the business strategy and furthering business objectives (Licker 2007).

According to Peterson (2004), governance is intended to mitigate IT challenges in three ways: structural, process and relational. The first way refers to the structural relationship of the IT function to the rest of the firm and focusses on strategic alignment (Weill & Ross 2004). Good governance is intended to ensure the alignment of the presumed IT interests of technical excellence and efficiency with those of the firm at large. The next section reviews the literature on the three most dominant IT governance models and best practice frameworks.

2.5.1.3 IT Governance Models/Best Practice Frameworks

Research in the field of IT governance has been underpinned and grounded by Agency Theory (Jensen & Meckling 1976). The literature on IT Governance recognizes that "effective governance" metrics are underpinned by the theoretical assumptions of agency theory that encourage the widespread propagation of "best practice" models and frameworks such as COBIT, ITIL and the Balanced Scorecard (BSC) (Masuku 2014). The three most influential IT governance models/frameworks, COBIT, ITIL, and BSC are discussed next.

<u>COBIT</u>

The Control Objectives for Information and Related Technologies (COBIT®) best practice framework incorporates many commonly accepted concepts and theories from general management and academic IT literature (De Haes, Debreceny & Van Grembergen 2013). COBIT is particularly influential in the IT governance, audit and compliance arena, informing much of how practitioners view, understand and implement IT governance within their organizations (De Haes, Van Grembergen & Debreceny 2013). This framework positions the IT governance objective as the creation of stakeholder value, defined as “realizing benefits at an optimal resource cost whilst optimizing risk” (ISACA 2012).

COBIT 5, the latest version of the framework, builds and expands on earlier versions by integrating other major frameworks, standards and resources, including ISACA’s Val IT and Risk IT, Information Technology Infrastructure Library (ITIL®) and related standards from the International Organization for Standardization (ISO) (ISACA 2017).

COBIT 5 claims to incorporate five principles that allow the firm to build an effective governance and management framework based on a comprehensive set of seven enablers that optimizes information and technology investment and use for the benefit of stakeholders (ISACA 2017).

The COBIT 5 process capability model is grounded on the principle that there are increasing levels of maturity of organizational governance and that an organization can make changes to its processes and activities in order to progress in these levels (Pasquini & Galiè 2013). COBIT 5 applies the international standard for process assessment ISO/IEC 15504 to assess IT processes (Pasquini & Galiè 2013).

The study by Pasquini and Galiè (2013) recognized the COBIT 5 Process Capability Model (based on ISO/IEC 15504) as a good approach to assess the “as-is” process capability level, target the “to-be” maturity based on financial analyses and opportunities that could result in improvements, and analyze the gap between “as-is” and “to-be” to reach a desired level of capability for a given process.

ITIL

The genesis of ITIL comes from a response to the severe economic recession in the late 1980s when the Central Computer and Telecommunications Agency (CCTA) in the United Kingdom developed the Government Information Technology Infrastructure Management framework in an attempt to reduce costs and better manage IT service delivery (Sallé 2004). In the year 2000, the CCTA merged into the Office for Government Commerce (OGC), an independent office of the UK Treasury. In the 1990s, ITIL gained the support of the British Standards Institution and was extended and adopted as BS 15000 (code of practice for IT service management) in 1995 (Cater-Steel & Toleman 2008). The ITIL framework gained popularity worldwide through the influence of the IT service management forum (itSMF) (Clacy & Jennings 2007; Lahtela & Jäntti 2010).

Information Technology Infrastructure Library (ITIL®) is a documented set of best practices and guidelines to implement ITSM. ITIL defines processes and functions related to service strategy, service design, service transition, service operation and continual service improvement (Glenfis-AG 2014). The ITIL 2011 edition, the latest edition published by the British Office of Government Commerce in July 2011, consists of five books: ITIL Service Strategy (OGC 2011e), ITIL Service Design (OGC 2011c), ITIL Service Transition (OGC 2011f), ITIL Service Operation (OGC 2011d) and ITIL Continual Service Improvement (OGC 2011b).

ITSM is an evolving practice for implementing and managing quality IT services, resources, and systems, to better align the delivery of IT services with the needs of the business, with emphasis on benefits to customers, resulting in more capable and proficient business processes and potentially beneficial cost cutting (Conger, Winniford & Erickson-Harris 2008). ITSM "provides a framework to align IT operations-related activities and the interactions of IT technical personnel with business customer and user processes" (Galup et al. 2009, p. 125). The main objective of ITSM is to improve IT services to satisfy business requirements and manage infrastructure while increasing alignment between IT and organizational goals (Masuku 2014).

ITIL is the most popular ITSM best practice framework (Forbes 2017), however, IT organizations need an international standard to audit their ITSM processes (Jäntti et al. 2013). ITIL underpins ISO/IEC 20000, the International Service Management Standard family for IT service management, especially ISO/IEC 20000-1:2010 Part 1: Service management system requirements and ISO/IEC 20000-2:2011 Part 2: Guidance on the application of service management systems (Jäntti et al. 2013). The IT service management process reference model (PRM) is defined in Part 4 of the standard. (ISO/IEC 2010). ISO/IEC TS 15504-8:2012 process assessment model

(ISO/IEC 2012) extends the PRM process definitions and defines Generic Practices, Generic Resources and Generic Input/Outputs for evaluating the service management process capability (Jäntti et al. 2013). In addition, Base Practices with Input and Output Information Items are used as process performance indicators that introduce a Process Maturity Framework (PMF). Recently, the ISO/IEC 15504 standard has been revised and reorganized as a new series of the standard: the ISO/IEC 330xx series (ISO/IEC 2017).

Measurement in ITIL is divided into three components (OGC 2011b): Critical Success Factors (CSFs) that reflect the organization's goals for ITSM, Key Performance Indicators (KPIs) that indicate the performance trend, and other metrics that enable measurements in practice (Jäntti et al. 2013). The strength of ITIL has been attributed to its activity-based process models and guidelines, and lists of critical success factors.

Balanced Scorecard

The Balanced Scorecard (BSC) is another widely adopted model for strategic alignment. The BSC framework was introduced by Kaplan and Norton in the 1990s as a framework of performance evaluation (Kaplan & Norton 1992). The BSC has been used as a framework of IT evaluation since its introduction in the IT field, and later used as a framework for IT Management, and IT Governance (Ahmad 2013). The premise of this model is the integration of financial and non-financial measures, arguing for the inclusion of measures concerning internal processes, the ability to innovate, and customer satisfaction with the traditional evaluation of financial metrics (Kaplan & Norton 1992). A system for business-IT alignment is provided to senior management through the use of cascading balanced scorecards. Enablers for the IT balanced scorecard include an IT development scorecard, and an IT operational scorecard; the IT balanced scorecard then may become an enabler of a business-balanced scorecard (Van Grembergen 2000).

The BSC is both a strategic measurement system and a strategic control system that is used to align personal and departmental goals to business strategy, and assist management to plan, execute and monitor business strategies (Kaplan & Norton 1996; Norreklit 2000). The BSC model differentiates itself from other strategic measurement systems in that it "includes outcome measures and the performance drivers of outcomes, linked together in cause-and-effect relationships" (Kaplan & Norton 1996, p. 31). The purpose of the balanced scorecard is to align "the strategy expressed in the actions actually undertaken to the strategy expressed in the plan" (Norreklit 2000, p. 69). This model inherently claims that financial measures represent past performance whilst the drivers of future performance are the nonfinancial measures (Kaplan & Norton 1996; Norreklit 2000).

The BSC model assumes that the suggested areas of measurement are linked by a cause-and-effect relationship. Norreklit (2000) suggested that this assumption is problematic, as it does not provide for a time lag dimension between the measures, as required in cause-and-effect relationships. To investigate further, Norreklit (2000) conducted an analysis of the BSC assumptions and concluded that "the balanced scorecard makes invalid assumptions about causal relationships, leading to the anticipation of performance indicators which are faulty, thus resulting in dysfunctional organizational behavior and sub-optimized performance" (p. 75) and made the argument that instead of being referred to as causal, the relationship between the measurement areas is more likely to be one of interdependence (Norreklit 2000). In addition, although the *balanced scorecard* attempts to integrate four important performance perspectives in one simple and easy to use management report, the main weakness of this approach is that it is primarily designed to provide senior managers with an overall view of performance, thus making it inapplicable at the operational level.

The next section moves down the hierarchical theoretical framework (Figure 2-3) to review the literature on the link between IT and the business. §2.4.2 discusses the Strategic Alignment Theory as the underpinning theory to Business-IT Alignment which is reviewed in §2.4.2.1.

2.5.2 Strategic Alignment

This section introduces Strategic Alignment as the theoretical foundation for the Business-IT Alignment focus of the study.

Rapid advanced development in IT technologies has stimulated new opportunities by using technology strategically for business benefits (Galliers & Leidner 2014). The alignment of IT strategies with business plans and business strategies to eventually implement them to improve productivity and competitiveness of the business requires the efficient and effective use of IT (Luftman 2000). Strategic alignment is invaluable to executives seeking to achieve alignment of their business and technology strategies (Coleman & Papp 2006; Ward & Peppard 2002).

Strategic Alignment has been defined as the “Strategic Fit” & “Functional Integration” among the four domains of business strategy, IT strategy, business infrastructure, and IT infrastructure (Henderson & Venkatraman 1993), and similarly as “The degree to which the IT mission, objectives and plans support and are supported by the business mission, objectives, and plans” (Reich & Benbasat 1996, p. 55) and “applying Information Technology (IT) in an appropriate and timely way, in harmony with business strategies, goals and needs” (Luftman 2000, p. 14).

In the 1990s, Henderson and Venkatraman (1993) presented a systematic model, the Strategic Alignment Model (SAM), that can enable the successful implementation of business, technology, and infrastructure for improved alignment (Henderson & Venkatraman 1993). The SAM framework recognizes that business success is dependent on the harmony of business strategy, IT strategy, organizational infrastructure and processes, and IT infrastructure and processes (Luftman 2004).

Based on the definition of Strategic Alignment by Henderson and Venkatraman (1993), strategic alignment is a continuous process, ideally executed by a management team working together and recognizing where the organization is strong and weak (and why), developing action plans that leverage areas of strength, and building and managing the four domains and the interrelationship between them. The strategic alignment refers to the extent to which operational decisions within the firm are consistent with the strategy, and the firm’s successful implementation of its strategy to achieve its fundamental goals (Henderson & Venkatraman 1991, 1993; Luftman, Lewis & Oldach 1993).

2.5.2.1 Business-IT Alignment

Stakeholders of organizations typically have different objectives, culture, and incentives (Rahbar, Zeinolabedin & Afiati 2013). Business-IT alignment is the highly sought-after state where businesses effectively use IT in a timely manner to achieve business goals and strategies. The 2016-2017 Global CIO Survey from Deloitte LLP found that CIOs can drive business value by continually assessing and aligning IT capabilities (Kark et al. 2017). The same survey found that the top IT capability selected by respondents was the capacity to align IT activities with business strategy and performance goals. About 75 percent of the CIOs surveyed said this capability was essential to their success, including the CIO of a large US retailer, who stated that "*The difference between good and bad IT organizations is business alignment*" (Kark et al. 2017).

Studies show that organizations with IT-enabled growth are not only positively affected by economic impacts (e.g., increasing sales and decreasing expenditures) (Alaeddini & Salekfard 2013), they can also achieve a better strategic match, a more efficient IT architecture and more core competencies, as well as better decision-making and faster competitive reactions (Rahbar, Zeinolabedin & Afiati 2013).

Scholars have proposed several definitions of business-IT alignment, of which the more relevant are listed below:

- Matching business requirements with relevant IT services (Tapia 2007);
- Aligning the information systems capabilities with the business goals (Chen 2008);
- Applying IT in an appropriate and timely manner, in accordance with existing business strategies, goals and needs (Luftman 2000);
- The degree to which the IT applications, infrastructure, and organization enable and support the business strategy and processes, including the processes to realize this (Silvius 2008).

The best practices of ITIL support, enhance and prioritize the vital importance of alignment between business and IT. The use of ITSM has influenced the alignment and general interaction of the business and IT (Luftman, Papp & Brier 1999).

There is a possible positive effect on the performance of the business, competitive advantage, and increased profitability, through business and IT alignment, since ITSM has a direct impact on the strategic position of the business (Luftman & Ben-Zvi 2011).

The following section addresses the next level of the theoretical model, by providing the theory that links ITSM Maturity to Business Performance.

2.5.3 Resource-Based View and Knowledge-Based Theory

A theoretical framework that is often used in the field of information management and other management fields is the Resource-Based View (RBV) of the firm (Wernerfelt 1984). RBV is deeply rooted in management strategy literature and proposes that companies compete due to “unique” resources that are valuable, rare, difficult to imitate, and non-substitutable by other resources (Barney 1991; Conner 1991; Schulze 1992). Furthermore, RBV posits that organizational resources are the source of improved company performance and on-going competitive advantage (Wade & Hulland 2004).

From the resource-based perspective, business is seen as a package of in-house, strategically relevant resources. The organization is perceived as a bundle of assets essential for the company to execute its strategy (Mills, Platts & Bourne 2003). The strategically relevant resources employed, owned and controlled by the business form the building blocks of competitive advantage of the firm. Accordingly, a company’s performance is determined by its ownership or control of the exclusive, strategically relevant resources needed to achieve its competitive advantage.

The RBV refers to resources such as physical (e.g., machines, plant, etc.), human (e.g., know-how), and organizational capital (e.g., the firm’s reputation) (Barney 1991). The RBV sees knowledge as a generic source for sustainable competitiveness but fails to realize the different types of knowledge-based capabilities such as acknowledging the significance of human resources, competencies and intellectual capital for competitiveness (Marrone 2010). Some researchers perceive that this constitutes a weakness of the RBV since it does not emphasize sufficiently the importance of learning and innovating in the firm, neither does it look at interfaces between individuals. Particularly in service industries, the primary source of competitive advantage is the continuous process of knowledge creation (Nonaka & Takeuchi 1995).

Using the resource-based view of the firm as a base, Grant (1996) proposed the knowledge-based view of the firm (KBV), also known as the knowledge-based theory. KBV is rooted in strategic management and extends the RBV of the firm.

A company's capabilities depend on both the tacit and explicit knowledge that exists within the company. Operational capabilities are essential for a company's existence as they are required to produce products or deliver services and constitute a "must have" set of know-how (Grant 2016). Dynamic capabilities are required for companies to expand and adapt to the ever-changing environment (Eisenhardt & Martin 2000), and to enable companies to improve or extend their existing strategy, resource base and processes. Financial services organizations, like Company X, can be regarded as knowledge-intensive organizations since they depend on the creation, capture, transfer, and application of specialized knowledge in their core business processes (Cuske et al. 2008).

IT Service Management frameworks, such as ITIL, are able to provide a positive influence on knowledge transfer by prescribing policies, procedures, and tools that serve as valuable enablers of knowledge generation and application (Marrone 2010). These frameworks influence the IT organization's resources and capabilities and ultimately can lead to improvement of a firm's competitive advantages (Marrone 2010).

The primary source of competitive advantage, specifically in the service industry, is the continuous process of knowledge creation (Colurcio 2009; Nonaka & Takeuchi 1995). The sustainable growth of a firm requires continuous redevelopment of knowledge-based resources and capabilities to be able to discover new business opportunities (Saarenketo 2009). In most organizations, specialized knowledge is distributed across different organization members, which causes a problem (Tsoukas 1996). §2.4.4 reviews literature on the Actor-Network Theory, the theory that was used as a method to guide the research.

2.5.4 Actor-Network Theory

Actor-Network Theory (ANT) was pioneered by French sociologists through their efforts to realize how scientific theories spread within scientific communities, become entrenched in the community and are then taken for granted as a basis for further scientific progress (Cater-Steel & McBride 2007). ANT was established by Michel Callon and Bruno Latour (Callon & Latour 1981) during the course of the 1980s, and was later further developed by the authors and other scholars (Callon 1999; Latour 1999; Law 2009; Law & Hassard 1999).

A major problem in adopting and implementing a best practice framework, such as ITIL, is convincing IT managers of the importance of ITIL and persuading executives to invest in IT service management projects (Cater-Steel & McBride 2007). The problems associated with ITIL adoption and technology adoption are not very different as they both involve changes to practices, changes in organizational behavior and the development of different attitudes and culture (Cater-Steel & McBride 2007).

The acceptance of IT service standards, and their entrenchment in organizations is a social phenomenon, one of establishing social acceptance, of developing social networks in which people's interests are similar, and the message of ITIL becomes part of everyone's mindset. A positive view of ITIL leads to the acceptance of the procedures as part of daily work lives, and people start to recommend its use to co-workers.

ANT provides an explanatory framework to explore how a network of actors communicate to align actor interests around the adoption and implementation of ITIL - the establishment of a social and technological arrangement (Cater-Steel & McBride 2007). Establishing a standard requires the aligning of the interests of actors within the network. Actors enroll others into the network, and as the interests of actors within the network are aligned, the network becomes stable and the standards entrenched. ANT suggests that the aligning of the interests of actors in the network involves the translation of those interests into a common interest in adopting a framework such as ITIL. This translation is achieved in the network through common definitions, meanings, and inscriptions attached to the service activities. The actor-network must first grow to reach a critical mass and then reach a state of stability. If the network remains unstable, it can disappear as quickly as it emerges, and the standard becomes obsolete. In order for stability to be established so that the standards become embedded in work practices, the notion of irreversibility must be established (Cater-Steel & McBride 2007).

According to ANT, standards adoption is not a just a technical process of writing the procedures and getting people trained. It is primarily a social process by which groups of people come to share interests and adopt similar attitudes. For ITIL to be accepted at any organization, it is these social processes that must be addressed first. It requires that the social links between IT services and the rest of the firm are strong enough that actor networks can be established and the message of ITIL transmitted so that people are enrolled into an ITIL network. Their interests must be shown to be aligned with the interests of the ITIL network. They must see that ITIL will help them achieve their objectives.

The systematic map of the literature reviewed for the underpinning theories is presented in Table 2-2 (below).

Table 2-2 Systematic map of the underpinning theories

		Underpinning Theories			
Researcher/Author	**Source**	**ITSM Best Practice Frameworks**	**IT Governance & Business-IT Alignment**	**Resource-Based View**	**Actor-Network Theory**
Kashanchi, R. & Toland, J. (2006)	JA		x		
Marrone, M., & Kolbe, L. M. (2011)	JA		x		
Rahbar, N., Zeinolabedin, N., & Afiati, S. (2013)	JA		x		
Silvius, A. (2008)	JA		x		
Weill, P., & Ross, J. W. (2004)	JA		x		
Peterson, R. (2004)	JA		x		
De Haes, S., & Van Grembergen, W. (2004)	JA		x		
Luftman, J. (2000)	JA		x		
Luftman, J., Papp, R., & Brier, T. (1999)	JA		x		
Luftman, J., & Ben-Zvi, T. (2011)	JA		x		
Jäntti, M., Rout, T., Wen, L., Heikkinen, S., & Cater-Steel, A.	JA	x			
Conger, S., Winniford, M., & Erickson-Harris, L. (2008)	JA	x			
Callon, M. (1999)	JA				x
Latour, B. (1999)	JA				x
Marrone, M. (2010)	JA			x	
Wernerfelt, B. (1984)	JA			x	
Barney, J. (1991)	JA			x	
Conner, K. R. (1991)	JA			x	
Wade, M., & Hulland, J. (2004)	JA			x	
Mills, J., Platts, K., & Bourne, M. (2003)	JA			x	

Researcher/Author	Source	Underpinning Theories: ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory
Grant, R. (1996)	JA			x	
Eisenhardt, K. M., & Martin, J. A. (2000)	JA			x	
Colurcio, M. (2009)	JA			x	
Saarenketo, S. e. a. (2009)	JA			x	
Tsoukas, H. (1996)	JA			x	
De Haes, S., Debreceny, R., & Van Grembergen, W. (2013)	JA	x			
De Haes, S., Van Grembergen, W., & Debreceny, R. S. (2013)	JA	x			
Galup, S. D., Dattero, R., Quan, J. J., & Conger, S. (2009)	JA	x			
Masuku, S. (2014)	JA	x			
Kaplan, R., & Norton, D. (1992)	JA	x			
Kaplan, R., & Norton, D. (1996)	JA	x			
Ahmad, M. (2009)	JA	x			
Norreklit, H. (2000)	JA	x			
Van Grembergen, W. (2000)	CP	x			
Schulze, W. S. (1992)	CP			x	
Chen, H.-M. (2008)	CP		x		
Tapia, R. S. (2007)	CP		x		
Licker, P. (2007)	CP		x		
Webb, P., Pollard, C., & Ridley, G. (2006)	CP		x		
Duffy, K. P., & Denison, B. B. (2008)	CP		x		
Fraser, P., Moultrie, J., & Gregory, M. (2002)	CP	x			
Pasquini, A., & Galiè, E. (2013)	CP	x			
Cater-Steel, A., & McBride, N. (2007)	CP				x
Grant, R. (2002)	B			x	
Nonaka, I., & Takeuchi, H. (1995)	B			x	
Callon, M., & Latour, B. (1981)	B				x
Law, J. (2009)	B				x
Law, J., & Hassard, J. (1999)	B				x
ISACA. (2012)	IR	x			
Glenfis-AG. (2014)	IR	x			
Cabinet Office (2011)	IR	x			
Forbes. (2017)	IR	x			
Count		17	15	14	6

Note. JA=Journal Article; CP=Conference Paper; B=Book; IR=Industry Resource.

The next major section focusses on the body of knowledge that directly relates to the research problem.

2.6 Focus Theories

2.6.1 ITSM Capability

2.6.1.1 ITSM Adoption, Implementation, and Benefits

The 2017 Forbes Insights survey on The State of ITSM (Forbes 2017) reported that ITIL is the most popular ITSM framework. Of the 261 global senior executives surveyed, 47 percent reported ITIL as the ITSM framework of choice. Figure 2-4 shows the list of most common ITSM frameworks from the Forbes Insights survey.

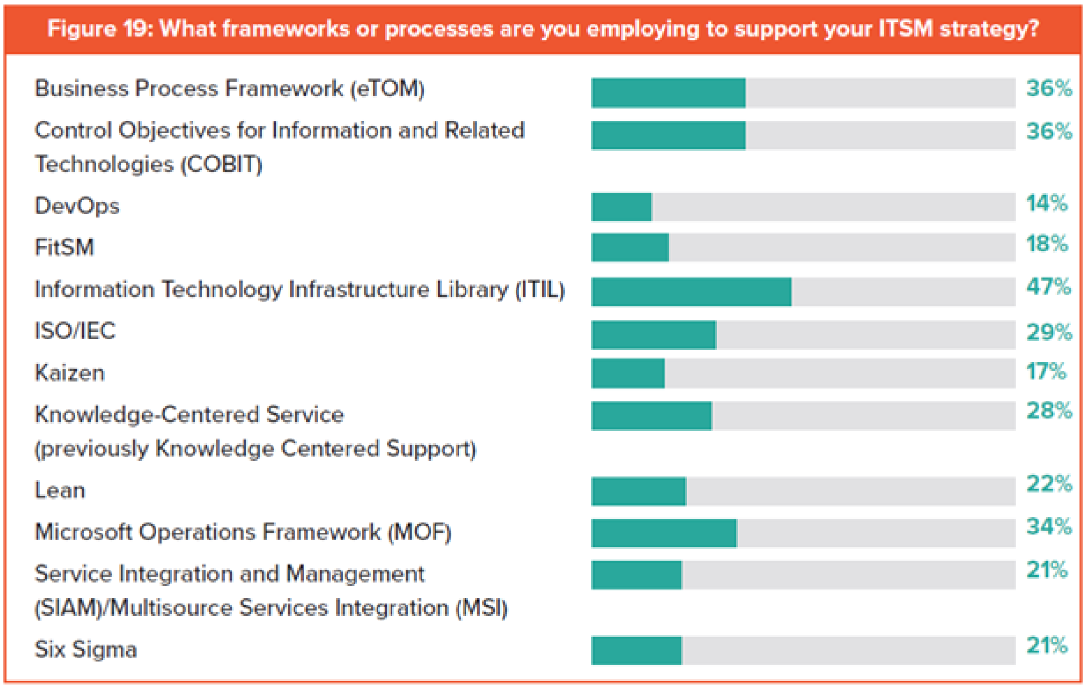

Figure 2-4 Forbes Insights survey list of most prevalent ITSM frameworks (Forbes 2017)

The adoption, implementation, and benefits of ITSM and the ITIL framework has been reported by numerous scholars across the globe, including the United States of America (Galup et al. 2009; Pollard & Cater-Steel 2009), United Kingdom (Shwartz et al. 2007), Germany (Egeler 2008), Australia (Cater-Steel, Tan & Toleman 2009a), New Zealand (Potgieter, Botha & Lew 2005), China (Zhen & Xin-yu 2007), Malaysia

(Ayat et al. 2009; Kanapathy & Khan 2012), Thailand (Lawkobkit 2008), and Norway (Iden & Eikebrokk 2014; Iden & Langeland 2010).

In 2009 it was estimated that an ITSM framework was being used by around 45 percent of US companies while 15 percent were planning its usage (Winniford, Conger & Erickson-Harris 2009). In 2008, the IT Governance Institute estimated that ITIL had the highest rate of adoption of 24 percent, followed by CobiT with an adoption rate of 14 percent (Marrone & Kolbe 2010). There is little empirical evidence of the possible negative outcomes of ITSM adoption, given the research focus on benefits of the adoption of ITSM. The studies by Gacenga, Cater-Steel and Toleman (2010) acknowledged that this might present a one-sided view of the outcomes of ITSM adoption and that information on costs, challenges and other risks need to be incorporated into any cost-benefit analysis. Organizations have reported that implementing ITIL to improve processes can change IT service management and provide benefits to the business such as improved resource utilization, more timely deliverables, improved communication with IT departments within the organization, a reduction of server errors, elimination of redundant work and a decrease of rework, and the justification of the cost of quality (Cater-Steel, Toleman & Tan 2006). It is clear that many organizations are convinced of the positive impact of ITIL in transforming IT service management.

ITSM frameworks, such as ITIL, are capable of having a positive impact on knowledge transfer in organizations and influence the IT organization’s resources and competences, and eventually lead to improvement of a business’s competitive advantages (Grant 1996). The maturity of ITSM is directly related to the number of realized benefits (Gacenga, Cater-Steel & Toleman 2010; Marrone & Kolbe 2010). However, the benefits listed by Gacenga et al. mainly accrue to IT and not directly to the general business. Previous empirical studies focused on process-specific benefits, and not financial returns (Gacenga, Cater-Steel & Toleman 2010). Research to date has not established the financial return on the investment of ITSM implementations. Investment in ITSM processes requires that the benefits are justified economically, but thus far, there has been little research on quantifying the benefits from ITSM implementation. Customer satisfaction and operational performance improve with the increase in ITIL framework activities. However, many organizations find it difficult to determine the tangible benefits from ITIL adoption (Cater-Steel, Toleman & Tan 2006).

The motivation to adopt ITIL may be due to legal compliance, a cost-saving measure, risk management as a means to effectively satisfy customers (Cater-Steel, Tan & Toleman 2009b).

The systematic map of the literature reviewed for ITSM adoption, implementation, and the outcomes and benefits of ITSM are presented in Table 2-3 (below).

Table 2-3 Systematic map of the literature reviewed for ITSM adoption, implementation, and the outcomes and benefits of ITSM

		ITSM Process Capability		
Researcher/Author	**Source**	**ITSM Adoption**	**ITSM Outcomes and Benefits**	**ITSM Implementation**
Pollard, C., & Cater-Steel, A. (2009)	JA		x	
Marrone, M. (2010)	JA		x	
Marrone, M., & Kolbe, L. M. (2010)	JA		x	
Egeler, M. (2008)	JA		x	
Marrone, M., & Kolbe, L. M. (2011)	JA		x	x
Gacenga, F., Cater-Steel, A., & Toleman, M. (2010)	JA		x	
Wan, S. H. C., & Chan, Y. H. (2008)	JA		x	
Cater-Steel, A. (2009)	JA		x	
Marrone, M., Gacenga, F., Cater-Steel, A., & Kolbe, L. (2014)	JA	x		
Kanapathy, K., & Khan, K. I. (2012)	JA			x
Tan, W.-G., Cater-Steel, A., & Toleman, M. (2009)	JA			x
Iden, J., & Eikebrokk, T. R. (2014)	JA			x
Winniford, M., S. Conger, L. Erickson-Harris. (2009)	JA			x
Suhonen, A., Heikkinen, S., Kurenniemi, M., & Jäntti, M. (2013)	JA			x
Hochstein, A., Tamm, G., & Brenner, W. (2005)	CP		x	
Cater-Steel, A., Toleman, M., & Tan, W.-G. (2006)	CP		x	
Disterer, G. (2012)	CP		x	
Salling Pedersen, A., & Bjørn-Andersen, N. (2011)	CP	x		
Conger, S., Winniford, M., & Erickson-Harris, L. (2008)	CP			x
Coelho, A. M., & Rupino da Cunha, P. (2009)	CP			x
Flores, J., Rusu, L., & Johanneson, P. (2010)	CP			x
Zajac, A., & Soja, P. (2012)	CP			x

de Espindola, R. S., Luciano, E. M., & Audy, J. L. N. (2009)	CP			x
Count		2	11	11

Note. JA=Journal Article; CP=Conference Paper.

2.6.1.2 ITSM Maturity Models

Maturity models describe evolutionary levels of improvement in a specific process, or domain, that organizations go through to become more mature (Mettler 2012). For each level of maturity, maturity models typically provide a general description and formally specify a number of specific characteristics along a set of well-defined attributes (Fraser, Moultrie & Gregory 2002). ITSM maturity can be defined as the extent to which "repeatable patterns of action" are defined, managed, measured, controlled, and effective as a process (Paulk et al. 1993; Wulf, Winkler & Brenner 2015). As maturity models describe both the definition of organizational routines and the performative perspective, they can also be used to describe the level of organizational capability (Paulk et al. 1993).

Process maturity can be rolled-up to a domain level maturity by the use of staged logic (i.e., certain processes need to be in place for a certain domain level), or continuous logic (i.e., the domain-level maturity is reflected in the aggregate levels of process maturity) (Wulf, Winkler & Brenner 2015). Maturity models can distinguish themselves from each other by their specificity of their process prescriptions, as some models define goals and attributes for each ITSM process individually, while others only define generic attributes, which are applicable for all ITSM processes (Wulf, Winkler & Brenner 2015). A third category of maturity models provides a combination of generic and specific process goals and attributes (Wulf, Winkler & Brenner 2015).

One of the most commonly used general purpose process maturity evaluation frameworks is the Capability Maturity Model (CMM) (Mesquida et al. 2012), which was originally designed to measure maturity in the domain of software development (Paulk et al. 1993). CMM is often referred to as the main framework, but its further refined framework, Capability Maturity Model Integration (CMMI) is more frequently used since some of the flaws of the original model have been eliminated in the latter. An extension of CMMI, the Capability Maturity Model Integration for Services (CMMI-SVC) has a specific focus on a set of processes required to manage service provider organizations (CMMI Product Team 2011). COBIT, a framework with a focus on IT governance, defines a generic scale for the assessment of process maturity and further provides control objectives for the individual COBIT processes (ISACA 2012). ISO/IEC 15504 (ISO/IEC 1998), initially referred to as the Software Process Improvement and Capability Determination (SPICE) framework, is an international standard for the assessment of processes. It can be applied for ITSM certification as specified in the ISO/IEC 20000 standard (ISO/IEC 2010). ITIL (OGC 2011a) since version 3 also provides some recommendations on how to assess the maturity of either the individual service management processes or the entire ITSM domain.

In summary, all reviewed maturity models define generic process attributes. The six generic process attributes specified by COBIT 5 (ISACA 2012) are compatible with the CMMI-SVC (CMMI Product Team 2011) and SPICE (ISO/IEC 1998) maturity models and in addition, cover specific goals and work products for ITSM processes.

2.6.1.3 ITSM Process Assessments

Process assessment is described in the literature as a series of steps targeted to compare an organization’s everyday processes with reference processes that comprise typical activities for the process at different capability levels (Barafort & Rousseau 2009b). Process assessments are primarily conducted by organizations to benchmark results against an international standard (Juran & Godfrey 1999). The international standard for process assessment ISO/IEC 15504 suggests that process assessments can be used for process improvement or to determine process capability (ISO/IEC 2005). The primary goal of a process assessment is to provide guidance to improve processes (Shrestha 2015).

Practitioner resources suggest that organizations prefer an easy, cost-effective and timely process assessment mechanism that unveils a realistic indication of process capability (Mainville 2014). This is particularly true for smaller organizations that are undertaking their first experience with assessments (Juran & Godfrey 1999).

The ISO/IEC 15054 standard defines six process capability levels with nine process attributes, as shown in

Table 2-4 (see below).

Table 2-4 ISO/IEC 15504 Process Capability Levels and Process Attributes

Process Capability Level	Process Attribute	Outcome
CL0 - Incomplete process	None	The process is not practiced, or it cannot fulfill its objectives. At this level, the process does not achieve its objectives.
CL1 - Performed process	PA1.1 Process Performance	The process is performed and achieves its objectives.
CL2 - Managed process	PA2.1 Performance Management PA2.2 Work Product Management	The process is managed following a series of activities such as planning, monitoring and adjusting activities. The outcomes are established, controlled and maintained.
CL3 - Established process	PA3.1 Process Definition PA3.2 Process Deployment	The process is formally established following a standard process that is defined and deployed.
CL4 - Predictable process	PA4.1 Process Measurement PA4.2 Process Control	The process is predictable within a defined boundary for measurement and control.
CL5 - Optimizing process	PA5.1 Process Innovation PA5.2 Process Optimization	The process follows continuous optimization journey through innovation and optimization to achieve current and projected business goals.

At a more detailed level, each process attribute consists of one or more generic practices, which are further expanded into indicators that provide criteria to assess process capability in finer detail (ISO/IEC 2004).

The fulfillment of each process attribute is assessed on a four-point achievement continuum (measurement scale): *Not*, *Partially*, *Largely*, *Fully* achieved (N-P-L-F).

Achievement of a given Process Capability level requires the attributes for that level to have been *Fully* or *Largely* achieved – **and** the attributes for all lower levels to be *Fully* achieved. For example, achieving level 1 capability requires Attribute PA 1.1 to be *Fully* or *Largely* achieved. Achieving level 2 requires both PA2.1 **and** PA2.2 to be *Fully* or *Largely* achieved and PA1.1 to be *Fully* achieved. Achieving level 3 requires both PA 3.1 **and** PA3.2 to be *Fully* or *Largely* achieved and PA1.1, 2.1 and 2.2 to be *Fully* achieved, and so on for capability levels 4 and 5. Table 2-5 shows the organization of process attributes into logical levels representing various process capability levels and the requirements to reach a capability level.

Table 2-5 Attribute Ratings and Process Capabilities

Capability Level	Process Attributes	Rating
Capability Level 5 - Optimizing	PA 5.2 Continuous Optimization	**L /F**
	PA 5.1 Process Innovation	**L /F**
	PA 4.1, PA 4.2	**F**
	PA 3.1, PA 3.2	**F**
	PA 2.1, PA 2.2	**F**
	PA 1.1	**F**
Capability Level 4 - Predictable	PA 4.2 Process Control	**L /F**
	PA 4.1 Process Measurement	**L /F**
	PA 3.1, PA 3.2	**F**
	PA 2.1, PA 2.2	**F**
	PA 1.1	**F**
Capability Level 3 - Managed	PA 3.2 Process Deployment	**L /F**
	PA 3.1 Process Definition	**L /F**
	PA 2.1, PA 2.2	**F**
	PA 1.1	**F**
Capability Level 2 - Managed	PA 2.2 Work Product	**L /F**
	PA 2.1 Performance Management	**L /F**
	PA 1.1	**F**
Capability Level 1 - Performed	PA 1.1 Process Performance	**L /F**
Capability Level 0 - Incomplete		

2.6.2 ITSM Performance

2.6.2.1 Critical Success Factors

The evolution of CSF research can be traced back to management literature on "success factors", where, in a broad approach, Daniel (1961) focused on industry-related CSFs that are relevant for any company in a particular industry (Daniel 1961). This focus was later expanded by Anthony, Dearden and Vancil (1972), who emphasized the need to adapt CSFs to both a company's specific strategic objectives and its particular managers (Anthony, Dearden & Vancil 1972).

The literature reviewed provided several definitions of CSF, but using the concepts of Daniel (1961) and Anthony, Dearden and Vancil (1972), Rockart (1979) provides the most frequently cited definition of CSF as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization" (Rockart 1979, p. 85). Consequently, Rockart (1979) stresses that these particular areas of activity should be constantly and carefully managed by a company.

The critical success factor (CSF) method was originally established for an organization's alignment of IT design and strategic direction, to serve as a means for identifying the key elements of an organization's success (Aitken 2003).

Most organizations have a mission that is reflected in a company mission statement and/or an *elevator pitch*. This mission echoes the company's unique values and vision that describes the organization's purpose and direction (Caralli et al. 2004). Attaining this mission involves the contribution and talent of the entire organization, by aligning the goals and objectives of every employee of the organization with the company's mission. (Caralli et al. 2004). However, Caralli et al. (2004) believe that achieving goals and objectives is not enough and that the organization must perform well in strategic areas on a regular basis to achieve the company mission. These key areas that are unique to the organization and the industry in which it competes can be defined as the organization's critical success factors. (Caralli et al. 2004).

Previous research on CSF and ITIL have mainly focused on CSFs for the successful adoption or implementation of ITIL (Cater-Steel & Tan 2005; Cater-Steel, Toleman & Tan 2006; Hochstein, Tamm & Brenner 2005; Iden 2009; Iden & Langeland 2010;

Pedersen et al. 2010; Pollard & Cater-Steel 2009; Tan, Cater-Steel & Toleman 2009). None of these studies use CSFs as a measure of achieving business goals post implementation of ITIL.

2.6.2.2 Key Performance Indicators

Key performance indicators (KPIs), also known as performance assessment indicators, are vital indicators for measuring the effect and outcome of management (Wu & Chen 2012). KPIs "represent a set of measures focusing on the aspects of organizational performance that are most critical for the current and future success of the organization" (Baker 2002, p. 10). KPIs are comprised of quantified indicators that are selected based on the design of an organization, as they can reflect the CSFs of the organization (Kerr 2000). However, irrespective of the type of KPI selected, it must harmonize with organizational goals, be objective and measurable (Kerr 2000).

KPIs are measures of specific organizational values or characteristics used to determine whether an organization's goals and objectives are being achieved. They reflect the CSFs, stakeholder requirements, and the organization's expectations. The organization's goals need to be specific, measurable, attainable, relevant and time-bound (SMART), in order for KPIs and their measures to be effective (Doran 1981).

A performance measure "is composed of a number and a unit of measure" (Birch 2000, p. 5). The number gives us a magnitude (how much) and the unit gives the number a meaning (what) (Birch 2000). Performance measures are always tied to a goal or an objective. KPIs can use both financial and non-financial metrics, expressed as a number, a ratio, a percentage, an index, a composite average or in a statistical context, to measure CSFs (Kerr 2000). A KPI is, therefore, a metric that is linked to a pre-determined target to determine if a CSF is achieved. Most often a KPI represents how far a metric is above or below a pre-determined target (Kerr 2000).

For each CSF there must be one or more associated KPI(s) that provide the measure, and a standard of performance or allowable variance from planned performance (Yang 2009). The key focus of a KPI is on the aspects of organizational performance that require improvement or on the aspects that must be kept within a specified level to ensure the success of the organization (Birch 2000).

A significant reason for using KPIs as metrics in ITSM is to align business goals with IT, to help achieve compliance requirements for business operations and to drive operational implementation of IT strategically (Brooks 2006).

2.6.2.3 Performance Measurement

Performance measurement may be described as "the process of quantifying the efficiency and effectiveness of action" (Neely 2005, p. 1229), and should be considered in the broad sense of a term that "covers both overall economic and operational aspects" (Tangen 2005, p. 40) including measures of productivity, profitability and quality (Belkhamza 2012).

Gacenga (2013) recognized performance measurement challenges at both the organizational level and IS/IT level. The frameworks and metrics identified in his work to address the challenges at organizational level were: SERVQUAL (Parasuraman, Zeithaml & Berry 1985), Sink and Tuttle model (Sink & Tuttle 1989), results and determinants framework (Brignall et al. 1991), balanced scorecard (Kaplan & Norton 1992), performance pyramid (Lynch & Cross 1991) and the performance prism (Neely, Adams & Kennerley 2002). Gacenga's review of the literature on performance measurement at the organizational level and in ITSM studies revealed that the BSC was the most widely adopted framework of measure (Gacenga 2013).

At the IS/IT functional level Gacenga (2013) listed a number of approaches that have been undertaken to overcome the challenges of performance measurement, for example: IS success (Delone & McLean 2003), IS productivity (Dedrick, Gurbaxani & Kraemer 2003; Weill 1992), IS quality (Chang & King 2005; Pitt, Watson & Kavan 1995), IS effectiveness (Scott 1995; Seddon, Graeser & Willcocks 2002) and IS performance (Marchand & Raymond 2008; Saunders, C & Jones 1992; Son, Weitzel & Laurent 2005; Van der Zee & de Jong 1999). Gacenga's review of the IS/IT performance literature conclude that the "BSC is useful at the IS level, and the IS BSC can be used to link the IS level with the BSC at the organizational level" (Gacenga 2013, p. 31).

ITSM performance measurement is gaining interest (Belkhamza 2012), with recent studies and publications investigating ITIL performance metrics (Barafort et al. 2005; Brooks 2006; Steinberg 2013; Van Grembergen, De Haes & Amelinckx 2003), IT service performance and quality measures (Hochstein, Zarnekow & Brenner 2004; Praeg & Schnabel 2006), business value of ITIL (Diao & Bhattacharya 2008; Moura et al. 2006; Šimková & Basl 2006), ITIL process capability and maturity assessment (Valdés et al. 2009), software for measuring ITIL process performance (Jäntti, Lahtela & Kaukola 2010) and evaluation frameworks for ITIL (McNaughton, Ray & Lewis 2010). Despite this recent research, there is no evidence of studies that associate ITSM process capability, process performance, and business financial performance. The current research project is motivated to contribute to this gap in the literature.

The systematic map of the literature reviewed for ITSM process performance is presented in Table 2-6 (below).

Table 2-6 Systematic map of the literature reviewed for ITSM process performance

		ITSM Process Performance				
Researcher/Author	**Source**	**ITSM Performance Measurement**	**ITSM Capability Assessment**	**CSFs/KPIs**	**KISMET**	**ITSM Process Improvement**
Gacenga, F., Cater-Steel, A., & Toleman, M. (2010)	JA	x				
Lepmets, M., Cater-Steel, A., Gacenga, F., & Ras, E. (2012)	JA	x				
Lepmets, M., Mesquida, A. L., Cater-Steel, A., Mas, A., & Ras, E. (2014)	JA		x			
Shrestha, A., Cater-Steel, A., & Toleman, M. (2016)	JA		x			
Marrone, M., & Kolbe, L. M. (2011)	JA			x		
Pollard, C., & Cater-Steel, A. (2009)	JA			x		
Iden, J., L. Langeland. (2010)	JA			x		
Kanapathy, K., & Khan, K. I. (2012)	JA			x		
McBride, N. (2009)	JA			x		
Cater-Steel, A. (2009)	JA			x		
Tan, W. G., A. Cater-Steel, M. Toleman. (2009)	JA			x		
Gacenga, F., Cater-Steel, A., & Toleman, M. (2010)	JA			x		
Wan, J., & Wan, D. (2011)	JA			x		
Hochstein, A., Tamm, G., & Brenner, W. (2005)	JA			x		
Cater-Steel, A., Tan, W. G., & Toleman, M. (2006)	JA			x		
Jäntti, M., Cater-Steel, A., & Shrestha, A. (2012)	JA				x	
Suhonen, A., Heikkinen, S., Kurenniemi, M., & Jäntti, M. (2013)	JA				x	
Walker, A., & Lok, H. (1995)	JA		x			

		ITSM Process Performance				
Researcher/Author	**Source**	**ITSM Performance Measurement**	**ITSM Capability Assessment**	**CSFs/KPIs**	**KISMET**	**ITSM Process Improvement**
Paulk, M. C., Weber, C. V., Garcia, S. M., Chrissis, M. B. C., & Bush, M. (1993)	JA		x			
Mesquida, A., Mas, A., Amengual, E., & Calvo-Manzano, J. (2012)	JA		x			
Barafort, B., & Rousseau, A. (2009)	CP		x			
Fraser, P., Moultrie, J., & Gregory, M. (2002)	CP		x			
Mohammed, T. (2008)	CP			x		
Gacenga, F., Cater-Steel, A., Tan, W., & Toleman, M. (2011)	CP	x	x			
Wulf, J., Winkler, T. J., & Brenner, W. (2015)	CP		x			
Göbel, H., Cronholm, S., & Seigerroth, U. (2013)	CP		x			
Conger, S., Winniford, M., & Erickson-Harris, L. (2008)	CP			x		
Cater-Steel, A., & McBride, N. (2007)	CP			x		
Heikkinen, S., Suhonen, A., Kurenniemi, M., & Jäntti, M. (2013)	CP				x	
Jäntti, M., Rout, T., Wen, L., Heikkinen, S., & Cater-Steel, A. (2013)	CP				x	x
Jäntti, M., & Niskala, J. (2014)	CP				x	
Lahtela, A., Jäntti, M. (2014)	CP				x	
Jäntti, M., Kurenniemi, M. (2013)	CP				x	
Mettler, T. (2012)	B		x			
Juran, J., & Godfrey, A. (1999)	B		x			
Shrestha, A. (2015)	T		x			
Mainville, D. (2014)	IR		x			
Count		3	14	14	7	1

Note. JA=Journal Article; CP=Conference Paper; B=Book; IR=Industry Resource.

2.6.3 Business Performance

2.6.3.1 Financial Measurement

Financial measurement methods can be broadly classified as accounting measurements or market measurements (Dehning & Richardson 2002). Accounting measurements include metrics such as return on assets (ROA), return on investment (ROI), return on equity (ROE), and return on sales (ROS). Market measurements comprise metrics on stock market returns, such as Tobin's q (market value/asset value), and shareholder value (Dehning & Richardson 2002). Dehning and Richardson (2002) focused on providing accounting researchers with a framework to guide future research in the evaluation of returns of investments in IT.

Figure 2-5 shows the general framework provided by Dehning and Richardson (2002) for further analysis of this research domain.

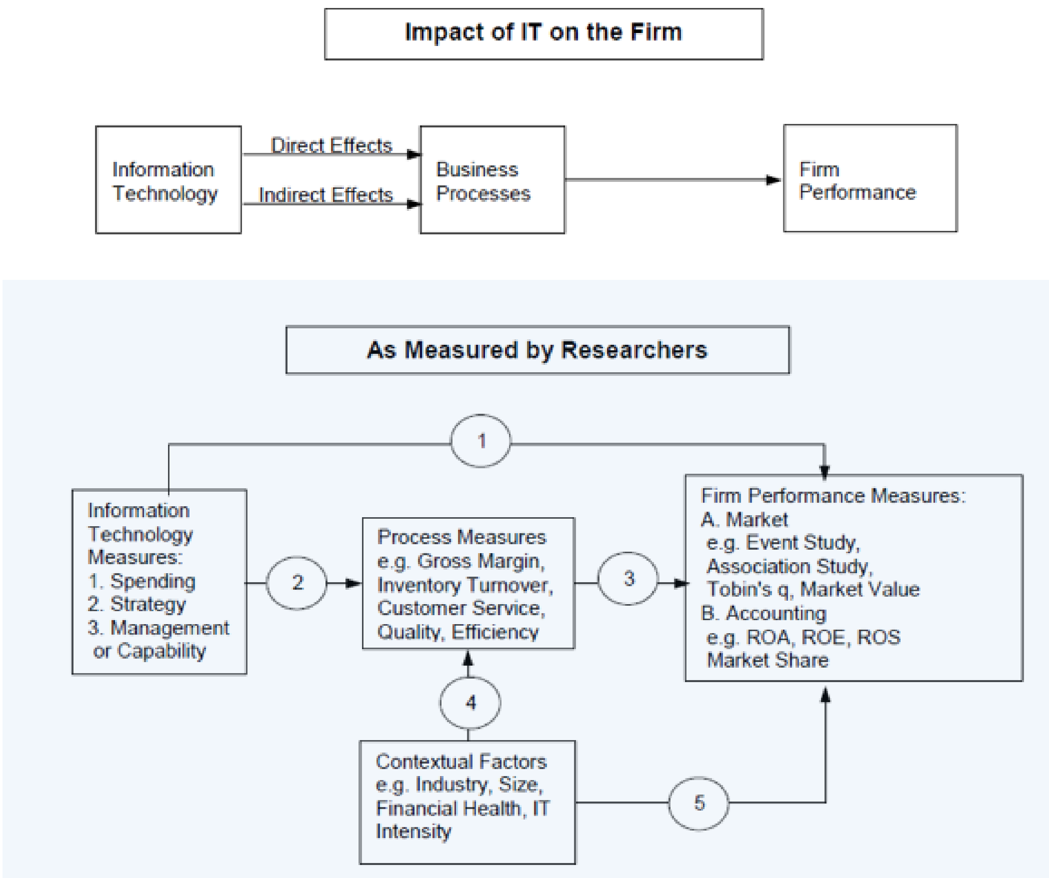

Figure 2-5 Framework for Evaluating Research on the Benefits of IT Investments (Dehning & Richardson 2002)

The top section of Figure 2-5 shows that both the direct and indirect effects of IT on business processes determine the overall performance of the firm. IT has a direct and/or indirect effect on business processes, that determine the overall performance of the firm (Dehning & Richardson 2002). Improving inventory management to reduce inventory levels, inventory holding costs, waste, and spoilage is an example of a direct effect of IT, while improving decision making utilizing information from a new IS that was unavailable in a previous IS, is an example of an indirect effect of IT on business processes (Dehning & Richardson 2002).

The lower shaded section of Figure 2-5 shows how researchers have measured IT, business process/firm performance (Dehning & Richardson 2002). Previous researchers have largely examined investments in IT in three ways: differences in the amount of money spent on IT (IT spending), the type of IT purchased (IT strategy), and how IT assets are managed (IT management/capability) (Dehning & Richardson 2002).

The framework presents three paths between IT and firm performance. Path 1 bypasses the effect of IT on business process, representing a direct link between IT and the firm's overall performance (Dehning & Richardson 2002). In this line of research, studies have measured a firm's performance using Market measures or Accounting measures (Dehning & Richardson 2002). Path 2 of the framework describes the relation between IT and business process performance, with Business process performance measures (Dehning & Richardson 2002). Path 3 shows how these process measures integrate to determine overall firm performance (Dehning & Richardson 2002).

The link between IT and performance depends on other factors, which are referred to as Contextual Factors in the framework (Dehning & Richardson 2002). Path 4 of the framework presents the Contextual Factors that link business processes and firm performance measures (Dehning & Richardson 2002). As shown in Figure 2-5, these Contextual Factors affect business processes through Path 4 and overall firm performance through Path 5 (Dehning & Richardson 2002).

In a case study research of three organizations that aimed to identify the effects of business process redesign (BPR) projects, organizational and process level measurements were examined by Kohli and Hoadley (2006). Organizational level measurements were identified as customer value, efficiency, and profitability, while process oriented measurements comprised labor costs, cycle time, efficiency, administrative expenses, responsiveness, resource usage, reporting, throughput, and effectiveness (Kohli & Hoadley 2006).

The total cost of ownership (TCO) and real option valuation (ROV) was proposed by Lei and Rawles (2003). Three primary categories of TCO costs were identified as acquisition cost, control costs, and operation costs. Acquisition costs consist of the hardware and software costs. Control costs include centralization and standardization costs. Operation costs are made up of support, evaluation, installation, upgrade, training, downtime, audit, and documentation costs. 'Real option valuation' considers the options to defer, expand, contract, abandon, switch use, or alter a capital investment (Lei & Rawles 2003). Although Lei and Rawles (2003) focused on using TCO and ROV to address IT investment evaluation problems, they considered the acquisition, control and operation costs in the development of the measurement model.

Identifying the related cost and time in business processes associated with ITSM processes could assist in measuring the financial impact of ITSM processes and business performance. The measurement process should be run as a project to gather data within a period or apply a simulation model to generate the necessary measurement data related to ITIL service management processes (Tiong, Cater-Steel & Tan 2009).

The literature on financial measurements in ITSM focused mainly on accounting measures related to costs of ITSM implementation. There is a need to address the issue that scarce academic research has been conducted on the potential impact of ITSM processes to improve business performance and ultimately financial profitability (Gacenga, Cater-Steel & Toleman 2010).

2.6.3.2 Business Risks

Increasingly, risk management is viewed as a business driver, especially after the implementation of the Sarbanes-Oxley Act, Basel II, and other more recent regulations. Stakeholders have become much more concerned about risk, and organizations are increasingly seeking a comprehensive risk control culture. Many are looking to Governance, Risk Management and Compliance (GRC) frameworks and processes to effect improvement (Racz et al. 2010). The global financial crisis in 2008 unveiled the importance of risk management. New risk management standards have been published since then, including the international standard, ISO 31000 'Risk management – Principles and guidelines' (ISO 2009).

The acronym GRC was first established in 2004 (Coopers 2004), and the popular validated scientific definition is "GRC is an integrated, holistic approach to organization-wide governance, risk, and compliance ensuring that an organization acts ethically correct and in accordance with its risk appetite, internal policies, and external regulations through the alignment of strategy, processes, technology, and people, thereby improving efficiency and effectiveness" (Racz et al. 2010, p. 107).

Governance supports appropriate management decision-making by ensuring that the information provided to executives is complete, accurate and timely, that controls are in place to validate executive strategies and that executive directions are carried out ethically and effectively (Tarantino 2008). Risk management identifies, analyses, and addresses risks that can negatively affect the organization's strategy and ability to operate (Moeller 2011). Identified risks can be managed by mitigation, avoidance, acceptance or risk sharing methods (Moeller 2011). Compliance addresses the consistency in which the organization adheres to applicable regulations, laws, policies, contracts, values, and strategies (Tarantino 2008).

There are a vast number of risks that may be identified, thus dealing with them may seem overwhelming, but Enterprise Risk Management (ERM) can help better manage risks by categorizing various risks into groups such as strategic, financial, operational, hazard, external, internal, controllable, uncontrollable, financial, nonfinancial, insurable and non-insurable (Sadgrove 2016).

To link risk performance to business performance, Sadgrove (2016) proposed an alternative risk categorization:

1. Price risk. The risk that an increasing product or service offering supply or an aggressive price reduction from competitors will force lower prices and consequently lower profits.

2. Market risk. The risk that customer preferences and demand might quickly change.

3. Credit risk. The risk of not meeting obligations, such as an entity that fails to settle a legal obligation;

4. Operational risk. The risk of loss caused by inadequate or failed internal processes, people, and technology, or from external events;

5. Strategic risk. The risk of poor performance resulting from poor strategy choices and implementation.

6. Legal risk. This can be a mixture of risks. There is the financial risk that banks refer to as liquidity risk from insufficient net positive cash flow or from exhausted capital equity-raising or cash-borrowing capability. There is also a risk from litigation (e.g., in financial services, a lawsuit for losses due to poor financial advice) and from compliance violations carrying regulatory authority penalties.

Specifically, in relation to ITSM, Steinberg (2013) proposed a similar categorization of risks using the BSC as a guide:

- Operational – how well the IT organization is delivering services on a daily basis;
- Capabilities – the capability of the IT organization to meet business needs;
- Regulatory – how well the IT organization is operating in a manner that protects it against regulatory risk for fines, penalties and audit issues;
- Financial – how well the IT organization is managing and controlling costs as well as protecting and enhancing revenue;
- Customer – the customer view of the services being delivered (Steinberg 2013, pp. 25-7).

2.6.3.3 Environmental Scanning

Environmental scanning entails the collection and use of information on events, trends, and relationships in an organization's external environment (Choo & Auster 1993). The knowledge gained from an environmental scan would support management decisions in planning the organization's future course of action (Choo 2001). Organizations scan the environment to understand the external forces of change better so that they may develop effective responses in order to circumvent surprises, gain competitive advantage, identify threats and opportunities, mitigate risks, and improve long-term and short-term planning (Sutton 1988).

The first notable study in the field of environmental scanning was performed by Aguilar (1967). In his study, Aguilar refers to environmental scanning as:

“scanning for information about events and relationships in a company's outside environment, the knowledge of which would assist top management in its task of charting the company's future course of action” (Aguilar 1967, p. vii).

A similar perspective is shared by the majority of authors in this field, with agreement that the main functions of environmental scanning are: to learn about events and trends in the external environment; to establish relationships between them; to make sense of the data; and to extract the main implications for decision making and strategy development (Daft, Sormunen & Parks 1988; Fahey & King 1977; Keegan 1974; Kefalas & Schoderbek 1973; Lenz & Engledow 1986; Stubbart 1982; Thomas, PS 1974).

The components most commonly referred to as comprising environmental scanning are political, economic, social, and technological elements, well known as “PEST analysis” (Aaker & Adler 1984; Fahey & Narayanan 1986; Johnson, G, Scholes & Whittington 2011). An extension of the PEST analysis is the PESTLE or PESTEL analysis that includes the two additional macroeconomic factors of Legal and Environmental conditions (Ho 2014).

Company X is a foreign exchange service provider that is subject to the external macroeconomic factors of the FX market. The Forex market is a truly global marketplace with trillions of dollars of trades executed every day by buyers and sellers from all over the globe (Bank of International Settlements 2016). The fact that foreign exchange trading has become such a globalized activity means that the external environment plays an even greater role in forex than ever before. In the context of this research and the case study organization, the review of the literature on the external factors that may affect Company X follows.

a) Political Conditions

Political instability and government changes influence exchange rates. Political turmoil and volatility can have a negative impact on a nation's economy (Blomberg & Hess 1997).

Elections are events that occur in almost every democratic nation. They can pose a large impact on the local currency. Frequent elections generally suggest political instability to traders and analysts and normally stimulates higher volatility in the local currency (Persson & Tabellini 1990). The value of a currency is affected if a country's government is changed, due to beliefs in changes of ideology and proposed monetary or fiscal policies. Unexpected elections, generally due to corruption scandals or a non-confidence vote, have the potential to cause chaos in the forex market (Rogoff 1996). For example, chaos among citizens of a country may lead to civil conflict that may, in turn, lead to higher political instability and economic uncertainty.

The impact of war is wide-scaled causing infrastructure damage that stifles a nation's short-term economic sustainability, which could cost governments as well as citizens billions (Singh & Jun 1995). A major part of these funds needs to be borrowed. An economy emaciated by war usually needs to be recovered with the aid of low-cost capital, such as lower interest rates, that inevitably leads to the depreciation of the local currency (Globerman et al. 2002). However, a war also provides potential advantages, such as boosting a struggling economy, especially the manufacturing industry, if it is involved to use its available resources on wartime production (Bennett & Green 1972).

The physical stability of a country, that is, the absence of war, conflict, social or political upheaval, will affect the desirability and strength of its currency. The major currencies belong to countries with political stability. Instability drives up demand for US dollars as a safe haven investment.

b) Economic Factors

Economic factors include economic policy, distributed by governments and/or central banks and economic conditions, generally exposed through economic reports, and other economic indicators (Layton, Robinson & Tucker 2009).

Economic policy encompasses government fiscal policy, that is, budget or spending practices and monetary policy which is the means by which a government's central bank influences the supply and "cost" of money (Layton, Robinson & Tucker 2009).

The widening of a nation's government budget deficit or surpluses usually causes the market to respond negatively, while the narrowing of budget deficits cause the market to react positively, and the impact is revealed in the value of a nation's currency (Balladur 1999).

High levels of inflation typically cause a currency to lose value. High inflation usually has a negative impact on currency because it decreases purchasing power (Balladur 1999). The demand for currency will strengthen if there is an expectation that short-term interest rates will rise to balance inflation.

Gross Domestic Product (GDP), employment levels, Consumer Price Index (CPI), industrial production reports, and retail sales are indicators of a robust economy (Layton, Robinson & Tucker 2009). The healthier the outlook for a country is, the stronger the desirability of their currency will be. In addition, when stocks and bonds are offered with high rates of return the country's currency demand will increase.

c) Social Environment

Illegal activity or fraud is the biggest risk for the retail forex trader (Cheung & Chinn 2001). Fraudulent activities include, but are not limited to, excessive commissions by brokers, caused by customer account "churning", high-pressure "boiler room" campaigns, misrepresentation, and lucrative Ponzi schemes (Cheung & Chinn 2001). There has been an increase in foreign currency fraud over the last few years. In particular, retail forex traders have been victim to fraud (National Futures Association 2016).

The psychology of the market and the sensitivities of traders impact the foreign exchange market in diverse ways (Payne 2003). Disturbing international events can lead to a "flight to quality", where assets are moved to an alleged "safe haven". Currencies will be in greater demand with higher pricing if perceived as stronger over their weaker counterparts (Acharya & Pedersen 2005; Vayanos 2004). Traditional safe havens during economic uncertainty, include gold, the U.S. Dollar and Swiss Franc (Acharya & Pedersen 2005).

The old finance market maxim "Buy the rumor, sell the fact" (Kadan, Michaely & Moulton 2014), is applicable to the forex market. The maxim is the shift of a currency price based on the news before the actual event, and an opposite reaction after the occurrence of the event or action. This is often referred to as the market being "oversold" or "overbought", where investors center too much on the importance of external events to forex rates (Cohen, L & Frazzini 2008), a cognitive bias known as anchoring (Kahneman, D, Slovic & Tversky 1982).

The factors in exchange rate movements are either speculative forces, over-reaction to news or bandwagon effects (Cheung & Chinn 1999). The bandwagon effect is a psychological phenomenon in which people do something primarily because other people are doing it, regardless of their own beliefs, which they may ignore or override (Lai & Pauly 1992). The bandwagon effect has wide implications and often happens by looking at trading recommendations of other people (Lai & Pauly 1992).

d) Technological Environment

Technological factors that have an impact on the forex industry include technology infrastructure, such as the internet, software, and hardware. Technology has molded a society that expects real-time results (Mullineux 2003).

Technological revolution, specifically the internet, has transformed the forex trading industry by lowering costs, improving latency, and providing real-time access to news and research (Economides 2001). The rate at which information is exchanged is of paramount importance in the forex trading world as the lower the latency of information, the faster the reaction times of market participants (Lyons 2002).

It has been argued by Mullineux (2003) that when analyzing the technological environment as part of a PESTEL analysis, that there is often an affinity to focus on technological advances in digital and internet-related areas, but it should also focus on new approaches in manufacturing, materials advancements, and logistics.

Mullineux (2003) acknowledged that technology is in constant flux, and as much as it has greatly expanded the Forex market, any company that wants to maintain its market edge must constantly be on the forefront of development.

e) Environmental Factors

Natural disasters have a catastrophic effect on the value of currencies. The infrastructure and morale of a country can be severely harmed by natural disasters such as earthquakes, tornadoes, floods, and hurricanes (Benson & Clay 2004).

A nation's economic output can be severely limited by basic infrastructure damage. The superfluous costs associated with the clean-up and rebuilding after a disaster, affect government and private spending (Cavallo et al. 2013). The economic uncertainty can lead to a decrease in consumer spending and loss of consumer confidence (Fengler, Ihsan & Kaiser 2008).

Significant man-made disasters including nuclear, chemical plant and oil-rig explosions; mining accidents; nuclear and terrorist bombings could unfavorably affect the market's economic and sentiment analysis for the nation, and therefore cause a fall in the value of that nation's currency (Barro 2009).

In 2011, the Triple Calamity in Japan in 2011 (an earthquake, a tsunami, and a nuclear disaster), which delivered a brutal strike on the local economy and also influenced global economy, is an example that proves what is stated above.

f) Legal Environment

The forex marketplace is mainly self-regulatory. Forex is an inter-bank market, where international banks make trades with each other at a rate that they decide upon (Dale 1994).

The forex trading industry was unregulated before 2008. In 2008, the US government appointed the Commodity Futures Trading Commission (CFTC) as the agency responsible for regulating the forex industry, as it made the most sense because currencies are considered commodities. At the same time, the National Futures Association (NFA) became the policing institution of the forex industry. Regulation to control volatility in the industry and limit the losses to investors was passed in 2009 by the CFTC (Rex 2013).

The rampant growth of retail forex trading has led to increased regulation by the CFTC. The CFTC has jurisdiction (under the US Commodity Exchange Act), overleveraged forex transactions provided to retail investors in the United States (Moran 1990). Retail customers are protected by the Act, as it only authorizes regulated entities to act as counterparties for retail forex transactions, and it enforces that all online forex dealers to the stringent financial standards enforced by the NFA (Kapstein 1992).

The institutional forex sector also needs regulation, as these currency markets are loosely regulated by local central banks and pose added risks to the retail investor. Regulation of the institutional forex market can help improve on information asymmetry and curb high currency volatility (Porter & Williams 2016). The regulation of the retail forex market may have controlled incidents of fraudulent activity in that sector, but non-regulation of the institutional forex market contributes significantly to retail forex investors not being able to win in the market.

The systematic map of the literature reviewed for business performance is presented in Table 2-7.

Table 2-7 Systematic map of the literature reviewed for business performance

		Business Performance	
Researcher/Author	**Source**	**Business Metrics**	**ITSM Financial Measurement**
Smith, H. A., McKeen, J. D., & Street, C. (2004)	JA	x	
Gacenga, F., Cater-Steel, A., & Toleman, M. (2010)	JA		x
Dehning, B., & Richardson, V. J. (2002)	JA		x
Kohli, R., & Hoadley, E. (2006)	JA		x
Tiong, C., Cater-Steel, A., & Tan, W.-G. (2009)	JA		x
Lei, K., & Rawles, P. T. (2003)	CP		x
Racz, N., Panitz, J. C., Amberg, M., Weippl, E., & Seufert, A. (2010)	CP	x	
Tarantino, A. (2008)	B	x	

Researcher/Author	Source	Business Performance: Business Metrics	Business Performance: ITSM Financial Measurement
Moeller, R. R. (2011)	B	x	
Sadgrove, K. (2016)	B	x	
Steinberg, R. A. (2013)	B	x	
Coopers, P. (2004)	IR	x	
Count		7	5

Note. JA=Journal Article; CP=Conference Paper; B=Book; IR=Industry Resource.

2.7 Chapter Summary

By dichotomizing the research topic into IT and the Business in Chapter 1, the literature review followed a structured method, using a top-down approach to examine the literature to logically synthesize studies around the underpinning Agency Theory. Relationships across the lower level focus areas were identified and confirmed.

Previous empirical studies on ITSM adoption, implementation, and benefits focused on process-specific benefits, and not financial benefits. Investment in ITSM processes requires that the benefits are justified economically, but thus far, there has been little research on quantifying the financial benefits from ITSM implementation.

The literature on ITSM process assessments confirms that the primary goal of a process assessment is to provide guidance to improve processes. The international standard for process assessment ISO/IEC 15504 suggests that process assessments can be used for process improvement or to determine process capability. Practitioner resources suggest that organizations favor an easy, cost-effective and timely process assessment instrument that exposes an accurate indication of process capability.

Previous research on CSF and ITIL have mainly focused on CSFs for the successful adoption or implementation of ITIL, while none of these studies use CSFs as a measure of achieving business goals post implementation of ITIL. The literature showed that an important goal for using KPIs as metrics in ITSM is to foster business-IT alignment, to help achieve compliance requirements for business operations and to drive operational implementation of IT strategically.

Research in ITSM performance measurement is gaining interest with recent studies and publications examining ITIL performance metrics, IT service performance and quality measures, business value of ITIL, ITIL process capability and maturity assessment, software for measuring ITIL process performance, and evaluation frameworks for ITIL. Despite this recent research, there is no evidence of studies that associate ITSM process capability, process performance, and business financial performance.

The literature on financial measurements in ITSM focused mainly on accounting measures related to costs of ITSM implementations. There is a need to address the issue that scarce academic research has been conducted on the potential impact of ITSM processes to improve business performance and ultimately financial profitability.

The literature review revealed that there is a lack of theoretical and practical knowledge around the development and use of a method and model to examine the association of ITSM process capability and process performance with financial performance. Furthermore, to date, there is no empirical evidence of applying a pragmatic academic method and model as an ITSM process improvement tool.

The next chapter presents the research action plan as it relates to the research philosophy, design, methods, and approach.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

Chapter 2 presented the theoretical foundation of this study, provided the context of the research problem and demonstrated the need for the research. Chapter 2 also revealed the existing gaps in academic research on links between ITSM process maturity and business performance. The literature review demonstrated that there is little academic research on the association of ITSM Process Capability and Process Performance with Business Performance.

The aim of this chapter is to explain the research action plan as it relates to the research philosophy, design, methods, and approach. Figure 3-1 illustrates an overview of Chapter 3.

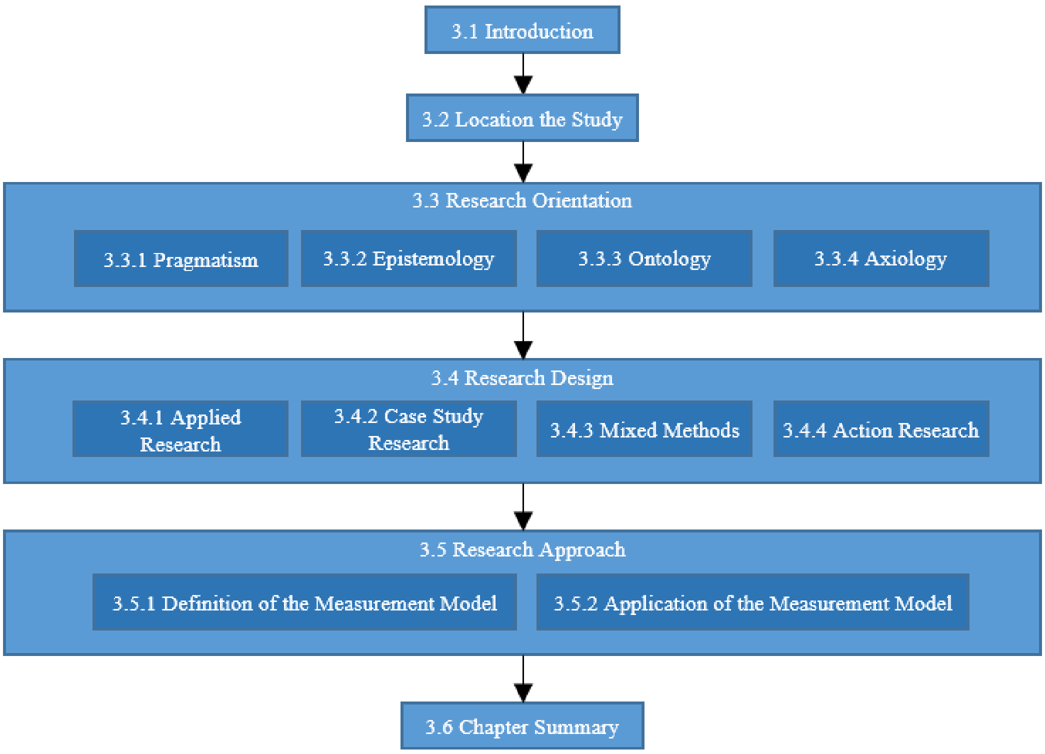

Figure 3-1 Overview of Chapter 3

Chapter 3 comprises six sections. *Section 3.1* provides an introduction to the chapter. *Section 3.2* presents the researcher's philosophical worldview, followed by a detailed description of the research orientation in *section 3.3*. Ethical considerations, trustworthiness, and validity are discussed in *§3.3.3.* A description of the research design is provided in *section 3.4*, followed by the overall research approach in *section 3.5*. *Section 3.5* also details the definition and the application of the measurement framework. Finally, *section 3.6* provides a summary and conclusion to this chapter.

3.2 Philosophical Worldview

In any research investigation, it is imperative that researchers are explicit about their own views and assumptions (Schuh & Barab 2007). When researchers engage in inquiry, they bring with them their own individual beliefs about knowledge, such as what constitutes knowledge, what is intelligible and how we obtain knowledge (Carter & New 2005). This is our paradigm, defined as the "basic belief system or worldview that guides the investigator" (Guba & Lincoln 1994, p. 105). Although the paradigm is the grounding that researchers work from, the researcher needs to critically comprehend, make clear choices about, and be able to communicate one's worldview to the reader (Schuh & Barab 2007). The adoption of a research paradigm can be as inimitable as the researcher adopting the paradigm (Schuh & Barab 2007).

Research methodology is a philosophical position or worldview that underpins and informs the research style (Sapsford & Jupp 2006). Another interpretation of research methodology is that it is the all-encompassing approach to the research design process including theoretical grounding, data collection, and analysis (Creswell 2009). It could, therefore, be inferred that the philosophical worldview of things is essential to the meaning of research methodology. Research philosophy is concerned with the way in which things are viewed in the world (Saunders, M, Lewis & Thornhill 2012; Yin 2009) and addresses the assumptions that underpin the research strategy and the methods selected as part of a research paradigm. Research philosophies are steered by different sets of assumptions which could be ontological, axiological or epistemological, that influence the way in which the research process is identified (Saunders, M, Lewis & Thornhill 2012). Many researchers choose to recognize these multifaceted philosophical perspectives within the context of the two main traditions of research inquiry, quantitative and qualitative research methods (Creswell 2009; Saunders, M, Lewis & Thornhill 2012). From the above, it appears that these research methods cannot be understood in isolation from the researcher's stance of research philosophy. The three major facets of thinking about research philosophy and the suppositions as suggested by Creswell (2009), Yin (2009) and Saunders, M, Lewis and Thornhill (2012) were considered in this research project.

3.2.1 Pragmatism

Pragmatism concerns thinking that choosing between one position (epistemology, ontology, or axiology) or another is impractical in reality; and that the research questions form the basis of which position to assume (Clark & Creswell 2011; Saunders, M, Lewis & Thornhill 2012).

Three types of pragmatism that are important for IT research are functional pragmatism (knowledge for action), referential pragmatism (knowledge about action), and methodological pragmatism (knowledge through action) (Goldkuhl 2008a).

Methodological pragmatism is appropriate for this study as it involves more than just observation for empirical data capture. Methodological pragmatism is based on learning about the world through action (Kolb 2014). This type of pragmatism builds on the idea of a planned intervention in the world to obtain knowledge as described by Dewey (1938) through his notion of inquiry, to specifically apply and test different approaches and policies. Dewey's original notion of inquiry inspired approaches, e.g. action science (Argyris, Putnam & McLain Smith 1985), development action inquiry (Torbert 1999), pragmatic-systemic inquiry (Cronen 2001), practical inquiry (Goldkuhl 2008a; Stevenson 2005) and pragmatic inquiry (Metcalfe 2008). A key notion of inquiry is thus to construct knowledge in the interest of change and improvement. Pragmatism is concerned with an influential view of knowledge; that it is used in action for making a focused difference in practice. This study is concerned with identifying changes to ITSM processes for improvement.

Action research adopts methodological pragmatism, however, one fundamental issue in action research is the contribution to local practice (Goldkuhl 2008b). Pragmatic research can be performed through action research (Baskerville & Myers 2004). In such cases, there is a direct impact on engaged local practices. Pragmatist research knowledge should also be valuable for practices external to the research ones (Goldkuhl 2008a; Mathiassen 2002). It is vital to create knowledge and take actions to enable knowledge transfer and knowledge use outside local practices. The role of local intervention in pragmatism is that it is meaningful as a local improvement, but more importantly, it is instrumental in creating knowledge that may be useful for local as well as general practices (Goldkuhl 2012).

Pragmatism concerns itself with taking action and implementing change and the relationship between knowledge obtained and action, making it suitable as a foundation for research approaches that intervene in the world and not merely observe from the outside. Pragmatism is an appropriate philosophy for this study because the research involves intervention for organizational change (as in action research). The emergent interest in action research and design research (Cole et al. 2005; Iivari & Venable 2009; Järvinen 2007) makes it important to investigate pragmatism as a potential paradigmatic base for exploring the impact of ITSM process maturity on business performance.

The next section details the research orientation in terms of epistemology, ontology, and axiology.

3.3 Research Orientation

Three sets of philosophical beliefs guide the choices regarding the research process: ontology (reality), epistemology (knowledge), and axiology (ethics) (Creswell 2009; Saunders, M, Lewis & Thornhill 2012; Yin 2009). These three sets of belief systems are described and presented in relation to the conceptual and methodological concerns of this study.

3.3.1 Epistemology

There are three epistemological orientations: research targeting explanation and prediction; studies involving interpretation and understanding; and research seeking intervention and change (Braa & Vidgen 1999). The first orientation positions itself within positivism while the second within interpretivism. The third approach does not have an apparent reference to a matching school of thought. Braa and Vidgen (1999) referred to action research as an alternative for this epistemological orientation; they discuss action and change-oriented research without explicitly locating it within a pragmatic paradigm.

Action case research, proposed by Braa and Vidgen (1999) combines interpretive and interventionary research. The link between change and interpretation has also been identified by other scholars (Baskerville & Pries-Heje 1999). Action research (Baskerville & Pries-Heje 1999) and variations such as action case research (Braa & Vidgen 1999), grounded action research (Baskerville & Pries-Heje 1999) and dialogical action research (Mårtensson & Lee 2004) all seem to include qualitative, interpretive and pragmatist research orientations.

This research aligns well with the third epistemological orientation, intervention, and change, as it involves intervention for organizational change. Changes to improve ITSM processes are implemented, and ad hoc, as well as planned interventions, are applied, as described in Chapter 4. The research also involves change and interpretation.

3.3.2 Ontology

Actions and changes are at the core of a pragmatist ontology where social beings act in a world of constant change (Blumer 1969). The "essence of society lies in an ongoing process of action, not in a posited structure of relations" (Blumer 1969, p. 71). Actions through guidance of purpose and knowledge are a way to change existence, and therefore of critical importance in pragmatism. Goldkuhl (2012) posits that reason and action change the world and that there is "an inseparable link between human knowing and human action" (Goldkuhl 2012, p. 7).

Dewey defined the concept of inquiry as "the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituents, distinctions and relations as to convert the elements of original situation into a unified whole" (1938, p. 108). This notion of inquiry is core to the belief system in pragmatic research. Inquiry is perceived "as a natural part of life aimed at improving our condition by adaptation accommodations in the world" (Cronen 2001, p. 14), meaning that inquiry is an exploration into some part of reality that drives the creation of knowledge for an organized change of this part of the reality.

This research is an exploration of a continually changing real-world situation that involves reasoning, creating knowledge and change to improve the situation.

3.3.3 Axiology

This study considers the axiological features of ethics, values and trustworthiness to address the issue of academic rigor in the research process.

Unlike with quantitative methods, where rigor is commonly taken for granted, Lincoln and Guba (1985) explained that qualitative research requires a different approach to rigor, referred to as *trustworthiness.* This refers to the level to which a reader can attain confidence in the integrity, value, and worthwhileness of a qualitative study (Behari-Leak 2015). This study uses a number of approaches to heighten transparency and rigor and trustworthiness.

The combination of multiple methods and perspectives in a single study adds rigor, breadth, and depth to any investigation (Denzin 2005). Data is solicited from various sources as a means of cross-checking and to make the data *trustworthy* and *worthwhile*. The different sources include different participants, different methods, and evidence of previous research studies in ITSM.

Validity is ensured by a series of evidence (Yin 2003) to reinforce relations between data and explanations offered. This study provides a chain of evidence to make all the steps followed in the analysis process transparent and explicit. The validity concerns in this study around the data generation and analysis are addressed through the linking of the data, findings and research questions.

An issue with a case study approach is that the researcher may not be seen as an *objective and neutral observer* if the researcher is professionally involved with the case organization and academically embedded in ITSM. This study should not be seen as being compromised by the participation of the researcher as the approaches to ensure rigor discussed above are executed and upheld to counteract this. Given each researcher's individual and unique perceptions and interpretations of phenomena, research is essentially biased to begin with, so there is no point in trying to "establish validity" in any external or objective sense (Trochim & Donnelly 2007). Academic rigor is applied to minimize the impact of any conscious or unconscious researcher bias.

3.3.3.1 Research Ethics Considerations

To meet the ethical requirements of this study, consent was first obtained from the CEO of Company X for approval to use the site as the case study, and then directly from the participants. For the purposes of the practical research, permission was granted by Company X to survey and interview staff for this project (see Appendix B.2). Permission was also granted by the case organization to access internal systems for data, documents, and archival records. Research data collection was undertaken after ethics clearance was obtained from the USQ Human Research Ethics Committee, on 23 October 2015 (Appendix B.1). The research aims were described to participants; it was explained that the scope of participation was voluntary, and not binding; and that the use of pseudonyms protected participants' anonymity and confidentiality in reports of their input.

The researcher's pragmatic epistemological stance of intervention and change and ontological orientation of this research being an exploratory study of a continually changing real-world situation that involves reasoning, creating knowledge and change to improve the situation, forms the basis of the research design. The overall research design is presented next.

3.4 Research Design

This section describes and justifies the research design. The research design choices are consistent with the scholar-practitioner approach to academic research (Burkholder, Cox & Crawford 2016; DeLuca & Kock 2007; Goubil-Gambrell 1992). The term scholar-practitioner "expresses an ideal of professional excellence grounded in theory and research, informed by experiential knowledge, and motivated by personal values" (Distefano, Rudestam & Silverman 2004, p. 393). Scholar-practitioners have the opportunity to bring critical thinking and reflection into the work arena in the form of action research (Scully-Russ, Lehner & Shuck 2013) and appreciative inquiry (Tranfield & Denyer 2004). In this way, they can help leaders and practitioners be more effective while contributing to the development of a dataset that may contribute to theory (Suss 2015).

3.4.1 Applied Research

This study is *applied* research because it is concerned with finding an answer to a real problem, for example, for companies that have adopted ITSM, the question of whether ITSM process capability and process performance is associated with business performance.

Applied research endeavors to advance and improve our understanding of a *problem*, with the intent of contributing to the solution of that problem, while basic research, on the other hand, focuses on expanding knowledge, i.e. to identify universal principles that contribute to our understanding of how the world operates (Saunders, M, Lewis & Thornhill 2012).

An applied research setting is used with a focus on the construct of *effect*. It is vital that the outcome measures are valid and that they accurately measure the variables of interest (Behari-Leak 2015). It is essential to measure multiple outcomes and to use multiple measures to assess each construct fully. In contrast, basic research concentrates on the construct of ‘cause’ (Bickman & Rog 2008). In laboratory studies, the independent variable (cause) must be clearly elucidated and not confounded with any other variables (Saunders, M, Lewis & Thornhill 2012).

Applied researchers are often faced with multiple questions to answer because they frequently work in real-world settings, and because they often use multiple measures of effects, they are more likely to use multiple research methods, often including both quantitative and qualitative approaches (Bickman & Rog 2008). Although using multiple methods may be necessary to address multiple questions, it is a strategy to use triangulation on a difficult problem from several directions, thus offering additional assurance to the study results (Bickman & Rog 2008).

Research validity is enhanced by bringing together different lines of evidence. As described above, a trademark of applied research is the triangulation of methods and measures to compensate for the fallibility of any single method or measure (Bickman & Rog 2008). The validity of both qualitative and quantitative applied research is enhanced by triangulation in data collection. The significance of triangulation in qualitative research design, ethnography, and case study research are emphasized by Yin (2011), Maxwell (2012), and Fetterman (2010). Likewise, Bickman and Rog (2008) supported the use of multiple data collection methods in all types of applied research.

Information systems is a highly applied field with robust vocational elements where a combination of practice and theory is needed for usable and relevant knowledge to be produced (Baskerville & Wood-Harper 1996).

3.4.2 Case Study Research

A case study examines a phenomenon in its natural setting, using multiple methods of data collection to collect information from one or a few entities (people, groups or organizations) (Benbasat 1984; Bonoma 1985; Kaplan 1986 ; Stone 1978; Yin 2013). In a case study research the boundaries of the phenomenon are not clearly evident at the outset of the research, and no experimental control or manipulation is used (Benbasat 1984). The case study approach is appropriate because this study focusses on modern-day events in a natural setting, and there is no sound theoretical base for the research (Yin 2013).

The site selected for this case study is a global financial services company with over 200 employees, headquartered in North America, with offices worldwide. As the findings contain commercially sensitive information, the identity of the company cannot be revealed. In this research, it is referred to as Company X. Company X has about 70 IT staff who attend to ITSM processes on a daily basis. Company X began to scrutinize its IT group's performance to ensure that it was in line with the overall business performance and contributed to the business' bottom line. Company X embarked on implementing three of the 26 ITSM processes: Incident Management, Problem Management, and Change Management, and was seeking to improve these processes to lower costs, improve efficiency and offer higher service levels. The business drivers for process improvement were service availability and reliability, and continual improvement.

Company X was chosen for this research project because the company had recently embarked on the implementation of ITSM processes, and needed to find out whether investment in process improvement (capability and performance) actually resulted in cost savings for the company. Moreover, it was convenient for Company X as the researcher is a full-time employee of the company and it was cost-effective for the company to have the researcher conduct the study without the need to hire a consultant. As a global financial services company, Company X is exposed to a number of external factors (as discussed in §6.8) that affected ITSM process capability and performance, which influenced the results of the study, thus making the case organization an ideal unit of analysis for this research project.

The focus of the study is guided by the specification of the unit of analysis. The unit of analysis in IT research can be at the organizational, group or individual level (Vessey, Ramesh & Glass 2002). The unit of analysis for this research is at the organizational level, to explore the association of ITSM process capability and process performance with business performance.

Case-study research is contingent on what one classifies as a case, which can be defined as a person, a group, a program, an organization, a problem, or a body of evidence (Rule & John 2011). The case has to be a case of something (Danermark, Ekstrom & Jakobsen 2001); it is a particular instance of something that is part of a larger group of instances. Company X as a site provides an instance of an IT Service Provider for an "empirical enquiry to investigate a contemporary phenomenon [in this case ITSM process improvement] within its real-life context, especially when the boundaries between phenomenon and context are not clearly defined" (Yin 2003, p. 13).

The number of cases included in a research project is the key feature of the case study research design. Case study research that includes multiple cases is said to be more valid and generalizable, though there are instances where a single case is informative (see e.g. (Lee, H et al. 1989)). Exploratory studies are mostly better served by single cases, that is, where there is no previous theory. Multiple cases are desirable when the purpose of the research is to describe phenomena, develop and test theories. The purpose of this research is to explore, describe and explain a complex situation, and act on the findings, rather than to test theories and discover general principles.

The exploratory study is a single-case study that will follow a pragmatic research approach, enabling methodological triangulation (Denzin 1970), to explore the research question. The case study method is well suited to this study as it allows rich data collection on service management processes, people, services, tools, and technologies. Eisenhardt (1989b, p. 534) has defined a case study as “a research strategy which focuses on understanding the dynamics present in single settings”.

To enhance transferability, this case study uses qualitative data collection methods such as interactive interviews, focus group workshops, participant observation, and direct observation to explore, describe and explain a complex situation in a real-life context. The diversity of research methods act as multiple sources and are useful in case study design to *triangulate* the evidence and to make the data as robust as possible (Rule & John 2011).

Instrument reliability is addressed to ensure that the questionnaire used to measure the variables consistently measures what it is supposed to (Yin 2003). In order to develop a highly credible study, the goals and aims of the investigation are described in detail. Qualitative data will be gathered through several sampling strategies at different times as well as with different participants. Three different methods (questionnaire, interviews and focus groups) are used for the qualitative data collection. This data and methodological triangulation ensure the rigor and credibility of the study. Validity refers to whether the outcomes of the study are bound to the investigation. To ensure internal validity, all data collected is documented, and verified by participants. All interviews are recorded and transcribed. A pilot study is conducted to ensure that the questions of the interviews and questionnaires are reviewed carefully, revised and checked. The survey data collection method is based on the ISO/IEC 15504 standard that has been validated through an international series of field tests (Cater-Steel, Toleman & Rout 2006).

3.4.3 Mixed Methods

Quantitative and qualitative research methods are the two mainstream traditional approaches in research methodology and philosophy (Creswell 2009). Their individual ontological and epistemological grounding and disparate ideologies of research conduct have given rise to the third research orientation – mixed methods.

The mixed methods approach to research is applied to combine the procedures, methods, methodologies, and language of both quantitative and qualitative in a single study (Johnson, RB & Onwuegbuzie 2004). While such an approach may be criticized for mixing traditions embedded in dissimilar philosophical assumptions, it has been accepted by the view that the use of research methods is justified by the research questions that dictate the choice of such methods in order to guarantee obtaining the answers to those questions (Cronholm & Hjalmarsson 2011; Onwuegbuzie & Leech 2006; Tashakkori & Teddlie 1998).

In mixed methods, the research questions are important as they serve as the foundation of the entire research process, the choice of methods, the research design, the sampling and sample, the tools for data collection and analysis (Bryman 2006; Johnson, RB & Onwuegbuzie 2004; Morse et al. 2006; Onwuegbuzie & Leech 2006).

Data collection in mixed methods research involves combining quantitative and qualitative approaches to data collection. The most widely used methods for data collection in mixed methods research are questionnaires, interviews, focus groups, observation, and secondary data (personal and official documents, physical data, and archived research data) (Creswell 2009).

Pragmatism provides a set of assumptions about knowledge that underpins the mixed methods approach, making it an ideal philosophical partner for the mixed methods research approach. Being multifunction in nature, the pragmatic research approach allows questions to be addressed that do not sit comfortably within a wholly quantitative or qualitative approach to research design and methodology. Pragmatic research approaches also perceive issues differently in different scenarios and allow for different views and interpretation of the world.

The use of either quantitative or qualitative methods will not suffice to address the research questions of this study, hence the rationale behind the choice of approach. The pragmatic approach accentuates that several realities exist in any given proviso and that the researcher's choice of paradigm is dependent on the research question the study is trying to solve (Saunders, M, Lewis & Thornhill 2012).

3.4.4 Action Research

Action research as a research methodology that exhibits the values of both qualitative and quantitative methodologies was selected as the primary inquiry method for this study. Action research aims to serve the overall alignment between ontology, epistemology, methodology, and axiology of the overall study.

Action research pursues both action (change) and research (understanding) outcomes (Dick 2002). The inclusion of action (change) in this research paradigm enables the application of action research to management research in a real live organization directly, in this case, Company X, as a problem-solving process in addition to a research methodology.

Action research is an approach used in designing studies that pursue to inform and influence practice. It is a specific orientation and purpose of inquiry rather than a research methodology. Action research comprises a “family of approaches” that have different orientations, yet reveal the characteristics that seek to “involve, empower and improve” aspects of participants’ social world (Reason & Bradbury 2008).

This research followed the cyclical process of action research (McNiff 2013) using the practice perspective suggested by Cronholm and Goldkuhl (2004). *Research practice* and *business practice* interact with each other through action research, thus affording the collaboration of two distinct practices that intersect to form the third practice, the *business change practice/empirical research practice* (Cronholm & Goldkuhl 2004).

This third practice affords the direct participation of the researcher with the business, that simultaneously generates new knowledge and theory for the research practice, and generates business change to improve business practice (Cronholm & Goldkuhl 2004).

The action research performed in this study consists of the three interlinked practices suggested by Cronholm and Goldkuhl (2004). This thesis and its research findings comprise the *theoretical research practice;* the *business change practice/empirical research practice* consists of the IT Service Management process improvement; and the *regular business practice* is the case study organization performing IT Service Management (Cronholm et al. 2011). Figure 3-2 shows the three interlinked practices.

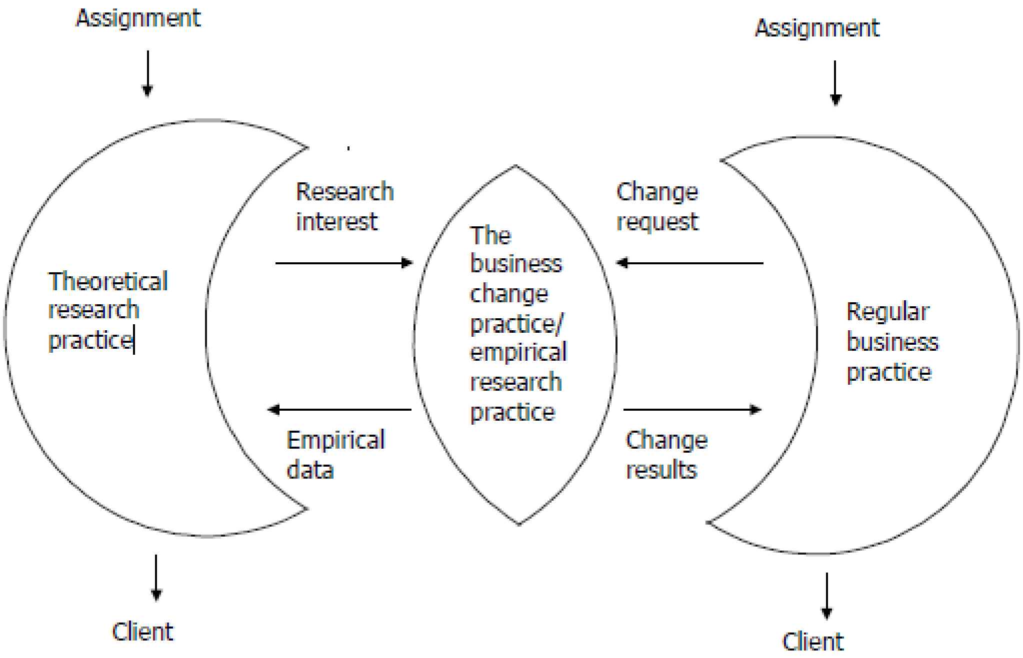

Figure 3-2 The interlinked practices proposed by Cronholm and Goldkuhl (2004, p. 54)

The links between the *theoretical research practice* and the *business change practice/empirical research practice* consist of a research interest as input and empirical data as output (Cronholm & Goldkuhl 2004). The links between the *regular business practice* and *business change practice/empirical theory practice* consist of change requests as input and change results as output (Cronholm & Goldkuhl 2004).

An illustration of the application of the interlinked practices proposed by Cronholm and Goldkuhl (2004) is presented in Figure 3-3.

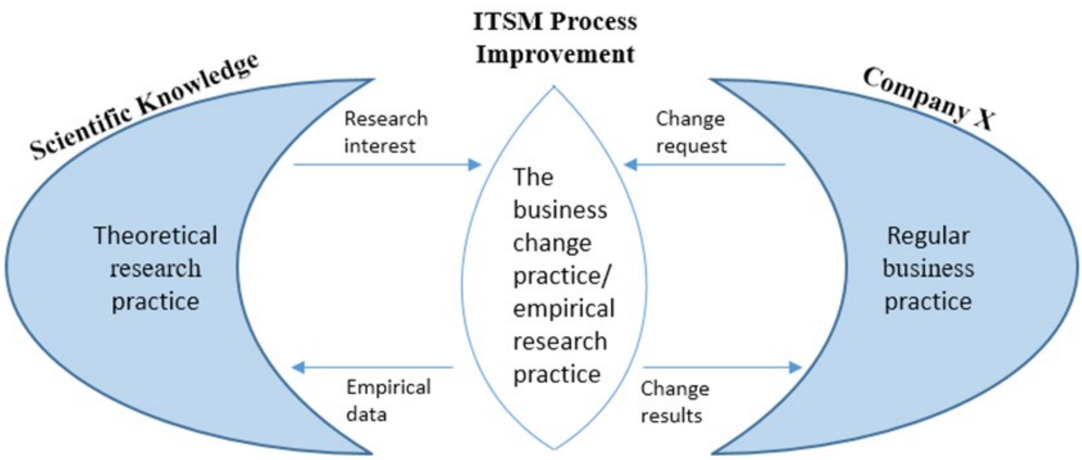

Figure 3-3 Application of the interlinked practices

This study employs a scholar-practitioner approach to changing/improving processes to measure results for the benefit of the case study organization Company X. Action research, defined as an approach employed by practitioners for improving practice as part of the process of change, is appropriate. The research is context-bound and participative. It is a continual learning process in which the researcher learns and also shares the newly generated knowledge with those who may benefit from it (Koshy 2005).

Action research can be applied in five phases (Diagnose, Plan, Take action, Evaluate action, and Reflect) (McNiff 2013). The method is highly pragmatic in nature (Baskerville & Wood-Harper 1996) and rooted in practical action, produces highly relevant research results, and aims to solve a direct problem situation while carefully informing theory (Goldkuhl 2008a). To ensure the rigor of this action research, the Keys to IT Service Management Excellence Technique (KISMET) model (Jäntti, Cater-Steel & Shrestha 2012) is adapted and used as a process improvement framework to achieve the goals of this action research study. The model supports action research methods (Suhonen et al. 2013) and focusses on improving ITSM practices. The model consists of the following seven phases: Create a process improvement infrastructure, Perform a process assessment, Plan process improvement actions, Improve/Implement the process based on ITSM practices, Deploy and introduce the process, Evaluate process improvement and Continual process improvement (Jäntti, Lahtela & Kaukola 2010).

The Design Science Research approach (Hevner et al. 2004) was considered for this study, however, the Action Research method is more aligned with the epistemological and ontological views of the research, and furthermore, the focus of the research is more on exploring the association of ITSM Process Capability, Process Performance, and Business Performance than on developing an artefact (Goldkuhl 2013).

The details of the research approach are described next.

3.5 Research Approach

The first research activity required the definition of a measurement model. The second activity through direct participation followed the cyclic process of the action research approach using the KISMET model as guidance, to systematically address process improvements and measure financial benefits at two points in time. The KISMET model was used to complement action research because action research was deemed too theoretical for Company X to understand and execute on. KISMET offered a common industry-familiar language that made it easy for both business managers and IT personnel to understand without any issues of translation and misinterpretation. The description of each phase of KISMET was practical, and that made it ideal for business buy-in and process improvement execution. The research applies two cycles of action research.

Appendix G details the research timeline.

3.5.1 Definition of the Measurement Model

The literature review presented in Chapter 2 failed to identify an empirically-tested measurement model that links ITSM process capability and process performance to business performance. The ITSM Metrics Modelling Tool proposed by Steinberg (2013) comprises operational measures, process maturity measures, KPIs, CSFs, and the BSC Scorecard.

Steinberg's model was used as a starting point to define the measurement model, with the objective of seeking an in-house practical fit-for-purpose model for Company X. It was decided to extend Steinberg's model to incorporate financial data. The researcher initially contacted Steinberg by email on 20 November 2015 to obtain approval to use his ITSM Metrics Modeling Tool, and then later on 10 October 2017 to confirm his approval (see Appendix B.7). Chapter 4 provides a detailed account of the development of an ITSM Measurement Framework applied in this research project.

3.5.2 Application of the Measurement Model

To apply the model, two cycles of Action Research were undertaken to improve the process capability and performance of Company X's ITSM. These two cycles address RQ2 by applying the KISMET (Jäntti, Lahtela & Kaukola 2010) model that had been previously developed to structure process improvement in ITSM.

Previous studies that used KISMET and Action Research (Heikkinen et al. 2013; Jäntti & Niskala 2014; Suhonen et al. 2013) show no evidence of an explicit mapping between the steps of the KISMET model and Action Research phases. The KISMET model was mapped to the Action Research phases and adapted to fit this study as shown in Table 3-1.

Table 3-1 Adaption and Mapping of KISMET to Action Research

Action Research Phase	KISMET Steps	Adapted KISMET Model
Diagnose	Create a process improvement infrastructure	Create a process improvement infrastructure
	Perform a process assessment	Assess process capability and performance
Plan	Plan process improvement action	Plan process improvement action
Take Action	Improve/implement the process on the basis of ITSM practices	Design process improvement guidelines
	Deploy and introduce the process	Execute the process improvement plan

Action Research Phase	KISMET Steps	Adapted KISMET Model
Evaluate Action	Evaluate the improvement of the process	Evaluate process improvement
Reflect	Design continual process / service improvement actions	Continual Process Improvement

The adapted KISMET phases are described next.

3.5.2.1 KISMET Phase 1: Create a process improvement infrastructure

Action research and qualitative research require rigorous data collection and documentation methods (Avison, Baskerville & Myers 2001; Miles & Huberman 1994). In this first phase of cycle 1, data is collected from multiple primary and secondary sources (Myers 2008), using the most common methods for case study data generation: questionnaires, interviews, focus groups and observation (Oates 2006). Key assessment participants are identified and selected from five business units at Company X. The target groups are purposefully sampled because they cover the business and IT functions at Company X and are involved in the ITSM processes selected.

The first phase of the KISMET model includes motivating business stakeholders to ITSM, defining business strategy and goals for ITSM process improvement, selecting and defining improvement targets, and identifying stakeholders who participate in the process improvement. The Actor-Network Theory and literature on Business and IT Alignment are used to guide this phase of KISMET.

3.5.2.2 KISMET Phase 2: Assess process capability and performance

The second phase includes identifying and selecting the ITSM processes to assess, documenting the challenges in the current state of the process, identifying the key recommendations for process improvement, identifying the tools that support the process, and benchmarking the process with ITIL best practices and ISO/IEC 20000 requirements.

The output from phase 1 of KISMET serves as input to this phase. Based on the business strategy and goals for ITSM improvement decided in phase 1, the appropriate ITSM processes are selected to assess. The improvement targets defined in phase 1 expose the current state of processes and the challenges to be addressed. The key concepts of the selected processes are identified and documented. The tools that support the processes are identified. Process capability is benchmarked with ITIL best practices and ISO/IEC 20000 requirements.

The literature review on process assessments helped guide the choice of method and tool for the process capability measurement. The criteria for the choice is the following:

1) The process assessment method needs to be transparent and aligned with a standard;

2) The assessment results need to be objective;

3) The data collection needs to be unobtrusive, reliable and repeatable.

The questionnaire data collection uses a Software-Mediated Process Assessment (SMPA) approach (Shrestha et al. 2014) to enable the researcher and case study organization to assess ITSM process capability. The four phases of the SMPA approach include assessment preparation; assessment data collection via online surveys; process capability measurement; and process improvement recommendations reporting (Shrestha et al. 2014). The SMPA tool is supported by the international standard for process assessment ISO/IEC 15504 (ISO/IEC 2012) and associated assessment models.

The SMPA approach allocates online assessment questions to the survey participants, via a browser-based software application, based on their role within each process: process performers; process managers; and external process stakeholders. The Process Assessment Model (PAM) for ITSM (ISO/IEC 2012) consists of a set of base practices to achieve the process outcomes and a set of generic practices for process management (CL2), standardization (CL3), quantitative measurement (CL4) and innovation (CL5) of process capability (Shrestha et al. 2014). Although ISO/IEC 15504 provides for capability levels from zero (incomplete) to five (optimizing), only questions relating to level 1 (performed), level 2 (managed) and level 3 (established) of the SMPA tool are used for all three processes, it was not considered likely by senior management at the case study that process capability higher than level 3 would be evident.

The second part of the process assessment is the process performance measurement. ITSM process performance is assessed based on Steinberg's ITSM Metrics Modelling Tool (Steinberg 2013). The model is built as a Microsoft Excel spreadsheet that captures operational metrics, calculates KPIs from operational metrics, scores KPIs depending on how they fall within specified tolerance levels, and calculates CSF risk levels from the combinations of KPI results. The model maps the CSF attainment scores to key areas of general business risk (outcome risks) and derives a Balanced Scorecard from the average of the associated CSF performance levels for each process.

Financial measures for each of the selected process are calculated and documented for the period being assessed.

The SMPA report, the outcome of the focus group session, the CSF Scorecard and the financial measurement results form the basis for the guide to the process improvement interviews.

3.5.2.3 KISMET Phase 3: Plan process improvement action

The *plan process improvement action* phase of KISMET includes the following steps: analyze the challenges that have been identified, plan improvement actions, and validate the challenges and improvement actions. A report is developed for each process, detailing the survey results and proposing an action plan for each of the report's recommendation. The report also provides the CSFs agreed upon by the business in the *Create a Process Improvement Infrastructur*e phase, suggested operational metrics and KPIs.

3.5.2.4 KISMET Phase 4: Design process improvement guidelines

The purpose of the *design process improvement guidelines* phase is to define and document roles and responsibilities, actions, metrics, and relationships to other ITSM processes.

Process managers create RACI (Responsible – Accountable – Consulted – Informed) matrices (Cannon 2011) for each of the actions to improve processes. The proposed actions are rationalized and detailed in collaboration with the process managers and performers. The relationship amongst processes is identified and documented.

3.5.2.5 KISMET Phase 5: Execute the process improvement plan

Although the KISMET model calls for deploying an ITSM process in this phase, the researcher adapted this phase to execute the process improvement plans. This phase includes the following steps: communicate the action plan to all stakeholders, create work instructions for how to improve the process in practice, encourage a positive attitude to ITSM among the staff, increase the awareness of ITSM in the organization through training, and organize ITSM workshops to clarify the ITSM process interfaces.

3.5.2.6 KISMET Phase 6: Evaluate process improvement

The *evaluate process improvement* phase of the KISMET model involves collecting feedback regarding an improved process, tools, and training, and conducting fine-tuning if applicable. The evaluate action phase serves to review and reflect on the improvement programs implemented and evaluate the outcomes of the process improvement programs. The aim is to identify changes in each of the selected ITSM process improvement areas, the effect on the processes, as well as the challenges that occur during implementation of the changes, and to make suggestions for further improvement. Detailed observation, monitoring, and recording enable the researcher to assess the effect of the action or intervention and hence the effectiveness of the proposed change. In addition to the planned observations, additional observations and insights are recorded in a journal on a regular basis.

3.5.2.7 KISMET Phase 7: Continual Process Improvement

This phase of the action research cycle is primarily concerned with the critical inspection of one's own practice. Many authors propose graphic representations of action research models in order to illustrate their views (Costello 2003).

At its most basic, action research can be viewed in terms of the processes outlined in Figure 3-4.

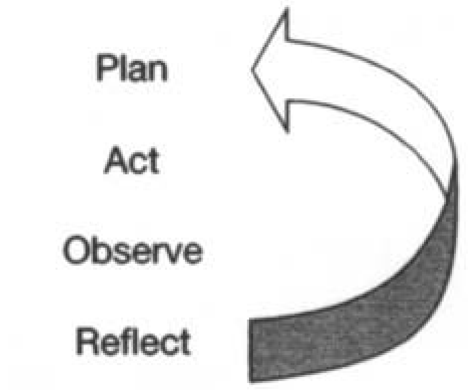

Figure 3-4 A basic action research model (Costello 2003, p. 7)

This model was first introduced in the work of Kurt Lewin (1946) and has been cited in several works on action research (for example, Avison et al. 1999; Costello 2003; Dick 1993; McTaggart & Kemmis 1988; Mertler 2015).

Reflection, in relation to action research, is an activity that must be done at the end of a particular action cycle (Mertler 2015). It is a vital step in the process since this is where the researcher-practitioner reviews what has been done, determines its effectiveness and makes decisions about potential changes for future implementations of the project.

3.5.2.8 KISMET Cycle 2

The *evaluate action* phase of cycle 1 directly leads to the *diagnose* phase of cycle 2. The diagnosing phase of cycle 2 uses the outcomes of the *evaluate action* phase of cycle 1 to further diagnose what needs to be done to the process improvement plans and the execution thereof. The effectiveness and applicability of the performance metrics are re-evaluated at this stage. Process capability and performance are reassessed. Qualitative and quantitative data are collected and analyzed in this phase. The results of the qualitative study and the performance metrics are compared against those from the diagnose phase from cycle 1. Another financial check is performed at this stage to compare with the baseline results of Company X’s financial position, to determine if the actions performed during the *acting* phase are associated with changes in the financial results.

3.6 Chapter Summary

Chapter 3 provides the blueprint for the research study. The underlying research philosophy, epistemology, and ontology, driven by the research questions, form the basis for the overall research design and approach. The research design and approach are underpinned by the research philosophy of pragmatism. The study is applied research integrating mixed methods within a case study, following the action research approach, to provide academic rigor and industry relevance.

Multiple methods that include surveys, focus groups, meetings, documents, software repositories and observation are used to collect data. The multi-method approach, driven by the research questions, offers data triangulation.

Action research was selected as the research approach and paradigm most suitable for the nature of this study. Action research, through a cyclical process, follows both action and research, thus fulfilling the need for this study to implement change and obtain knowledge and understanding. The cyclical and spiralling nature of action research aligns well with the continual process improvement program at the case study. The KISMET model is used within the phases of action research to guide the research activities and offer rigor to the study.

CHAPTER 4 DESIGN OF THE BEHARI ITSM MEASUREMENT FRAMEWORK

4.1 Introduction

Chapter 3 presented the blueprint of the study, detailing the overall design and approach that is underpinned by the research philosophy, epistemology, ontology, and axiology. Chapter 3 also outlined and justified the research method and the action research approach followed in the study.

This chapter describes the design of the Behari ITSM Measurement Framework (BITSMMF) and illustrates the linkage of ITSM process capability and process performance to business financial performance.

Chapter 4 comprises four main sections. *Section 4.1* provides an introduction to the chapter. *Section 4.2* details the components of the BITSMMF and presents the conceptual model. *Section 4.3* applies the conceptual model. *Section 4.4* covers the summary of the chapter and value of the model. Figure 4-1 illustrates an overview of Chapter 4.

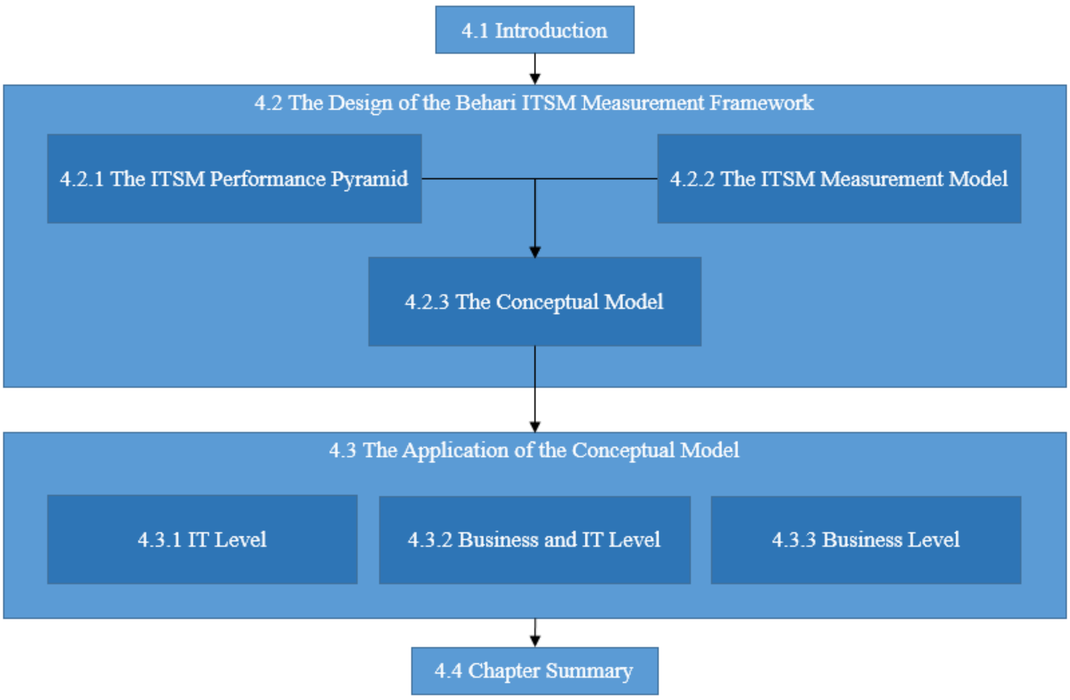

Figure 4-1 Overview of Chapter 4

4.2 The Design of the Behari ITSM Measurement Framework

The BITSMMF referred to as the Behari Framework going forward, consists of the following two integrated components: ITSM Performance Pyramid ($ITSMP^2$) and ITSM Measurement Model ($ITSM^3$).

The $ITSM^3$ is an extension and adaption of the ITSM Metrics Model Tool proposed by Steinberg (2013), while the $ITSMP^2$ is based on the Performance Pyramid proposed by Lynch and Cross (1991).

4.2.1 The ITSM Performance Pyramid

The Strategic Measurement and Reporting Technique (SMART) Performance Pyramid, developed by Lynch and Cross (1991), comprises a hierarchical structure of financial and non-financial performance measures across nine dimensions, that are mapped onto the organization from corporate vision to individual objectives (Johnson, S 2005). The Performance Pyramid was designed to serve as a management control system of performance metrics to assist in the achievement of corporate vision by cascading down through four levels. Figure 4-2 shows the SMART Performance Pyramid developed by Lynch and Cross (1991).

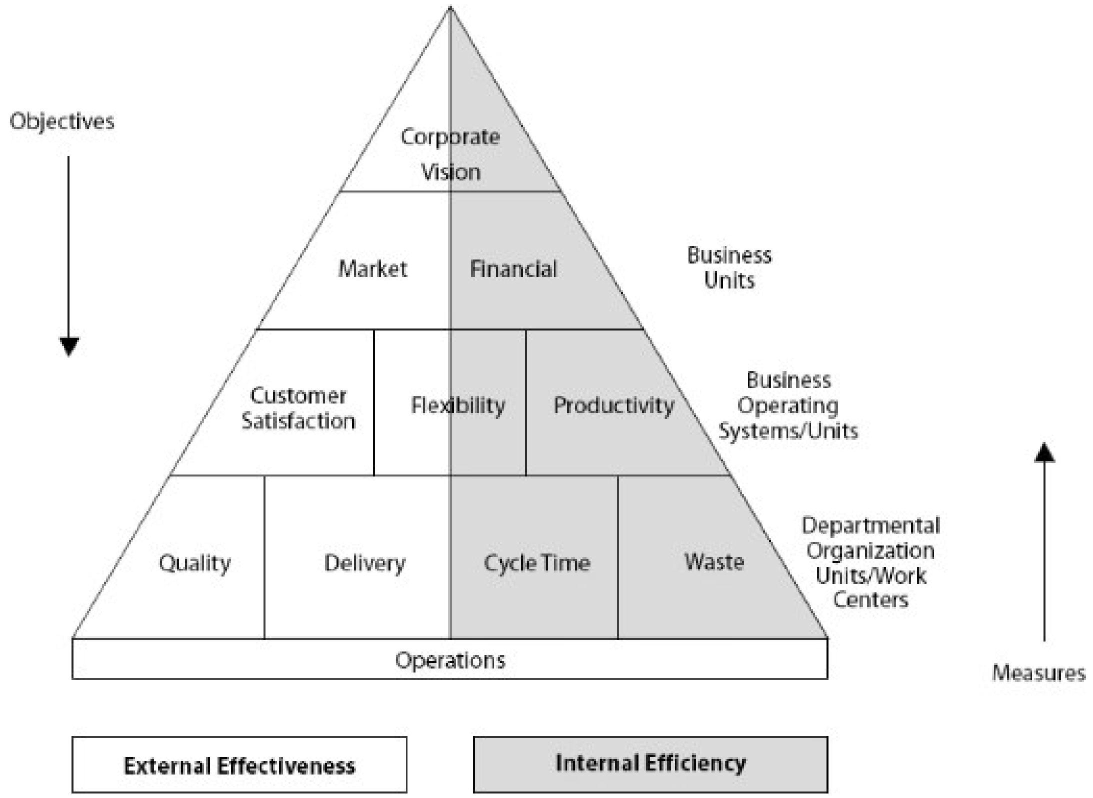

Figure 4-2 SMART Performance Pyramid (Artto 1999, p. 6)

The SMART Performance Pyramid is an interrelated system of variables controlled at different organizational levels. The pyramid contains four hierarchical levels of measures and objectives that affect the organization's external effectiveness and its internal efficiency simultaneously while integrating the links between the corporate strategy, strategic business units, and operations. The purpose of the pyramid is to link an organization's vision to its operation by decoding objectives from the top-down and measures from bottom-up (Laitinen 2002; Tangen 2004).

The first level down from the corporate vision involves the setting of short-term financial targets like cash flow and profitability and long-term goals for growth as well as market position. Key market and financial measures are identified at this level of the objectives, as ways of monitoring performance in achieving the vision. To attain these market and financial objectives, the driving forces of customer satisfaction, flexibility and productivity are also derived (Lynch & Cross 1991).

The next level down involves the day-to-day operational measures concerning customer satisfaction, flexibility, and productivity.

Lastly, at the base of the pyramid, specific operational measures are derived from the satisfaction, flexibility, and productivity measures at the third level. Here the objective is to enhance quality and delivery performance and reduce cycle time and waste. Individual departments can use the four key performance measures (quality, cycle time, delivery and waste) on a daily basis (Striteska & Spickova 2012).

The strength of the SMART Performance Pyramid is that it draws together the hierarchical view of business performance measurement with the business process review (Neely et al. 2000). It also makes explicit the difference between measures that are of interest to external stakeholders, such as customer satisfaction, quality and delivery, and measures that are of interest within the business such as productivity, cycle time and waste (Neely et al. 2000).

Lynch and Cross (1991) concluded that it was essential that the performance measures chosen should:

- link operations to strategic goals. It is vital that departments be aware of the extent to which they contribute, separately and together, to achieve strategic goals;
- support decision-making at all levels of an organization by providing timely and accurate information;
- include strategic, operational, financial, and nonfinancial indicators;
- measure the effectiveness of all processes and services;
- measure efficiency regarding resource utilization within the organization;
- include an appropriate mix of both quantitative and qualitative methods;
- comprise an appropriate focus on both the long-term and short-term;
- and be flexible and adaptable to an ever-changing business environment.

The SMART Performance Pyramid does not explicitly integrate the concept of continual improvements; does not provide any mechanisms to identify key performance indicators (Ghalayini, Noble & Crowe 1997); and has not been empirically tested (Metawie & Gilman 2005). Moreover, stakeholders other than customers and shareholders do not feature prominently in the SMART Performance

Pyramid (Neely, Adams & Kennerley 2002). It is necessary to ensure that measures are included that relate to other stakeholders as well.

The research project is about continual process improvement, using CSFs and KPIs to access process capability, process performance and business performance by involving all stakeholders (operational, strategic and external stakeholders).

Supporters of the Performance Pyramid claim that it is superior to the BSC in two ways:

- It has a hierarchical structure, requiring business management to set objectives for each level of the organization. The performance measures that emerge from these objectives are specific and appropriate to each level.
- It is process-focused – that is, it explicitly considers how processes combine to achieve the organization’s goals. The measures interact horizontally, for example cutting the production cycle time should shorten the delivery time. They also interact vertically,– e.g., cutting the cycle time should also increase productivity.

Another key feature of this model is its recognition that financial and nonfinancial measures can support each other. For example, increased flexibility should improve a company’s market position by meeting customers’ needs more effectively, while also improving its financial performance by increasing revenues and reducing fixed costs.

The primary aim of the SMART Performance Pyramid is to connect through organization’s strategy with its operations by translating objectives from the top down and measures from the bottom up (Tangen, 2004). It attempts to integrate corporate objectives with operational performance indicators, but does not provide any mechanism to identify key performance indicators (Striteska & Spickova, 2012).

The SMART Performance Pyramid provides a good base for adaptation to the ITSM Performance Pyramid, as the nine dimensions of the SMART Performance Pyramid logically map to the hierarchal levels of the ITSM Performance Pyramid to provide a holistic view of business performance. Moreover, the SMART Performance Pyramid uses a bottom-up approach to measures that aligns well with Steinberg’s bottom-up approach to operationalization the ITSM Metrics Model.

One of the drawbacks of the SMART Performance Pyramid is its tendency to focus on two groups of stakeholders, i.e. shareholders and customers. It is necessary to ensure that measures are included which relate to other stakeholders as well. This makes the SMART Performance Pyramid an ideal candidate to enhance into the ITSM Performance Pyramid to include all stakeholders across all the hierarchical levels.

The SMART Performance Pyramid fails to explicitly define linkages to other key concepts in performance measurement, such as critical success factors (CSFs) and key performance indicators (KPIs) (Watts & McNair-Connolly, 2012). The ITSM[3] (as described in *section 4.2.3*) will be used to provide the ITSM Performance Pyramid with the CSF and KPI dimensions.

The SMART Performance Pyramid developed by Lynch and Cross (1991) was adapted to comprise three levels of hierarchical objectives: Business Level, Business and IT Level, and the IT Level, to meet the requirements of this research. The nine dimensions of performance measurement are included and span all levels of the organization. Figure 4-3 illustrates the conceptual model of the ITSM Performance Pyramid.

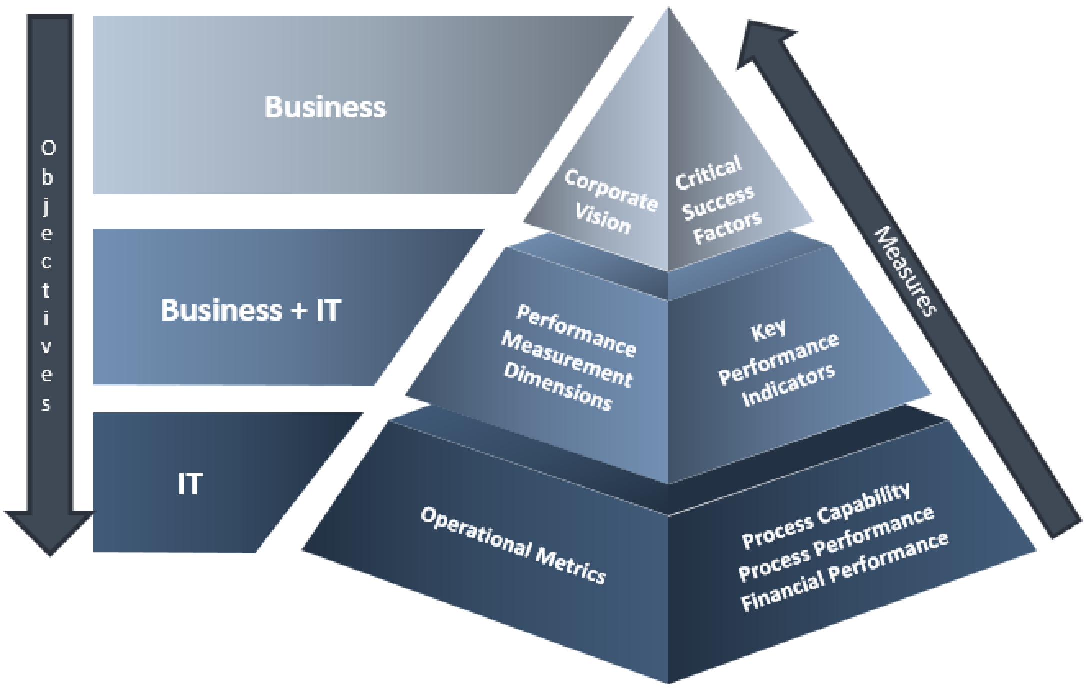

Figure 4-3 Conceptual Model of the ITSM Performance Pyramid

4.2.2 The ITSM Measurement Model

The ITSM Metrics Model Tool was proposed by Steinberg (2013) as a measurement model that uses several metrics' categories that integrate into an overall metrics framework. The model was designed around these categories interacting with each other to translate observations and operational events into performance indicators that can be used to determine the impacts of specific risks to make critical IT and business management decisions. Figure 4-4 illustrates the measurement model Steinberg proposed.

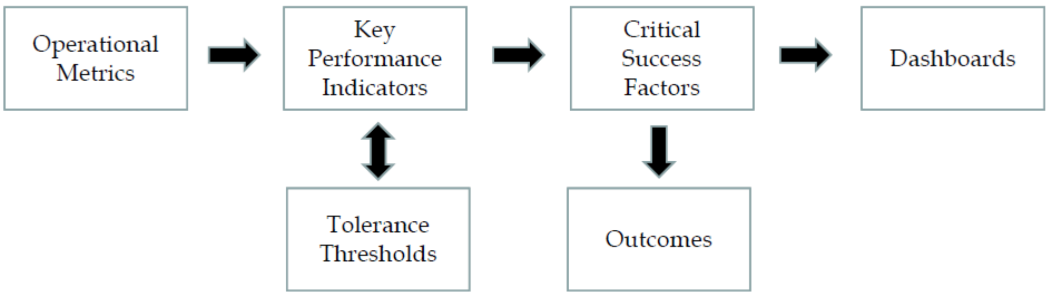

Figure 4-4 Steinberg's Metrics Model (Steinberg 2013, p. 20)

Steinberg's ITSM Metrics Model Tool is a simple spreadsheet tool that can be used to measure ITIL-related processes and used as a practical guide to demonstrate operational metrics to be used and how these can be calculated into key performance indicators (KPIs) and critical success factors (CSFs) that senior management understands.

The model justifies an ITSM improvement initiative by modeling the desired, stated target improvements expected to occur. Its purpose is to demonstrate the impacts and effects of current ITSM practices.

The data flow within Steinberg's model can be described using the metrics model presented in Figure 4-4. Operational metrics are calculated into KPIs. KPI results will fall into tolerance ranges. KPIs are then calculated into CSFs. CSFs are then used to determine outcomes and presented in a dashboard format.

KPIs are metrics that indicate the performance level of an operation or process to provide a foundation for pragmatic management decision-making. KPIs are calculated or derived from one or more operational metric(s), which indicate whether one or more CSF(s) are being met and fall within a target and acceptance range. CSFs are metrics that represent key operational performance requirements to indicate the performance of a process or an operation. CSFs are calculated or derived from one or more KPI(s) and based on the performance of KPIs within tolerance levels. CSFs also indicate a performance level. Dashboards represent the key metrics in a report or graphical interface to indicate the success, at-risk status or failure of a business operation. Dashboards are used to quickly assess the state of a business operation to prompt timely action to correct operational deficiencies.

To apply Steinberg's model, tolerance levels are recorded in the ITSM Metrics Model Tool for each process to define acceptable and not acceptable KPI levels. For each ITSM process, operational metrics are then entered with live data from ITSM process reporting and other infrastructure measurements and observations. KPIs are then derived from the above and coded green, yellow or red depending on how they fall within the specified tolerance levels. CSF risk levels are then derived from combinations of KPI results and color-coded green, yellow or red. Green indicates that the KPI has met or bettered the success target, while a yellow color indicates that the KPI is between the success and warning targets, and a red color indicates that the target has not met the warning threshold that was set. Each process Balanced Scorecard is then derived from combinations of Outcome Risks associated with the dimensions of the Balanced Scorecard. The dashboards are derived from the average score of Outcome Risks associated with the dimensions of the Balanced Scorecard. A process Balanced Scorecard is presented as a radar chart showing each scorecard area (Customer, Capability, Operational, Financial and Regulatory).

As mentioned in Chapter 2 § 2.4.1.3, the primary drawback of the BSC approach is that it is mainly designed to provide senior management with an overall high-level view of performance, and is thus not intended for the operations level (Ghalayini, Noble & Crowe 1997). Further, Ghalayini, Noble and Crowe (1997) also argued that the balanced scorecard is constructed as a monitoring and controlling tool rather than an improvement tool. Furthermore, Neely et al. (2000) argued that although the balanced scorecard is a valuable framework suggesting important areas in which performance measures might be useful, it provides little guidance on how the appropriate measures can be identified, introduced and ultimately used to manage the business.

Although Steinberg's model made a valuable contribution, one critical dimension is missing: financial measures. Steinberg's ITSM Metrics Model Tool was modified and extended to fit this study, to address the research questions posed in §1.3. Steinberg's work was extended to propose the ITSM^3 to include financial measures at all levels of the model (Operational Metrics, KPIs, and CSFs). In addition, rather than use the balanced scorecard approach Steinberg proposed, the model was extended to present the performance measurement dimensions of the ITSM Performance Pyramid, including costs and financial performance data.

4.2.3 The Conceptual Model of the Behari ITSM Measurement Framework

The integration of the components ITSM^3 and ITSMP^2 to form the Behari IT Service Management Measurement Framework (BITSMMF) solves the two issues identified in the SMART Performance Pyramid and Steinberg's model. The inclusion of the financial dimension from the ITSMP^2 affords the extension of Steinberg's model to add financial measures to the ITSM Metrics Model Tool (see *section 5.3.2* & *section 6.3.3*), and the integration with the ITSM^3 provides a mechanism to identify key performance indicators that the Performance Pyramid lacks (see *section 5.3.3*).

Figure 4-5 depicts the conceptual model of the Behari framework, a *top-down* model of measurement and control developed to link process capability, performance and financial profitability to KPIs, CSFs, and business risks. At the top business level, an organization is concerned with the association of business risks with CSFs to derive CSF scores to determine CSFs risks. At the middle level, both the business and IT are involved with the ITSM function to derive KPIs that support the organization's CSFs. At the lower operational level, IT is focussed on the ITSM process metrics such as process capability, process performance, and financial performance.

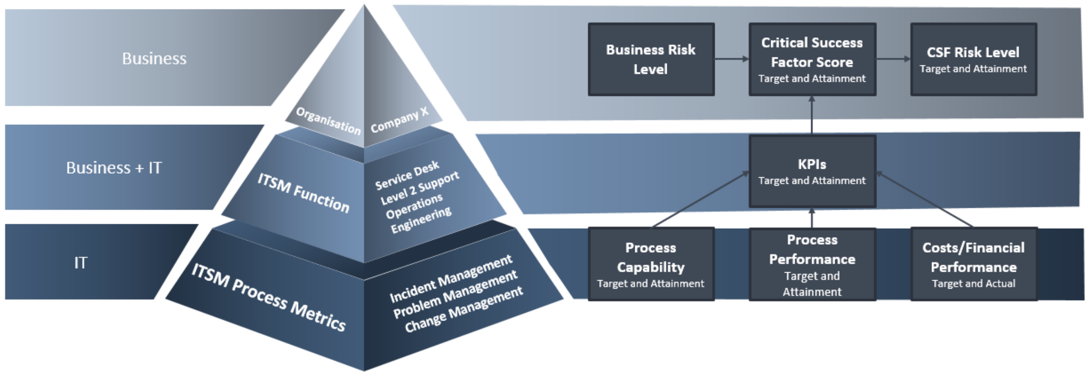

Figure 4-5 Behari IT Service Management Measurement Framework

Although the conceptual model uses a *top-down* approach to show the drivers of organizational change and improvement and aligns a company's strategic goals with operational objectives, to operationalize the BITSMMF, the practical approach is to work from the *bottom up* to achieve the goals. This two-way approach is in line with the Performance Pyramid developed by Lynch and Cross (1991). The following sections describe each level in detail following the bottom-up approach to operationalize the BITSMMF.

The next section details the application of the conceptual model.

4.3 Details of the Conceptual Model Constructs

4.3.1 IT Level

Process Capability Measurement

An ITSM process assessment can be used to determine the level of maturity a process has achieved. The level of ITSM maturity is incorporated into the ITSM[3] to enable process maturity to be linked to process performance and financial measures. It is evident from the literature review (Chapter 2 §2.5.1.2) that a variety of ITSM maturity evaluation frameworks are available to determine the level of maturity of an IT process, for example, Capability Maturity Model Integration for Services (CMMI Product Team 2011), COBIT (ISACA 2012), and ISO/IEC 15504 (ISO/IEC 1998). Process assessment is defined as an activity that aims to compare the actual processes performed in an organization with reference processes that include typical activities for the process at different capability levels (Barafort & Rousseau 2009a). The ITSM[3] uses the ISO/IEC 15504 international standard for process assessment (ISO/IEC 2012) to measure process capability.

The SMPA approach to process assessment was used to measure the process capability. Process attribute achievement ratings are calculated from the online survey respondents by the software tool using the measurement framework of the ISO/IEC 15504 standard. The process capability score is based on the average rating of all responses and uses the process attribute achievement scale as shown in Table 4-1. The process capability level can then be derived from the attribute ratings.

Table 4-1 Process attribute rating scale

F	Fully	There is certainty that process activities are usually performed.	>85%-100%
L	Largely	Process activities are performed in the majority of cases.	>50%-85%
P	Partially	Process activities are performed but not frequently.	>15%-50%

N	Not	Process activities are not or rarely performed.	0%-15%

Process Performance Measurement

Operational metrics are the basic observations of operation events for each ITSM process that serve as a starting point for operationalizing the model and will be used to calculate the KPIs for each of the processes. Operational metrics such as *Number of incident occurrences*, *Average incident response time*, and *Incident reopen rate* are sourced from the organization's ITSM reporting tools, Human Resource systems, observations and other infrastructure measurements.

Costs/Financial Performance

The ITSM[3] includes financial measures: the cost of running a process and the cost of process failures. Including these costs in the model establishes the association of financial measures with ITSM capability and performance.

Process Costs

Process costs are the labor costs associated with running the ITSM process. Process costs include additional costs the business incurs in addition to that paid to employees for the work done. These additional costs are referred to as "on-costs" or "non-wage labor costs" (Australian Bureau of Statistics 1993; OECD 2003).

Each process can be performed by multiple business units, and each business unit may perform multiple processes.The cost of ITSM tools and training are included as on-cost items. The number of staff in each business unit, and the proportion of time spent working on each process is applied to calculate the total number of hours spent per business unit per process. The total number of hours is multiplied by the hourly rate to calculate the total cost per business unit per process according to the following formulae:

Total hours spent on process (x) = [(annual available hours – annual leave hours) assessment period * % time spent on process per year] * total no. of staff per business unit*

Annual fully-burdened cost per staff (z) = average (annual salary per staff member + annual on-cost per staff member)

Labor Cost per Hour (y) = z / annual available hours

*Labor Cost per Business Unit = x * y*

Cost of IT Failures

IT failures can result in costs to the organization. These costs are associated with specific processes directly related to the failure of IT services. These costs may include fines, penalties, legal costs, loss of revenue and sales. Penalties for IT service failure may be time-based and noted in service level agreements between the client and service provider.

4.3.2 Business and IT Level

Key Performance Indicators

A key performance indicator (KPI) denotes a specific value or characteristic that is measured to evaluate whether an organization's goals are being accomplished. KPIs support the CSFs and take into account the needs of stakeholders and the organization's expectations. An organization's KPIs need to be specific, measurable, agreed upon, realistic, and time-based (SMART), to be effective. KPIs can use both financial and non-financial metrics (Kerr 2000). KPIs are metrics that are used to indicate the performance level of an operation or process. KPIs are used to provide a foundation for actionable management decisions. While operational metrics are generally historical in nature, KPIs are really the "metrics that matter" (Steinberg 2013).

KPIs are derived from one or more Operational Metric(s). The ITIL guidelines suggest appropriate process KPIs to meet the organizational goals (Sharifi et al. 2009). The ITSM[3] also includes the process capability level, the cost of running the process and other financial measures related to the process as KPIs.

Tolerance Thresholds and KPI Scoring

Tolerance thresholds represent upper and lower boundaries for acceptable KPI values that should be set by the IT Service Manager and agreed by IT and Senior Business Management. These thresholds are critical as they form the triggers for when management needs to take action or make a key decision.

Each KPI should be associated with target and warning tolerance values. The target value may be more or less than the warning value depending on the KPI being measured. For some of the indicators (e.g., *incident resolution rate*), a higher value indicates a positive value, whereas for others (e.g., *number of incidents*) a lower value indicates a positive outcome. Traffic light indicators are commonly used in measurement and status reports (Cokins 2009).

For each KPI target, the result is compared to the target and warning threshold to deduce a KPI score. Steinberg used a three-point scale: 1 KPI result meets the target; 2 KPI results within the warning zone; 3 KPI results outside the warning zone. Steinberg's model then identifies the maximum score of the KPIs that are associated with a CSF to score the CSF attainment.

4.3.3 Business Level

Critical Success Factor Scoring

CSFs scores are derived from one or more KPIs by comparing how those KPIs perform within the tolerance range. A CSF is usually indicated with a performance level that indicates the extent to which the CSF was achieved. Typically, this performance level can be rated on a simple ordinal scale such as *High*, *Medium* or *Low*. According to Steinberg (2013), a recommended approach to derive a CSF score is to model the worst-case scenario. First, identify the KPIs that relate to the CSF and then rate the CSF based on the highest (worst) value observed in any one of those KPIs.

Business Risks

Business risks (referred to as Outcome Risks in Steinberg's model) are key indicators of general business risk areas (Gewald & Hinz 2004; Steinberg 2013). Categories of risk include operational, financial, regulatory, reputation, and security (Netter & Poulsen 2003). Business risks are associated with CSFs that identify the success, at risk or failure of CSFs. Business risk levels are used to quickly assess the level of risks created by a process or by operational deficiencies. In short, business risks are the events that the IT department is trying to protect against. Business risks may be associated with one or more CSF(s). Business risk levels are determined by the highest scoring CSF associated with the business risk.

ITSMP² Risk Level Scorecard

The ITSMP² Risk Level Scorecard is derived by using the average scores of only the Business Risks associated with an ITSMP² performance dimension. The results are represented graphically as a radar chart to show the deviation from risk level targets.

4.4 Chapter Summary

This chapter presents the development and description of the Behari ITSM Measurement Framework as a practical measurement framework to link ITSM process capability and process performance to financial performance. The ITSM³ is designed to facilitate *What-If* analyses to model the impacts of future business decisions on KPIs and CSFs. This analysis can be achieved by increasing or decreasing the values of the Operational indicators that may be related. The model may also be used for analytics, for example, drilling down to more specific operational metrics. The model is designed with flexibility to allow it to be easily adapted for any ITSM process to meet the organization's needs.

The ITSM³ provides a method to derive KPIs from operational metrics, link KPIs that operationalize CSFs to applicable CSFs to achieve organizational goals, and to associate business/outcome risks to these CSFs to ultimately determine the risks of these CSFs. One of the aims of the model is to provide an understanding of the potential degree of financial benefits realizable due to process improvements. The application of the model uncovers the link between ITSM process capability and performance and financial measures.

CHAPTER 5 ACTION RESEARCH - CYCLE 1 (ARC1)

5.1 Introduction

Chapter 4 presented the design of the Behari ITSM Measurement Model that demonstrates the association of process capability and process performance to financial costs. The conceptual model was described, and the details of how it can be operationalized were provided to demonstrate how the components of the model interact with each other.

This chapter aims to describe the events of the first cycle of the action research. Chapter 6 describes the second cycle of the action research. Using the action research approach, the researcher, through direct participation, followed a cyclic process to systematically champion process improvements and measure financial benefit in the case study organization Company X. The KISMET (Keys to IT Service Management Excellence Technique) model (Jäntti et al. 2013) was used as a process improvement guide to achieve the goals of this action research study. As detailed in Chapter 3 §3.4.4, the action research cycle consists of the following five phases: *Diagnose*, *Plan*, *Take Action*, *Evaluate* and *Reflect* (Baskerville & Wood-Harper 1996). The adapted KISMET model, as described in Chapter 3 §3.5.2, consists of the following seven activities: *Create a process improvement infrastructure*, *Assess process capability and performance*, *Plan process improvement action*, *Design process improvement guidelines*, *Execute the process improvement plan*, *Evaluate process improvement* and *Continual process improvement*.

Chapter 5 comprises nine main sections. *Section 5.1* provides an overview of the chapter. The following seven sections are mapped directly to the seven phases of the KISMET model and describe the specific activities of each phase. *Section 5.2* details the activities of the first phase (*Create a process improvement infrastructure*) of the KISMET model. *Section 5.3* walks through the second phase *Assess process capability and performance*, followed by *section 5.4 Plan process improvement action*, and *section 5.5* the *Design process improvement guidelines* phase of KISMET. *Section 5.6* details the activities of *Execute the process improvement plan* followed by *section 5.7 Evaluate process improvement* and *section 5.8 Continual process improvement*.

Finally, *section 5.9* summarizes this chapter. Figure 5-1 shows the overview of Chapter 5.

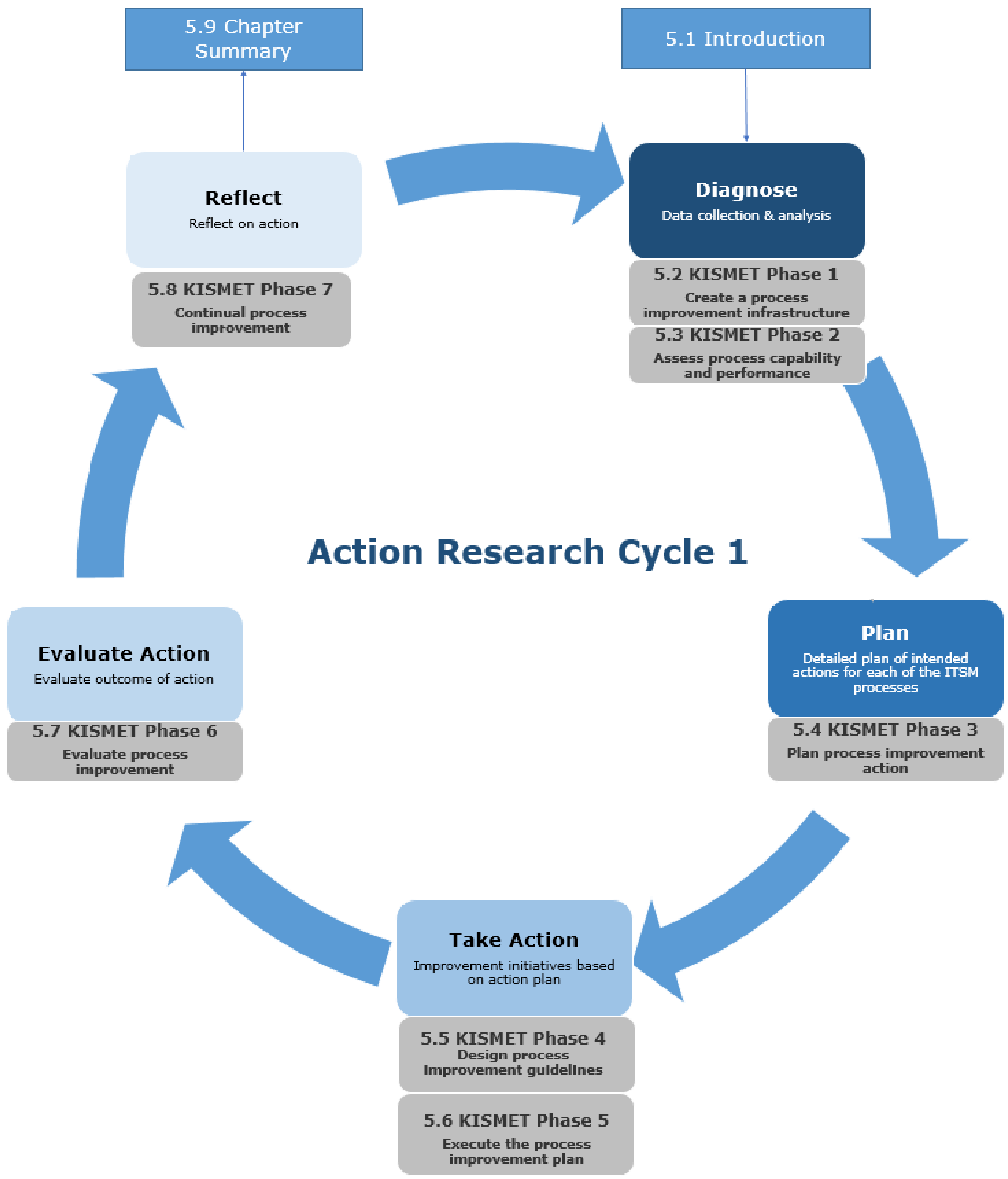

Figure 5-1 Overview of Chapter 5

The timeline of activities for the first action research cycle is presented in Figure 5-2.

Action Research Phase	KISMET Phase & Activity	Start Date	End Date
Diagnose	**KISMET Phase 1: Create a process improvement infrastructure**	**23-Feb-15**	**31-Oct-15**
	Project Kickoff	23-Feb-15	23-Feb-15
	Meeting to review current state of ITSM processes	27-Feb-15	27-Feb-15
	Strategic planning meeting to establish CSFs	28-Feb-15	2-Mar-15
	Selection and Deployment of ITSM Software Tools	1-Mar-15	30-Apr-15
	Migration of data from SugarCRM and Bugzilla to Zendesk and Jira	1-May-15	31-Jul-15
	Set up Performance Metrics	1-Aug-15	31-Oct-15
	KISMET Phase 2: Assess process capability and performance	**10-Nov-15**	**29-Feb-16**
	Process assessment preparation	10-Nov-15	12-Nov-15
	Process assessment data collection	16-Nov-15	30-Nov-15
	Analysis of process capability assessment report	1-Dec-15	9-Dec-15
	Focus group workshop	13-Jan-16	13-Jan-16
	Financial measurement	1-Feb-16	29-Feb-16
	Process performance assessment	1-Feb-16	29-Feb-16
Plan	**KISMET Phase 3: Plan process improvement action**	**22-Feb-16**	**27-Feb-16**
	Interviews/Meetings to discuss process improvment action	22-Feb-16	27-Feb-16
Take Action	**KISMET Phase 4: Design process improvement guidelines**	**1-Mar-16**	**23-Mar-16**
	Development of process guidelines	1-Mar-16	23-Mar-16
	KISMET Phase 5: Execute the process improvement plan	**1-May-16**	**31-Oct-16**
	Execute on improvement plan	1-May-16	31-Oct-16
Evaluate Action	**KISMET Phase 6: Evaluate process improvement**	**1-Nov-16**	**30-Nov-16**
	Evaluate the outcomes of the process improvement program	1-Nov-16	30-Nov-16
Reflect	**KISMET Phase 7: Continual process improvement**	**1-Dec-16**	**31-Dec-16**
	Conduct process reviews and report process improvement ideas	1-Dec-16	31-Dec-16

Timeline --> 2015: Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec; 2016: Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Figure 5-2 Action Research Cycle 1 Timeline

5.2 KISMET Phase 1: Create a process improvement infrastructure

The adoption of the ITIL framework requires organizational change. With any organizational change comes challenges. One of the most difficult challenges to overcome is to persuade people to conform to the new set of standards and align their interests (Cater-Steel & McBride, 2007).

The research aim of this phase was to identify the primary problem(s) to be solved through the action research project. For the management of Company X, the main objective of this phase was to analyze the current state of ITSM processes to propose improvement areas that align with the business strategy.

The first step in effecting change was to enroll actors or stakeholders at a senior level at Company X to the interests of ITSM and service improvement.

A kickoff meeting was convened by the researcher on 23 February 2015 with the executive staff of Company X to motivate the need for ITSM to improve processes and to get *buy-in*. The meeting also served to introduce the research project and emphasize the benefits of the study to the business. The company's strategic goals for ITSM process improvements were discussed and aligned with the company's IT objectives. The strategic goals of Company X were stated as:

- To deliver high quality, reliable services that meet customer requirements;
- To improve Process Performance / Service Levels; and
- To build Engineering Team capabilities, such as efficiency, effectiveness, and knowledge.

An important aim of the kickoff meeting was to develop a corporate mindset and communication strategy on this new initiative of process improvement. The researcher presented a condensed version of the research proposal with an emphasis on measurable key milestones of the initiative, which helped strengthen the inscriptions within the network and focus the meeting on the alignment of interests to establish a common interest amongst executive staff.

Although there are a number of ITSM processes being performed at the case organization, such as Incident Management, Problem Management, Change Management, Release Management, Configuration Management, Availability Management and Capacity Management, only three were observed to be performed regularly with established workflows and policies: Incident Management, Problem Management and Change Management. These three processes were chosen as the focus of the CSI project at Company X. Company X’s senior management believed that scrutinizing these three processes for possible improvement would have the highest impact on meeting the business goals of the company. The choice is consistent with the results of a cross-national study of ITIL adoption where it was found that Incident Management, Problem Management, and Change Management were the top three operational processes adopted by industry (Marrone et al. 2014).

The outcome of the kickoff meeting resulted in Company X’s *Global Service Initiative*: the adoption of formal processes for Incident, Problem and Change Management. The vision of this initiative was to provide a substantial level of improvement for customers through the implementation of best practices in the following areas:

- Incident Management – improve in this process through application of ITSM best practices;
- Problem Management – implement problem management functions; and
- Change Management – initiate the global change/request management program.

The perceived anticipated benefits of this initiative were:

- Reduced *Case* resolution times;
- Increased first-call resolutions;
- Improved team efficiencies;
- Standardized *Case* documentation for improved knowledge transfer; and

- Greater customer satisfaction.

The researcher identified three ITSM champions at the case organization as catalysts to persuade other actors that it was in their interest to conform to a set of standards to improve IT processes. The idea was to create a social network of people, standards, and systems (Cater-Steel & McBride 2007).

The *Global Service Initiative* was planned as a cross-functional CSI project involving six global teams: Business Support, Operations, Trading Solutions, Execution Services, Engineering, and Program Management. The six global team leaders met and agreed upon the development of a new framework for IT Service Management. The Program Management Office (PMO) facilitated this meeting. As Director of Engineering, the researcher represented the Engineering team. Specific improvements to the global support organization and the implementation of ITSM best practices across all business units were agreed upon. The goal was to develop rigorous, repeatable and standardized processes that ultimately would be rolled-out across the global IT support organization and would generate improved performance.

A subsequent meeting, facilitated by Company X's PMO was held on 27 February 2015 with six process managers and five technical leads to review the current state of processes. The workflow for each process was drawn on a whiteboard with issues and challenges highlighted by participants. The analysis of the current state of processes highlighted some critical issues:

- Lack of one system to capture all issues;
- An unacceptably high number of incidents were being categorized as most critical;
- Inconsistent communication channels;
- Duplication of efforts across different business units;
- Lack of prioritization of incidents;
- Often the same issues continued to reoccur;
- Too much time spent "chasing" for status updates; and

- Unauthorized and unplanned changes were contributing to the excessive number of incidents.

The process managers identified 67 key assessment participants selected across the following six business units at Company X: Business Support, Operations, Trading Solutions, Execution Services, Engineering, and Program Management. The target business units were purposefully selected for the sample as they cover the business and IT functions at Company X and are involved in all ITSM processes. The Business Support unit consists of two tiers. Tier one functions as the service desk providing a central point of contact for handling customer issues. Tier one support is the focal point for customers reporting incidents and making service requests. Tier two staff handle escalated issues from tier one staff and also serve as the interface to other ITSM activities of Company X, such as problem management and change management. The Operations unit is responsible for the deployment and maintenance of the infrastructure and applications in the production data center and UAT (User Acceptance Testing) environments. The Trading Solutions unit works with customers to create custom deployment solutions. Execution Services is responsible for maintaining a high level of trade execution quality for customers. This business unit works closely with the business to analyze big data to craft trading strategies that best fit a customer's needs. Engineering is the unit that develops the FX cloud-based software, fixes defects and works with the operations team as part of the DevOps movement at Company X. The Program Management business unit manages several projects simultaneously and provides Company X management with regular reports on program status.

Some of the selected assessment participants were involved in multiple processes. The numbers of participants in each business unit and process, as well as their geographical dispersion, are listed in Table 5-1.

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Table 5-1 Number of participants across business units, processes, and geographic region

Organization Business Unit	Change Management	Incident Management	Problem Management	Geographic Region
Business Support	3	9	3	US, UK, Singapore
Operations	12	12	0	US, India
Trading Solutions	19	0	0	US, UK, Singapore, India
Execution Services	7	1	1	US
Engineering	0	0	14	US, India
Program Management	4	4	3	US
Total	45	26	21	

Figure 5-3 shows the organizational chart for Company X highlighting in yellow the business units selected for the process capability assessment.

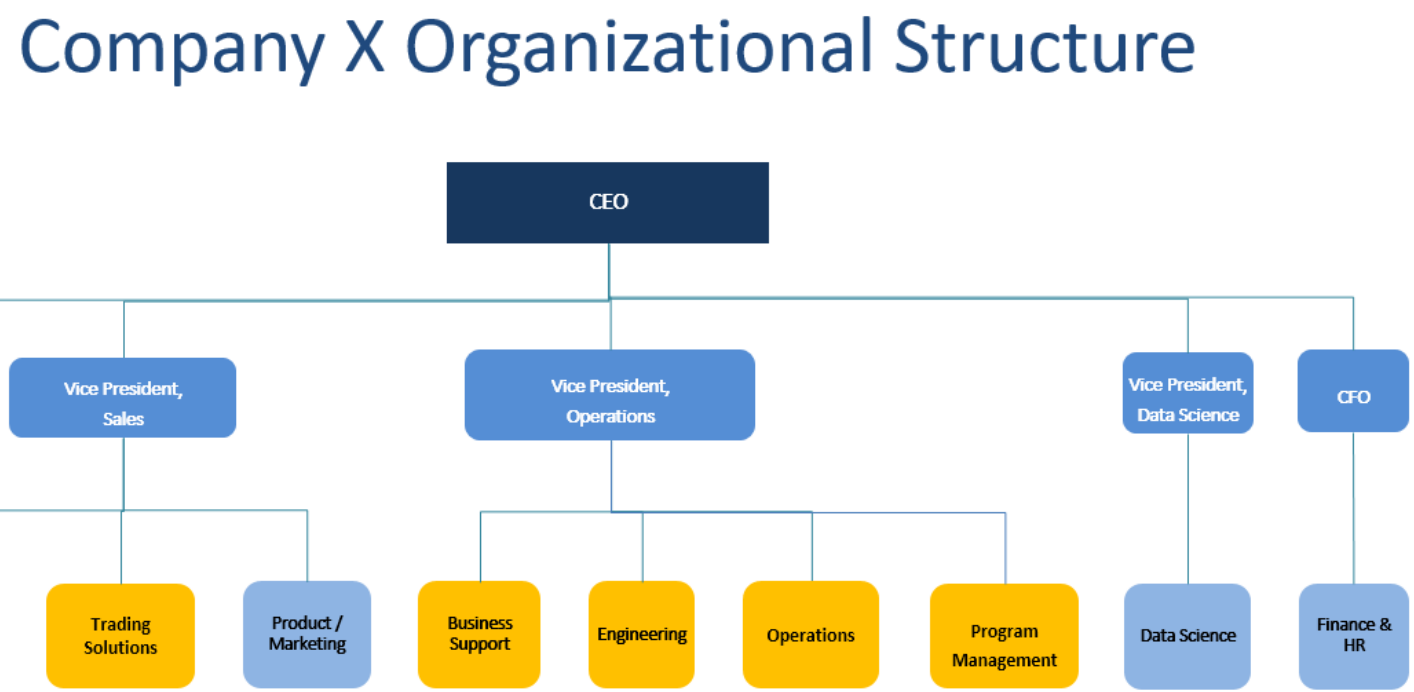


Figure 5-3 Company X's Organizational Chart

The researcher convened and facilitated a strategic planning meeting with process managers to establish a set of five CSFs that align with Company X's strategic business goals. Table 5-2 shows the CSFs that were defined for each process.

Table 5-2 Critical Success Factors for three processes at Company X

Incident Management	Problem Management	Change Management
Quickly resolve incidents	Minimize impact of problems	Protect services when making changes
Maintain IT service quality	Reduce unplanned labor spent on incidents	Make changes quickly and accurately in line with business needs
Improve IT and business productivity	Improve quality of services delivered	Make changes efficiently and effectively
Effectively resolve incidents	Effectively resolve problems and errors	Utilize a repeatable process for handling changes
Cost savings	Cost savings	Cost savings

Company X used SugarCRM® (2015) to track incidents and problems and for general customer support. SugarCRM is a customer relationship management (CRM) system offered as a Web application for sales-force automation, marketing initiatives, customer support and collaboration (SugarCRM 2015). Over the years, the management of the system grew to be overly complex, so Company X migrated to SalesForce® (2015) for customer relationship management and Zendesk® (2018) for customer support. Zendesk manages the three selected ITSM processes. Zendesk® (2018), a cloud-based customer service platform, was used for the data collection for the quantitative part of the study. The software provides an analytic plugin module, GoodData® (2015) that reports on the key performance metrics such as the number of incidents reported, resolved, unresolved over a period, and escalated to problem management. Also, Jira (Atlassian 2017) served as the bug tracking system for incidents and problems. Jira is a Web-based software-as-a-service product that provides bug tracking, issue tracking, and project management capabilities.

The next section details the second activity of the Kismet model.

5.3 KISMET Phase 2: Assess process capability and performance

As explained in Chapter 3 §3.5.2, the second activity of the KISMET model, *Perform a process assessment,* was adapted to include both process capability assessment and process performance assessment. The next section details the process capability assessment.

5.3.1 Process Capability Assessment

From the literature review, it is evident that ITSM process assessments guide process improvement and that transparently benchmarking process capabilities against an international standard is worthwhile (Shrestha et al. 2014). Practitioner resources suggest that organizations prefer an easy, cost-effective and timely process assessment mechanism that unveils a realistic indication of process capability (Mainville 2014).

The Software-Mediated Process Assessment (SMPA) approach to process assessment was chosen for this study, for its alignment with international standards, its transparency and efficiency, and its ability to objectively measure feedback from stakeholders (Shrestha et al. 2014). The SMPA approach uses online surveys for data collection and a decision support system for analysis and reporting. The detailed design of the SMPA approach is described in Shrestha et al. (2014). The SMPA approach allocates assessment questions to the survey participants, via an online interface, based on their role within each process: process performers; process managers; and external process stakeholders. Questions are based on the process assessment model (PAM) and sourced from an exemplar PAM for ITSM (ISO/IEC 15504 part 8). The PAM for ITSM (ISO/IEC 2012) consists of a set of base practices to achieve the process outcomes and a set of generic practices for process management (CL2), standardization (CL3), quantitative measurement (CL4) and innovation (CL5) of process capability (Shrestha et al. 2014).

Process attribute achievement ratings are calculated from the online survey respondents by the software tool using the measurement framework of the ISO/IEC 15504 standard. The process capability score is based on the average rating of all responses and uses the process attribute achievement scale as shown in Table 5-3. The process capability level can then be derived from the attribute ratings.

Table 5-3 Process attribute rating scale

F	Fully	There is certainty that process activities are usually performed.	>85%-100%
L	Largely	Process activities are performed in the majority of cases.	>50%-85%
P	Partially	Process activities are performed but not	>15%-50%
N	Not	Process activities are not or rarely performed.	0%-15%

The questionnaire data collection was facilitated through the SMPA approach to enable the researcher and case study organization to assess ITSM process capability. The three stages of the process capability assessment are described next: assessment preparation; assessment data collection via online surveys; and the analysis of the process capability assessment report.

Stage 1: Assessment Preparation

The University's research industry partner Assessment Portal Pty Ltd. that specializes in online assessment services provided the SMPA platform. On 10 November 2015, the researcher discussed the requirements of the survey by video conference with the CEO of Assessment Portal. Assessment Portal set up the survey by uploading the questions, participant information and entering the organization details. Training for the researcher on how to use the tool was conducted on 12 November 2015 by Assessment Portal. In the role of assessment facilitator, the researcher completed the sponsor survey for the organizational profile, allocated respondents to appropriate processes and roles, set up the assessment details, such as the target completion date, assessment objectives and text for the auto-generated emails. The researcher tested the survey invitation email, the facilitator interface, and survey interface.

The SMPA tool allocates assessment questions to the survey participants based on three process roles: process performers; process managers; and external process stakeholders. Staff members of the Program Management business unit were allocated to the External Process Stakeholder role for each process. To ensure anonymity, participant names were coded using a five character abbreviation to indicate the process, role and participant number, as shown in Table 5-4.

Table 5-4 Participant Process Role Codes

Code	Process	Role	Participant
IMPM	Incident Management	Process Manager	1-5
IMPP	Incident Management	Process Performer	1-19
IMPS	Incident Management	Process	1-4
PMPM	Problem Management	Process Manager	1-3
PMPP	Problem Management	Process Performer	1-15
PMPS	Problem Management	Process	1-3
CMPM	Change Management	Process Manager	1-5
CMPP	Change Management	Process Performer	1-37
CMPS	Change Management	Process	1-4

Participant responses were coded as shown in Table 5-5.

Table 5-5 Codes of Participants by Process and Role

ITSM Process	Process Managers	Process Performers	Process Stakeholders	Count
Incident Management	IMPM1-IMPM5	IMPP1-IMPP19	IMPS1-IMPS4	28
Problem Management	PMPM1-PMPM3	PMPP1-PMPP15	PMPS1-PMPS3	21
Change Management	CMPM1-CMPM5	CMPP1-CMPP37	CMPS1-CMPS4	46
Total	13	71	11	95

Although ISO/IEC 15504 provides for process capability levels from zero (incomplete) to five (optimizing), only questions relating to level 1 (performed), level 2 (managed) and level 3 (established) were used for all three processes. Company X had recently implemented formal ITSM processes, and it was not considered likely that process capability higher than level 3 would be evident.

<u>Stage 2: Assessment Data Collection</u>

Stakeholders identified in Phase 1 of the SMPA were initially contacted by email (participant contact information is available in Company X's Microsoft Outlook® contacts) on 16 November 2015 to explain the research objective and solicit participation in the assessment (see Appendix C.1). Later that day, an auto-generated survey invitation email was sent to all participants, outlining the purpose of the survey, requesting consent and providing a link to login to the SMPA tool. On 19 November 2015, an internal email using everyday business language was then sent to all participants with a clearer explanation (see Appendix C.2). On 23 November 2015, an email was sent to all participants to highlight the completion status of the survey at that point in time and to encourage participants to complete the survey. On 25 November 2015, a progress report was sent to process managers to have them encourage their team members to complete the survey by the deadline. An auto-generated email was sent out to all participants on 28 November 2015 to remind participants of the completion deadline of 30 November 2015. On the date of the deadline, 80 percent of the surveys were completed. Since many participants were on vacation during this period, it was decided to extend the close date of the survey to 5th December 2015. The closing date was extended to 4 December 2015 and advised to all participants (see Appendix C.3). All surveys were completed by the new deadline of 4 December 2015.

The survey closed on the newly scheduled close date, and the process capability assessment report was auto-generated by the Assessment Portal system.

Stage 3: Analysis of the Process Capability Assessment Report

The process capability assessment report was analyzed and discussed by the facilitator and his research supervisors from 7th December 2015 to 17th December 2015.

The process capability assessment report presented the process attribute achievement ratings and provided process improvement recommendations when any area of a process demonstrated risk (a score of *partial* achievement or lower).

For each process, scores were calculated based on valid answers (responses of *Fully*, *Largely*, *Partially* and *Not*) excluding *Do not know* and *Do not understand* responses.

A summary of the assessment survey results for all three processes is shown in Figure 5-4.

	Level 1 Performed	Level 2 Managed		Level 3 Established	
	Process Performance	Performance Management	Work Product Management	Process Definition	Process Deployment
Incident Management	L	L	L	L	L
Problem Management	L	P	P	P	P
Change Management	L	L	L	L	L

Legend	
"Fully"	F
"Largely"	L
"Partially"	P
"Not"	N

Figure 5-4 Assessment survey results

All three processes were rated at capability level 1, indicating that the process activities are performed. The processes achieve their purpose but in a non-repeatable way and with few controls. During each instance, the process is not implemented in a managed fashion (planned, monitored, and adjusted). The process inputs and outputs are not appropriately established, controlled, and maintained. Moreover, the way the processes are managed is not uniform throughout the organization.

Incident Management

In order to generate the assessment profile for Incident Management, 77 percent of assessment survey responses were considered as valid answers. Invalid responses comprised 22 percent *Do not know* and 1 percent selected *Do not understand*. Out of the 28 invited participants, 2 participants did not attempt the survey.

The summary of the assessment results for the Incident Management process is shown in Figure 5-5.

	Level 1	Level 2		Level 3	
Profile	Process Performance	Performance Management	Work Product Management	Process Definition	Process Deployment
Rating Score	L	L	L	L	L
Score Reliability	High	High	High	High	High
Number of responses	26	26	26	26	26

- F Fully: There is certainty that process activities are usually performed.
- L Largely: Process activities are performed in the majority of cases.
- P Partially: Process activities are performed but not frequently.
- N Not: Process activities are not or rarely performed.

Score Reliability percentage is calculated based on coefficient of variation (CV) that measures dispersion of responses from the average rating score at each process capability level.

- "High" score reliability when CV is below 30%
- "Moderate score reliability for CV between 30 and 50%
- "Poor" score reliability for CV above 50%

Figure 5-5 Incident Management Process Assessment Results

Problem Management

Problem management had 84 percent valid assessment survey responses. Less than 1 percent of participants did not understand the question with 16 percent did not know the answer to questions. All 21 invited survey participants completed the Problem Management assessment.

The summary of the assessment results for the Problem Management process is shown in Figure 5-6.

	Level 1	Level 2		Level 3	
Profile	Process Performance	Performance Management	Work Product Management	Process Definition	Process Deployment
Rating Score	L	P	P	P	P
Score Reliability	High	Poor	High	High	Moderate
Number of responses	21	21	21	21	21

- F Fully: There is certainty that process activities are usually performed.
- L Largely: Process activities are performed in the majority of cases.
- P Partially: Process activities are performed but not frequently.
- N Not: Process activities are not or rarely performed.

Score Reliability percentage is calculated based on coefficient of variation (CV) that measures dispersion of responses from the average rating score at each process capability level.

- "High" score reliability when CV is below 30%
- "Moderate score reliability for CV between 30 and 50%
- "Poor" score reliability for CV above 50%

Figure 5-6 Problem Management Assessment Results

Change Management

In order to generate the assessment profile for Change Management, 80 percent of assessment survey responses were considered. 29 percent of participants chose the *Do* *not know* option while less than 1 percent did not understand the question. Out of the 46 invited participants, 1 participant did not attempt the survey.

The summary of the assessment results for the Change Management process is shown in Figure 5-7.

	Level 1	Level 2		Level 3	
Profile	Process Performance	Performance Management	Work Product Management	Process Definition	Process Deployment
Rating Score	L	L	L	L	L
Score Reliability	High	High	High	High	Poor
Number of responses	45	45	45	45	45

F	Fully	There is certainty that process activities are usually performed.
L	Largely	Process activities are performed in the majority of cases.
P	Partially	Process activities are performed but not frequently.
N	Not	Process activities are not or rarely performed.

Score Reliability percentage is calculated based on coefficient of variation (CV) that measures dispersion of responses from the average rating score at each process capability level.

- "High" score reliability when CV is below 30%
- "Moderate score reliability for CV between 30 and 50%
- "Poor" score reliability for CV above 50%

Figure 5-7 Change Management Assessment Results

<u>Focus Group Workshop</u>

The researcher created a presentation outlining the survey results for the focus group workshop. The presentation included questions to evaluate the SMPA tool.

The researcher facilitated the focus group workshop at Company X on 13th January 2016. The workshop was held to enable group level discussion to evaluate the SMPA tool and discuss and refine the results of the process capability assessment report. A cross-section of seven survey participants was selected to participate in the focus group.

An invitation email was sent to the selected participants on 4th January 2016, outlining the purpose of the focus group and provided the Participant Information Sheet and Consent Form as attachments (included in Appendix C.4, Appendix B.5 and Appendix B.6). The consent forms were signed before proceeding. One invited participant did not agree to be recorded, so was excused from the focus group session. The meeting was video and audio recorded with the facilitator taking notes as necessary. The meeting duration was about one hour.

The workshop was conducted with a participant from each of the six business units across all three ITSM processes to discuss the process capability results and triangulate the data. Some participants played multiple roles across the three ITSM processes, as shown in Table 5-6.

Table 5-6 Participant Roles

Participant	Process Roles
Participant 1	IMPM1, PMPM1, CMPM1
Participant 2	IMPM2, CMPM2
Participant 3	IMPM3, CMPM3
Participant 4	IMPP1, CMPP1
Participant 5	IMPP2, PMPP2, CMPP2
Participant 6	PMPP1
Participant 7	IMPS1, PMPS1, CMPS1

The breakdown of the focus group participants by process and role is shown in Table 5-7.

Table 5-7 Coded participant breakdown by process and process role

ITSM Process	Process Manager	Process Performer	Process Stakeholder
Incident Management	IMPM1-IMPM3	IMPP1	IMPS1
Problem Management	PMPM1	PMPP1	PMPS1
Change Management	CMPM1-CMPM3	CMPP1	CMPS1

The comments entered in the surveys were reviewed for specific details of perceptions of process challenges. All responses to questions are detailed in the focus group transcripts.

<u>SMPA Tool Evaluation</u>

In the workshop, an evaluation of the SMPA tool was conducted. Table 5-8 lists the evaluation criteria, questions asked and sample responses.

Table 5-8 SMPA Tool Evaluation Criteria and Questions

Criterion	Questions and Sample Responses
Usefulness	How useful do you think it was to assess processes using online
	IMPP1: *"Speed of response."* PMPP1: *"It saved the progress, and whenever you came back you can start from where you stopped."*
Comfort	In your experience, how user-friendly was responding to the online surveys?
	IMPM1: *"There were some bugs because of how you had your survey set up for three levels versus five levels. I was asked to click the Continue button to proceed to level 4, but there was no Continue button."*
Efficiency	Were there too many or not enough questions?
	IMPS1: *"And a lot of the questions seemed redundant. The attention span is usually the first 5 minutes of taking the survey."*
Effectiveness	Does asking direct questions in an online survey gather accurate responses and make assessment results more visible?
	IMPM1: *"Your initial email you sent, it appeared as though the answers were anonymous to everyone."*
Trust	Is it more trustworthy to answer online surveys than interviews?
	IMPS1: *"I think this depends on the trust factors because we need to know to what extent it is anonymous."*

Based on the evaluation questions, the workshop participants agreed on the following points about the SMPA Tool:

- Online surveys are convenient;
- The survey contained too many questions – some were redundant;
- It would have been better to see all questions up front;
- The remaining time displayed is subjective – was not useful;
- Examples need to be more organization specific for better understanding of the question;
- Attentive span was lost after a few minutes;

- Training in ITSM language is required for better quality of responses.

The discussion on the Assessment Survey results is summarized as follows:

- assessment results for Incident and Problem Management were as expected;
- Change Management results were a surprise (until the focus group participants drilled deeper later);
- All participants thought that the measurement was reliable;
- There was interest in finding out why participants chose the *Do not know* option;
- Communication was highlighted as being the primary problem at Company X followed by the lack of training (in ITSM & Company X's process workflow);
- There was much speculation around the Change Management assessment results.

The comments staff entered in the survey were reviewed and found to be in line with the workshop participants' perceptions.

During the workshop, the survey results for each assessed process were evaluated with probing questions using five criteria. Table 5-9 shows the survey results evaluation criteria and probing questions for Incident Management as discussed in the workshop.

Table 5-9 Incident Management Survey Results Evaluation

Evaluation Criteria	Probing Discussion Questions	Summary of Responses
Communication	Do you believe that the information on Company X's Incident Management Process was communicated to all participants?	The focus group felt that communication of the Incident Management process was a problem and that only the Business Support business unit had more insight into the process than other business units.
Knowledge	Do you believe that all participants have sufficient knowledge to understand the questions?	The Change Management process manager felt that only the Business Support staff members had the knowledge to comprehend the questions.
Rating Score	Why do you think the rating score was ranked *Largely* for all three capability levels? That is, process activities are performed in the majority of cases.	The focus group felt that this is true and expected as incidents are dealt with by many people at Company X.
Score Reliability	Why do you think there is high reliability of responses across all three levels?	Most people feel that Incident Management is the most mature process.
Answer Breakdown	Why do you think 22% of participants chose the "Do not know" answer?	Lack of communication of the process.

The comments entered by Incident Management survey participants were reviewed further. Table 5-10 shows the selected option for the related survey question, and the comment entered.

Table 5-10 Survey Comments: Incident Management

Survey Question	Selected Option	Comment
Do you know if process inputs and outputs are regularly reviewed?	P	Depends on the urgency or how important the customer is.
Do you know if process outcomes are easily accessible?	Do Not Know	Maybe recorded in Jira or somewhere, but not everyone has access to review. We only depend on internal communication at the moment.
Do you know if the standard process provides information to implement multiple requirements?	Do Not Know	If this process is documented, it is not disseminated to all team members.

Problem Management

Table 5-11 shows the evaluation criteria and probing questions for Problem Management as discussed in the workshop.

Table 5-11 Problem Management Survey Results Evaluation

Evaluation Criteria	Probing Discussion Questions	Summary of Responses
Communication	Do you believe that the information on Company X's Problem Management was communicated to all participants?	The focus group felt that there was a lack communication of the Problem Management process and that only the Engineering business units had more insight into the process than other business units.

Evaluation Criteria	Probing Discussion Questions	Summary of Responses
Knowledge	Do you believe that all participants have sufficient knowledge to understand the questions?	The Problem Management process manager felt that only senior Engineering staff members had the knowledge to comprehend the questions.
Rating Score	Why do you think the rating score was ranked *Poor* for capability levels greater than 1? i.e., Process activities are performed in the majority of cases.	The focus group believed that all groups did not have an equal level of knowledge of this process.
Score Reliability	Why do you think there is *Poor* reliability of responses for process attribute 2.1 Performance Management?	The group felt that there was not enough awareness of how to manage performance and what it meant by all business units.
Answer Breakdown	Why do you think 16% of participants chose the "Do not know" answer?	Lack of communication of the process.

The comments entered by Problem Management survey participants were reviewed. Table 5-12 shows the selected option for the related survey question, and the comment entered.

Table 5-12 Survey Comments: Problem Management

Question	Selected Option	Comment
Do you know if there is a good organizational support to effectively manage and perform process activities?	P	Support to fix the problems is not there. Until that priority (fixing issues vs. adding new features) is changed this whole process will continue to be broken as far as the customer is concerned. My response is, "Yes, but in reality, this would be a Yes – only if you are deemed a priority."
Do you know if problems are effectively resolved?	L	If a stakeholder is aware
Do you know if stakeholders are kept informed about the status and progress of problem resolution?	P	based on priority

Change Management

Table 5-13 shows the evaluation criteria and probing questions for Change Management as discussed in the workshop.

Table 5-13 Change Management Survey Results Evaluation

Evaluation Criteria	Probing Discussion Questions	Summary of Responses
Communication	Do you believe that the information on Company X's Change Management was communicated to all participants?	The focus group believed that the information on Change Management was not communicated to all involved.
Knowledge	Do you believe that all participants have sufficient knowledge to understand the questions?	The consensus was that all participants of the process had sufficient knowledge of the process.
Rating Score	Why do you think the rating score was ranked *Largely* for all capabilities levels?	All focus group participants believed that this was because of the diverse groups operating in silos.
Score Reliability	Why do you think there is high reliability of responses for all process attributes except one? i.e., Process Deployment	All focus group participants believed that this was because of the diverse groups operating in silos.
Answer Breakdown	Why do you think 20% of participants chose the "Do not know" answer?	The group felt that this was indeed true.

The comments entered by Change Management survey participants were analyzed further. Table 5-14 shows the selected option for the related survey question, and the comment entered.

Table 5-14 Change Management Survey Comments

Question	Selected Option	Comment
Do you know if process activities and tasks are clearly defined?	P	For upgrade or release yes.
Do you know if appropriate training is provided to staff to better perform process activities in your organization?	N	The underlying system is too complex to have all-encompassing resources/tools to test configuration changes made in/out of change mgmt.
Do you know if appropriate training is provided to staff to better perform process activities in your organization?	L	I feel that training in Company X can be more institutionalized. For instance, training could be based on some syllabus, from a dedicated trainer. As the organization expands, it will be necessary to have formal training departments.

A summary of the number of comments per selected option for each process is shown in Table 5-15 (below).

Table 5-15 Survey Comments: Summary by Process and Selected Option

Process	Selection					Total Comments
	F	L	P	N	Don't Know	
Incident Management	2	3	2	0	3	10
Problem Management	0	3	4	2	0	9
Change Management	2	4	3	2	1	12

5.3.2 Financial Measurement

The KISMET model was enhanced to include financial measures as part of the process performance assessment. Financial measures related to the three selected processes were gathered.

Cost of Outages/Major Incidents

An outage or major incident at Company X is categorized into the following classes: grid down, risk position, system down, inaccurate state, stuck rate, customer connectivity issue, performance degradation and system issues with part of a customer solution. Table 5-16 shows example symptoms of Service Outages and Major Incidents at Company X.

Table 5-16 Examples of Service Outages and Major Incidents at Company X

Issue	Description	Criticality	Potential Costs Incurred
Grid down	A Grid down situation is a system-wide outage that affects all customers. The Business Support unit uses all their resources to resolve the problem and is also required to escalate to Engineering Managers and the Executive Staff. Business Support is responsible for contacting key customers, informing them of the system-wide outage and they inform the customer when the issue is resolved. Once the Grid has recovered, Business Support informs key customers that the system is available and apologizes for any inconvenience.	Emergency Critical	Average Loss in Trading Volume for the outage period Wasted labor costs
Risk Position	A risk position occurs when a trade goes into a pending state waiting for a response from a provider. Customers may have an open position that they cannot close as the market moves away from them. Business Support examines the Grid Monitors and determines where the Risk Positions are occurring. They determine if it is affecting a single or multiple customers or single or multiple liquidity providers. The issue is escalated to Operations informing them to what the next steps are with the problematic Liquidity Provider(s). Business Support would contact the problematic liquidity provider(s).	Emergency Critical	Credit offered to customers Fines or penalties Credit offered to customers Wasted labor costs

Issue	Description	Criticality	Potential Costs Incurred
System Down (impacts customer)	Business Support examines the Grid Monitors and narrows down which Systems are affected. The issue is escalated to Operations, Trading Solutions and Engineering. Business Support contacts key customers impacted by a system outage. They inform them that there is a system outage and that they will inform the customer when the issue is resolved. Once the issues are resolved, Business Support informs the customer(s) that the system is available and apologizes for any inconvenience. In case an Incident Report is required, Operations provides the draft incident report, and the Incident Manager prepares the final report.	Emergency Critical	Average Loss in Trading Volume for the period the system is down Wasted labor costs
Inaccurate state (customer hits EUR/USD, but gets filled with a GBP/JPY rate)	An example of this issue is when a customer hits EUR/USD, but gets filled with a GBP/JPY rate. Business Support first examines the Grid Monitors and narrows down the trades affected. They then escalate to Trading Solutions and Engineering.	Emergency Critical	Fines or penalties Wasted labor costs
Stuck Rate	This issue occurs when the rate aggregation service fails to include all incoming liquidity provider rates in the Volume Weighted Average Price (VWAP). The risk is that these old rates can be traded on, that may lead to a risk position for the trader.	Critical	Credit offered to customers Wasted labor costs

Issue	Description	Criticality	Potential Costs Incurred
	This issue is escalated to Operations to restart liquidity provider rate stream or escalated to Trading Solutions to investigate a Broker/Order Adaptor.		
Customer Connectivity issues	Issues with connectivity to Company X's Grid, either from the trading application or Application Programming Interface (API). These issues are escalated to Operations and Trading Solutions.	Critical	Average Loss in Trading Volume Wasted labor costs
Noticeable performance degradation impacting customer trading	This occurs when the virtual machine for a customer fails to run the garbage collection and utilizes a high percentage of memory. This is escalated to Operations and Trading Solutions.	High	Average Loss in Trading Volume Wasted labor costs
System issues with a part of customer solution	These could range from credit checks or inaccurate configuration of a component. These are escalated to Operations.	High	Average Loss in Trading Volume Wasted labor costs

The costs associated with outages and major incidents at Company X were calculated as the sum of the average loss in trading volume for the outage period plus payments/credit offered to customers.

Company X's revenue model is based on earning a dollar amount per one million dollars traded per customer. The dollar amount earned varies by customer and trading volume ranges. For the six month period 1 May 2015 to 31 October 2015, there were three major incidents and one outage at the case organization. As shown in Table 5-17 the cost of outages and major incidents at Company X during this period totaled $17,370.

Table 5-17 Cost of outages and major incidents at Company X (May-Oct 2015)

Category	Events	Financial Measure	Cost
Major Incident	28/06/2015 21:05 Support received 200+ Risk Position alerts. 21:37 Customer A's connection was restored, and trading resumed.	Average loss in trading volume	32 minutes $40,000,000 @ $5/million = $200
		Credit offered to customers	Risk Position = $30,000 Credit Offered @50% = $15,000
Major Incident	26/07/2015 21:22 Email from Customer B regarding connectivity issues. 22:05 Application server restarted, and Customer B was able to connect.	Average loss in trading volume	43 Minutes $60,000,000 @ $7/million = $420
Outage	10/08/2015 06:15 Notification of a connectivity issue from a customer. 07:25 Issued identified as related to the packet drop on one of Company X's Internet Service Providers (ISPs). 07:52 Operations disabled all routing via the affected ISP and switched to alternate ISP.	Average loss in trading volume	1 hour 37 minutes $300,000,000 @ an average of $5/million = $1,500
Major Incident	29/10/2015 14:39 Customer C users were unable to login to Portal, and LP prices were refreshing sporadically on the trading UI.	Average loss in trading volume	21 Minutes $50,000,000 @ $5/million = $250

Category	Events	Financial Measure	Cost
	14:50 Operations observed high load on one of Customer C's servers. 15: 00 Service restored and prices resumed on the trading UI.		
Total cost of outages and major incidents			$17,370

Process Costs

The calculations for the process costs are defined in Chapter 4 §4.3.1.

The labor assumptions applied to Company X are outlined in Table 5-18.

Table 5-18 Labor Metric Assumptions for Company X

Labor Assumption	Detail	Value
Available hours to work per year	40 hours x 52 weeks	2,080 hours
Total leave hours per year	15 days of vacation, 10 holidays and 5 days of sick leave (30 days per year x 8 hours)	240 hours
Time period review	6 months	0.5 year

Company X's annual costs in addition to an employee's hourly wage include payroll taxes, insurance, medical benefits, onsite lunch, equipment, software, supplies and training costs.

Table 5-19 shows the calculations for Company X's on-cost to calculate the fully-burdened annual cost per employee. The business units are described in §5.2.1.

Table 5-19 Company X's fully-burdened costs per employee

Cost Item	Tier 1	Tier 2	Operations	Engineering	Trading Solutions	Execution Services
Average annual salary	$82,291	$100,625	$76,173	$131,585	$126,854	$118,367
Add: On-cost items:						
Payroll taxes (8%)	$6,583	$8,050	$6,094	$10,527	$10,148	$9,469
Insurance (5%)	$4,115	$5,031	$3,809	$6,579	$6,343	$5,918
Medical benefits (1%)	$823	$1,006	$762	$1,316	$1,269	$1,184
Onsite lunch	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Equipment	$579	$550	$1,186	$1,650	$1,400	$685
Software licenses	$1,200	$1,212	$1,750	$2,100	$1,200	$1,200
Supplies	$100	$100	$150	$150	$150	$150
Training costs	$0	$800	$1,500	$1,000	$500	$0
Total on-costs	$15,400	$18,750	$17,250	$25,322	$23,010	$20,606
Total fully-burdened cost	$97,691	$119,375	$93,423	$156,907	$149,864	$138,973

Table 5-20, Table 5-21 and Table 5-22 show the costs per business unit for each of the processes after applying the formula described in §4.3.3.1.

Table 5-20 Incident Management Costs per Business Unit at Company X (May-Oct 2015)

Business Unit	Time[a]	# Staff	Hours Spent on Incidents	Cost/Hour	Total Cost
Support Tier 1	80%	7	5,152	$46.97	$241,989.44
Support Tier 2	30%	4	1,104	$57.39	$63,358.56
Operations	25%	13	2,990	$44.92	$134,310.80
Engineering	25%	14	3,220	$75.44	$242,916.80
Execution Services	40%	8	2,944	$72.05	$212,115.20
Trading Solutions	35%	19	6,118	$66.81	$408,743.58
Total cost of Incidents					$1,303,434.38
a) Proportion of Time Spent on Incidents					

Table 5-21 Problem Management Costs per Business Unit at Company X (May-Oct 2015)

Business Unit	Time[a]	# Staff	Hours Spent on Problems	Cost/Hour	Total Cost
Support Tier 1	5%	7	322	$46.97	$15,124.34
Support Tier 2	50%	4	1,840	$57.39	$105,597.60
Operations	50%	12	5,520	$44.92	$247,958.40
Engineering	50%	14	6,440	$75.44	$485,833.60
Execution Services	10%	8	736	$72.05	$53,028.80
Trading Solutions	20%	19	3,496	$66.81	$233,567.76
Total cost of Problems					$1,141,110.50
a) Proportion of Time Spent on Problems					

Table 5-22 Change Management Costs per Business Unit at Company X (May-Oct 2015)

Business Unit	Time[a]	# Staff	Hours Spent on Changes	Cost/Hour	Total Cost
Support Tier 1	5%	7	322	$46.97	$15,124.34
Support Tier 2	10%	4	368	$57.39	$21,119.52
Operations	40%	12	4,416	$44.92	$198,366.72
Engineering	10%	14	1288	$75.44	$97,166.72
Execution Services	15%	8	1104	$72.05	$79,543.20
Trading Solutions	35%	19	6118	$66.81	$408,743.58
Total cost of Changes					$820,064.08
a) Proportion of Time Spent on Changes					

5.3.3 Operationalizing the Behari ITSM Measurement Model

The researcher convened a meeting on 20 January 2015 with nine process managers and the Vice President of operations to identify the key operational metrics that could be used to derive the most applicable KPIs that satisfy the CSFs defined in §5.2.1.

Operational metrics

Operational metrics data were collected from Zendesk for the six month period 1 May 2015 to 31 October 2015. The researcher created Zendesk dashboards presenting the operational metrics for each process. The operational metrics selected for each process, with their source and actual data for the period assessed are shown in Table 5-23, Table 5-24, and Table 5-25.

Table 5-23 Incident Management Operational Metrics (May-Oct 2015)

Operational Metric	Data Source	Count	Time in Hours
Total number of incidents	Zendesk	10,171	
Average time to resolve Severity 1 and Severity 2 incidents	Zendesk		52.2
Number of incidents resolved within agreed service levels	Zendesk	3,377	
Number of high severity/major incidents	Zendesk	6,672	
Number of incidents with customer impact	Zendesk	3,371	
Number of incidents reopened	Zendesk	1,116	
Average incident response time	Zendesk		7.2
Average incident closure duration	Zendesk		166.5
Incidents completed without escalation	Zendesk	8,462	
Total available time to work on incidents	Zendesk		22,080
Total time spent resolving incidents	Labor reports		8,000

Table 5-24 Problem Management Operational Metrics (May-Oct 2015)

Operational Metric	Data Source	Count	Time in Hours
Number of repeat incidents	Zendesk	2	
Number of major problems	Zendesk	8	
Total number of incidents	Zendesk	7	
Total number of problems in pipeline	Zendesk	83	
Number of problems removed (error control)	Zendesk	16	
Number of known errors (root cause known and workaround in place)	Zendesk	5	
Number of problems reopened	Zendesk	3	
Number of problems with customer impact	Zendesk	3	
Average problem resolution time - severity 1 and 2 problems (hours)	Zendesk		664.5
Total available labor hours to work on problems	Zendesk		1000
Total labor hours spent working on and coordinating problems	Labor reports		200

Table 5-25 Change Management Operational Metrics (May-Oct 2015)

Operational Metric	Data Source	Count	Time in Hours
Total changes in pipeline	Zendesk	3,815	
Total changes implemented	Zendesk	125	
Number of failed changes	Zendesk	17	
Number of emergency changes	Zendesk	22	
Number of unauthorized changes detected	Zendesk	138	
Number of changes rescheduled	Zendesk	25	
Average process time per change (hours)	Zendesk		402
Number of changes resulting in incidents	Zendesk	27	
Total available labor hours to coordinate (not implement) changes	Staffing reports		49.1
Total labor hours spent coordinating changes			40

Key Performance Indicators

The researcher facilitated a meeting on the 21st January 2016 with a representative from each of the business units (Business Support, Operations, Trading Solutions, Execution Services, Engineering and Program Management), to discuss, select, and agree upon KPIs. Suggested KPIs from ITIL guidelines were presented by the researcher, and the most applicable KPIs that meet the organizational goals of Company X were discussed in detail.

The list of KPIs and their meaning for each process as agreed by IT and the business at Company X is shown below in Table 5-26, Table 5-27, and Table 5-28.

Table 5-26 Key Performance Indicators for Incident Management

KPI	KPI Meaning
Incident Management Process Capability	How good are we at our Incident Management practices?
Process performance metrics	
Number of incident occurrences	How many incidents do we experience within our infrastructure?
Number of high severity/major Incidents	How many major incidents do we experience?
Incident resolution rate	How successful are we at resolving incidents per business requirements?
Customer incident impact rate	How well do we prevent incidents from impacting customers?
Incident reopen rate	How successful are we at permanently resolving incidents?
Average time to resolve severity 1 and 2 incidents (hours)	How quickly are we resolving incidents?
Average incident response time (hours)	How quickly are we responding to incidents?
Percentage of incidents completed without escalation	How successful are we at one-touch tickets?
Incident labor utilization rate	What proportion of available labor capacity is spent handling incidents?
Financial Measures	
Incident management cost	What does it cost us to manage the process?
Cost of outages	What do outages and major incidents cost us?

Table 5-27 Key Performance Indicators for Problem Management

KPI	KPI Meaning
Problem management process capability	How good are our Problem Management practices?
Process performance metrics	
Incident repeat rate	How effective are we at minimizing repeat incidents?
Number of major problems	How many major problems do we experience?
Problem resolution rate	What percentage of problems have we eliminated?
Problem workaround rate	For what percentage of problems do we implement workarounds?
Problem reopen rate	How successful are we at removing problems permanently?
Customer impact rate	How well are we keeping problems from impacting customers?
Average problem resolution time - severity 1 and 2 problems (hours)	How long does it take us to resolve problems?
Problem labor utilization rate	How much available labor capacity is spent handling problems?
Financial Measures	
Problem management cost	What does it cost us to manage the process?
Cost of outages	What do outages and major problems cost us?

Table 5-28 Key Performance Indicators for Change Management

KPI	KPI Meaning
Incident management process capability	How good are our Change Management practices?
Process performance metrics	
Change efficiency rate	How efficient are we at handling changes?
Change success rate	How effective are we at handling changes?
Emergency change rate	What percentage of changes are emergencies?
Change reschedule rate	How well do we implement changes on schedule?
Average process time per change (hours)	How long does the average change take?
Unauthorized change rate	What percentage of changes bypass the Change process?
Change incident rate	How much available labor capacity is spent handling changes?
Change labor workforce utilization	How much available labor capacity is spent handling problems?
Financial Measures	
Incident management cost	What does it cost us to manage the process?
Cost of outages	What do outages and major incidents cost us?

Tolerance Thresholds and KPI Scoring

Based on the KPI method detailed in Chapter 4 §4.4.2, the KPI items, established threshold targets, the desirable result (polarity), the calculations of the KPI results, and the actual results for the case organization are shown below in Table 5-29,

Table 5-30 and Table 5-31 for incident management, problem management and change management respectively. In these tables, the color of the KPI Result cell indicates the level of achievement of the KPI. Green indicates that the KPI is being met, yellow indicates that the KPI result is within the threshold and red indicates that the KPI is not being met.

Table 5-29 KPI Threshold Targets, Results, and Scores for Incident Management

KPI Item	Target Level	Warning Level	Calculation	Polarity[a]	KPI Result	KPI Score[b]
Incident management process capability	2	1	Outcome of process assessment as described in §4.1	M	1	2
Process performance metrics						
Number of incident occurrences	10,000	12,000	Total number of incidents	L	10,171	2
Number of high severity/major incidents	5000	6000	Number of high severity/major incidents	L	6,672	3
Incident resolution rate	50%	40%	Number of incidents resolved within agreed timeframe/ Total number of incidents	M	33%	3
Customer incident impact rate	30%	50%	Number of incidents with customer impact/ Total number of incidents	L	33%	2
Incident reopen rate	10%	20%	Number of incidents reopened/ Total number of incidents	L	11%	2
Average time to resolve severity 1 and 2 incidents (hours)	40	60	Average time to resolve severity 1 and 2 incidents	L	52.20	2
Average incident response time (hours)	4	8	Average incident response time	L	7.2	2
Percentage of incidents completed without escalation	90%	70%	Incidents completed without escalation / Total number of incidents	M	83%	2
Incident labor utilization rate	50%	75%	Total labor hours spent resolving incidents/ Total available labor hours to work on incidents	L	36%	1
Financial Measures						
Incident management cost	$1,000,000	$1,200,000	Calculation shown in Table 5-20	L	$1,303,416	3
Cost of outages	$15,000	$20,000	Calculation shown in Table 5-17	L	$17,370	2

KPI Item	Target Level	Warning Level	Calculation	Polarity[a]	KPI Result	KPI Score[b]
Note: a) Polarity: L indicates a lower value is desirable; M indicates a higher value is desirable b) KPI score: 1 indicates KPI is met; 2 indicates a warning - KPI is within threshold; 3 indicates KPI is not met						

Table 5-30 KPI Threshold Targets, Results, and Scores for Problem Management

KPI Item	Target Level	Warning Level	Calculation	Polarity[a]	KPI Result	KPI Score[b]
Problem management process capability level	2	1	Outcome of process assessment as described in §4.1	M	1	2
Process performance metrics						
Incident Repeat Rate	15%	20%	Number of repeat incidents / Total number of incidents	L	28.57%	3
Number of Major Problems	10	12	Number of high severity and major problems	L	8	1
Problem Resolution Rate	90%	80%	Number of problems removed(error control) / Total number of problems	M	19.3%	3
Problem Workaround Rate	30%	50%	Number of known errors / Total number of problems	L	6%	1
Problem Reopen Rate	10%	20%	Number of problems reopened / Total number of problems	L	3.6%	1
Customer Impact Rate	15%	20%	Number of problems with customer impact / Total number of problems	L	0%	1

KPI Item	Target Level	Warning Level	Calculation	Polarity[a]	KPI Result	KPI Score[b]
Average Problem Resolution Time - Severity 1 and 2 Problems (Hours)	80	120	Average problem resolution time in hours	L	664.5	3
Problem Labor Utilization Rate	50%	75%	Total labor hours spent working on and coordinating problems / Total available labor hours to work on problems	L	20%	1
Financial Measures						
Problem management cost	$1,000,000	$1,200,000	Calculation shown in Table 5-21	L	$1,141,073	2
Cost of outages	$15,000	$20,000	Calculation shown in Table 5-17	L	$17,370	2
Note: a) Polarity: L indicates a lower value is desirable; M indicates a higher value is desirable b) KPI score: 1 indicates KPI is met; 2 indicates a warning - KPI is within threshold; 3indicates KPI is not being met						

Table 5-31 KPI Threshold Targets, Results, and Scores for Change Management

KPI Item	Target Level	Warning Level	Calculation	Polarity[a]	KPI Result	KPI Score[b]
Change management process capability level	2	1	Outcome of process assessment as described in §4.1	M	1	2
Process performance metrics						
Change Efficiency Rate	80%	65%	Total changes implemented / Total changes in pipeline	M	3.3%	3
Change Success Rate	80%	70%	1-(Number of failed changes / Total changes implemented)	M	86%	1
Emergency Change Rate	60%	80%	Number of emergency changes / Total changes in pipeline	L	57.7%	1

KPI Item	Target Level	Warning Level	Calculation	Polarity[a]	KPI Result	KPI Score[b]
Change Reschedule Rate	30%	50%	Number of changes rescheduled / Total changes in pipeline	L	65.5%	3
Average Process Time Per Change (Hours)	160	200	Average process time per change in hours	L	401.6	3
Unauthorized Change Rate	15%	20%	Number of unauthorized changes detected / Total changes in pipeline	L	0.6%	1
Change Incident Rate	5%	7%	Number of changes resulting in incidents / Total changes implemented	L	0.2%	1
Change Labor Workforce Utilization	50%	75%	Total labor hours spent coordinating changes / Total available labor hours to coordinate (not implement) changes	L	81%	3
			Financial Measures			
Change management cost	$1,000,000	$1,200,000	Calculation shown in Table 5-22	L	$820,061	1
Cost of outages	$15,000	$20,000	Calculation shown in Table 5-17	L	$17,370	2

Note:

a) Polarity: L indicates a lower value is desirable; M indicates a higher value is desirable

b) KPI score: 1 indicates KPI is met; 2 indicates a warning - KPI is within threshold; 3indicates KPI is not being met

Linking KPIs to Critical Success Factors

An outcome of the kickoff meeting held on 23 February 2015 was the establishment of two strategic CSFs: Improve IT and Business Productivity, and Maintain IT Service Quality; and two tactical CSFs: Quickly Resolve Incidents, and Effectively Resolve Incidents. The researcher included a fifth CSF of reducing costs as an outcome of a process improvement initiative at the organization. CSF scores were derived from one or more KPIs by comparing how those KPIs performed within the tolerance range.

Table 5-32, Table 5-33 and Table 5-34 show the KPIs associated with each CSF for each of the three processes.

Table 5-32 Incident Management: Mapping of KPIs to CSFs

Critical Success Factor	Associated Key Performance Indicator
Quickly Resolve Incidents	Number of high severity/major incidents Incident resolution rate Incident reopen rate Average problem resolution time - severity 1 and 2 problems (hours) Percentage of Incidents completed without escalation Incident labor utilization rate Incident management cost
Maintain IT Service Quality	Number of high severity/major incidents Customer incident impact rate Average problem resolution time - severity 1 and 2 problems (hours) Average incident response time Incident labor utilization rate
Improve IT and Business Productivity	Number of incident occurrences Incident resolution rate Incident reopen rate

Critical Success Factor	Associated Key Performance Indicator
	Average incident response time Percentage of Incidents completed without escalation Incident management cost Incident management process capability
Effectively Resolve Incidents	Average problem resolution time - severity 1 and 2 problems (hours) Percentage of Incidents completed without escalation Incident labor utilization rate Incident management cost Cost of major issues and outages
Cost Savings	Number of high severity/major incidents Incident resolution rate Percentage of Incidents completed without escalation Incident labor utilization rate Incident management cost Cost of major issues and outages Incident management process capability

Table 5-33 Problem Management: Mapping of KPIs to CSFs

Critical Success Factor	Key Performance Indicator
Minimize Impact of Problems (Reduce Incident Frequency/Duration)	Incident repeat rate Number of major problems Problem workaround rate Problem reopen rate Average problem resolution time - severity 1 and 2 problems (hours)

Critical Success Factor	Key Performance Indicator
Reduce Unplanned Labor Spent on Incidents	Incident repeat rate Problem resolution rate Problem reopen rate Customer impact rate Problem labor utilization rate
Improve Quality of Services Being Delivered	Problem workaround rate Customer impact rate Average problem resolution time - severity 1 and 2 problems (hours) Problem management cost
Effectively Resolve Problems and Errors	Problem reopen rate Average problem resolution time - severity 1 and 2 problems (hours) Problem labor utilization rate Cost of outages
Cost Savings	Customer impact rate Problem labor utilization rate Problem management cost Problem management process capability

Table 5-34 Change Management: Mapping of KPIs to CSFs

Critical Success Factor	Key Performance Indicator
Protect Services when Making Changes	Change efficiency rate Change success rate Emergency change rate Average process time per change (hours) Unauthorized change rate

Critical Success Factor	Key Performance Indicator
	Change labor workforce utilization
Make Changes Quickly and Accurately in line with Business Needs	Change success rate Change reschedule rate Unauthorized change rate Change incident rate Change management cost
Make Changes Efficiently and Effectively	Change efficiency rate Change success rate Average process time per change (hours) Change incident rate Change labor workforce utilization Cost of outages
Utilize a Repeatable Process for Handling Changes	Unauthorized change rate Change labor workforce utilization Change management cost Change management process maturity
Cost Savings	Change incident rate Change management cost Cost of outages Change management process maturity

Table 5-35, Table 5-36 and Table 5-37 show the CSF attainment level and scores derived from the highest value of the associated KPI scores as explained in §4.5.1.

Table 5-35 Incident Management: CSF Attainment and CSF Scores

Critical Success Factor	CSF Attainment	CSF Score
Quickly resolve incidents	Low	3
Maintain IT service quality	Low	3
Improve IT and business productivity	Low	3

Critical Success Factor	CSF Attainment	CSF Score
Effectively resolve incidents	Medium	2
Cost Savings	Low	3

Table 5-36 Problem Management: CSF Attainment and CSF Scores

Critical Success Factor	CSF Attainment	CSF Score
Minimize Impact Of Problems (Reduce Incident Frequency/Duration)	Low	3
Reduce Unplanned Labor Spent On Incidents	Low	3
Improve Quality Of Services Being Delivered	Low	3
Effectively Resolve Problems and Errors	Low	3
Cost Savings	Medium	2

Table 5-37 Change Management: CSF Attainment and CSF Scores

Critical Success Factor	CSF Attainment	CSF Score
Protect Services When Making Changes	Low	3
Make Changes Quickly And Accurately In Line With Business Needs	Low	3
Make Changes Efficiently And Effectively	Low	3
Utilize A Repeatable Process For Handling Changes	Low	3
Cost Savings	Medium	2

Outcome Risks

As described in §4.5.2, after determining the CSF attainment levels and scores, the researcher worked with process managers at Company X to compile a list of outcome risks and then with input from process managers, associated CSFs with these risks.

Table 5-38 provides a list of Company X's outcome risks, the associated CSF scores for the Incident Management process and the derived risk levels. Outcome risk levels were derived from the maximum of the CSF score of the associated CSF, as shown in the last row of Table 5-38.

As an example, the *service outages* outcome risk is mapped to three CSFs: *maintain IT service quality*, *effectively resolve incidents* and *cost savings*. From Table 5-35, the attainment of the CSFs *maintain IT service quality* and *cost savings* are *Low*, scoring 3, while the attainment of the CSF *effectively resolve incidents* is *Medium*, scoring 2. To model the worst-case scenario, the maximum of these scores (3) is used to derive the outcome risk level of *High*.

Table 5-39 and Table 5-40 provide a list of Company X's outcome risks, derived risk levels and the associated CSF scores for the Problem Management and Change Management processes.

Table 5-38 Incident Management: Mapping of Outcome Risks to CSF Scores

Outcome Risk Item	Critical Success Factor Score					Risk Level
	Quickly Resolve Incidents	Maintain IT Service Quality	Improve IT and Business Productivity	Effectively Resolve Incidents	Cost Savings	
Service outages	0	3	0	2	3	High
Rework	3	0	3	2	3	High
Waste	3	0	3	2	3	High
Delayed solutions	0	0	3	2	0	High
Slow operational processes	0	0	3	2	0	High
Security breaches	0	3	0	0	3	High
Slow turnaround times	0	0	0	2	0	Moderate
Unexpected costs	3	3	3	2	3	High
Higher or escalating costs	3	3	3	2	3	High
Slow response to business needs and	3	0	3	2	3	High
Inability to scale	3	0	3	0	0	High
Fines and penalties	0	0	0	0	3	High
High levels of non-value labor	3	0	3	2	3	High
Loss of market share	0	3	3	2	3	High
Loss of revenue/sales	0	3	0	2	3	High

Table 5-39 Problem Management: Mapping of Outcome Risks to CSF Scores

Outcome Risk Item	Critical Success Factor					Risk Level
	Minimize Impact of Problems (Reduce Incident Frequency/Duration)	Reduce Unplanned Labor Spent on Incidents	Improve Quality of Services Being Delivered	Effectively Resolve Problems and Errors	Cost Savings	
Service outages	0	3	0	3	2	High
Rework	3	0	3	3	2	High
Waste	3	0	3	3	2	High
Delayed solutions	0	0	3	3	0	High
Slow operational processes	0	0	3	3	0	High
Security breaches	0	0	0	3	2	High
Slow turnaround times	3	0	0	3	0	High
Unexpected costs	3	3	3	3	2	High
Higher or escalating costs	3	3	3	3	2	High
Slow response to business needs and	0	0	3	3	2	High
Inability to scale	3	0	3	0	0	High
Fines and penalties	0	0	0	0	2	Moderate
High levels of non-value labor	3	0	3	3	2	High
Loss of market share	0	3	3	3	2	High
Loss of revenue/sales	3	0	3	0	2	High

Table 5-40 Change Management: Mapping of Outcome Risks to CSF Scores

Outcome Risk Item	Critical Success Factor					Risk Level
	Protect Services when Making Changes	Make Changes Quickly and Accurately in Line with Business Needs	Make Changes Efficiently and Effectively	Utilize a Repeatable Process for Handling Changes	Cost Savings	
Service outages	0	3	0	3	2	High
Rework	3	0	3	3	2	High
Waste	3	0	3	3	2	High
Delayed solutions	0	0	3	3	0	High
Slow operational processes	0	0	3	3	0	High
Security breaches	0	0	0	3	2	High
Slow turnaround times	3	0	0	3	0	High
Unexpected costs	3	3	3	3	2	High
Higher or escalating costs	3	3	3	3	2	High
Slow response to business needs and changes	0	0	3	3	2	High
Inability to scale	3	0	3	0	0	High
Fines and penalties	0	0	0	0	2	Moderate
High levels of non-value labor	3	0	3	3	2	High
Loss of market share	0	3	3	3	2	High
Loss of revenue/sales	3	0	3	0	2	High

ITSMP² Risk Level Scorecard

The researcher met with the three process managers at Company X, and the decision was made to set the target risk threshold level at 2.0 or less (moderate or low risk) for all performance dimensions of the ITSMP². For each dimension of the ITSMP², the average score of the maximum Business Risk score associated with a dimension was calculated are compared to the threshold to deduce the ITSMP² Risk Level. If the Risk Level Score was less than 1.0, the risk level was considered to be low, if less than 2.0 moderate, otherwise high. Table 5-41, Table 5-42 and Table 5-43 show the ITSMP² Risk Level and scores derived from the average associated Business Risk score for each of the three processes.

Table 5-41 Incident Management: ITSMP² Risk Levels

ITSMP² Performance	Risk Level Score	Risk Level
Operational	2.9	High
Customer Satisfaction	2.9	High
Productivity	2.9	High
Market	2.8	High
Financial	3.0	High

Table 5-42 Problem Management: ITSMP² Risk Levels

ITSMP² Performance Dimension	Attainment Level Score	Risk Level
Operational	3.0	High
Customer Satisfaction	3.0	High
Productivity	3.0	High
Market	2.8	High
Financial	2.9	High

Table 5-43 Change Management: ITSMP² Risk Levels

ITSMP² Performance Dimension	Risk Level Score	Risk Level
Operational	3.0	High
Customer Satisfaction	3.0	High
Productivity	3.0	High
Market	2.8	High
Financial	2.9	High

ITSMP^2 Risk Level Scorecard

The ITSMP^2 Risk Level scores in Table 5-41, Table 5-42 and Table 5-43 are represented graphically to show their deviation from the target as shown in Figure 5-8, Figure 5-9 and Figure 5-10. As a result of these outcomes, process improvement plans were developed to improve processes.

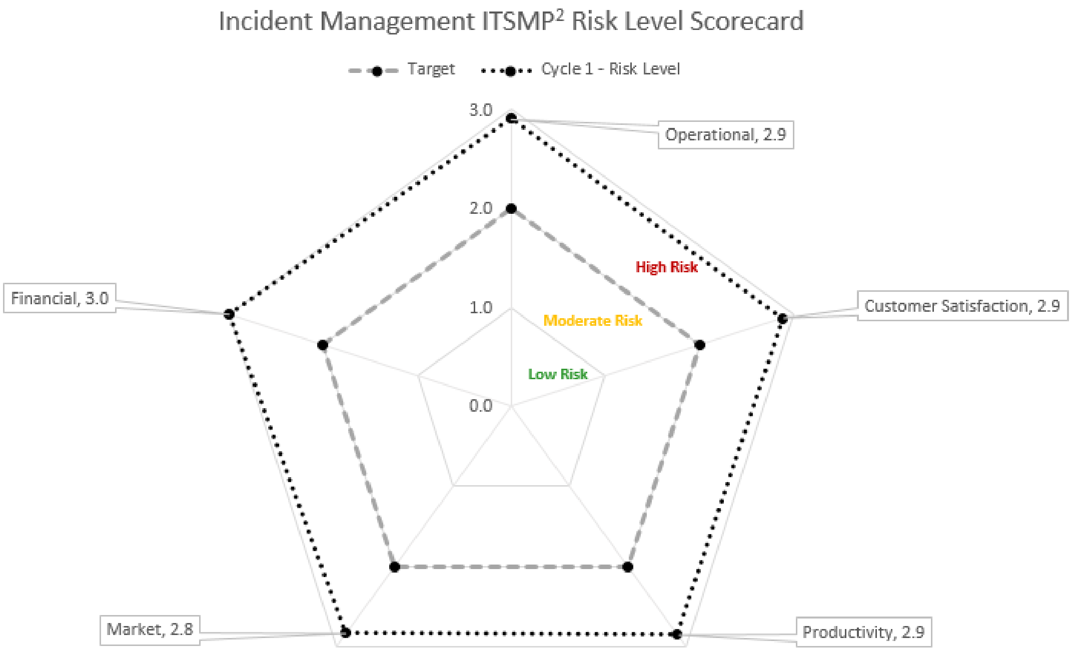


Figure 5-8 ITSMP^2 Risk Level Scorecard for Incident Management

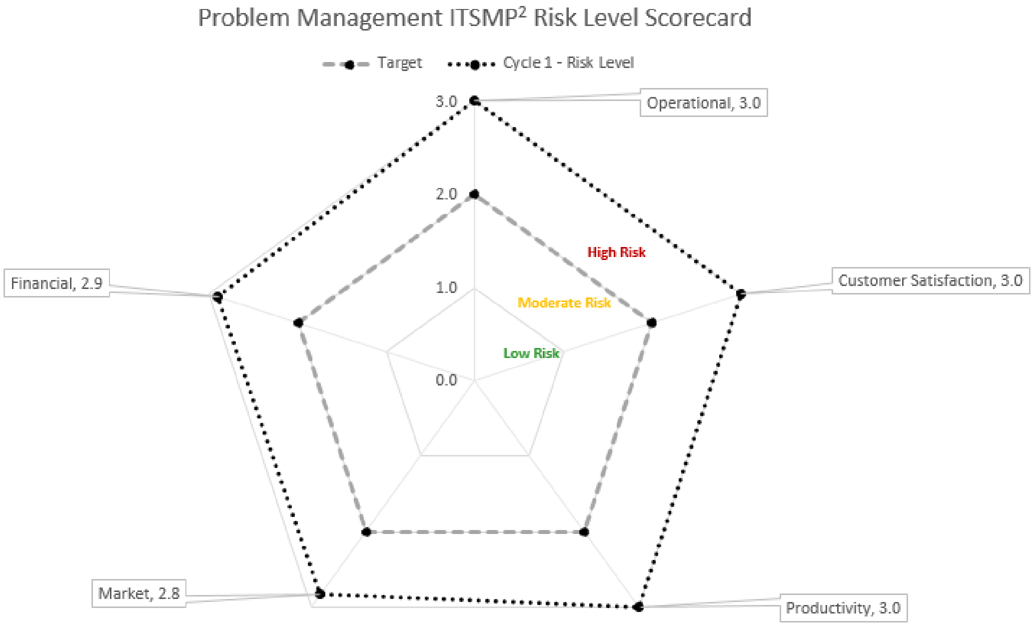


Figure 5-9 ITSMP² Risk Level Scorecard for Problem Management

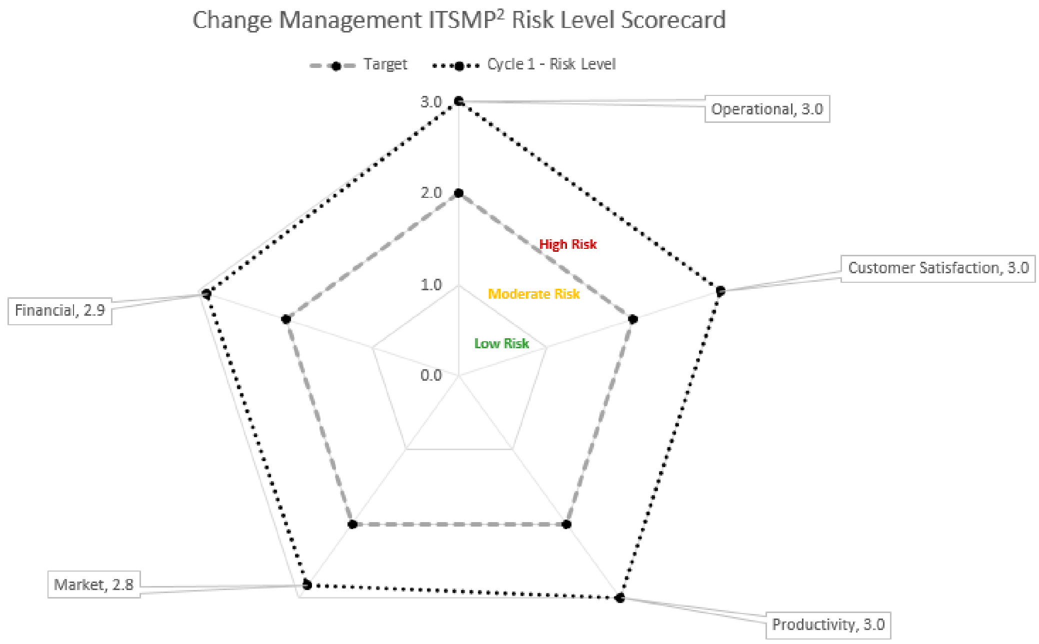


Figure 5-10 ITSMP² Risk Level Scorecard for Change Management

5.4 KISMET Phase 3: Plan process improvement action

This phase is the *action* part of the action research and served to specify actions the organization needs to take to address the problems identified in the diagnose phase. This phase seeks to provide a specific and tangible approach to trying out new ideas in an attempt to solve the original problem(s). The researcher collaborated with Company X practitioners to devise plans based on the results of the diagnosis to improve processes.

The researcher met with the process managers in February 2016 to analyze the challenges exposed by the process capability survey results and process performance results to formulate improvement action plans.

The SMPA report and the outcome of the focus group workshop formed the basis of a guide to the process improvement interviews. Semi-structured interviews/meetings were conducted with the process managers from 22nd February 2016 to 29th February 2016. Participants were provided with an interview information sheet and a consent form prior to the meetings (see Appendix B.3 and Appendix B.4). These meetings were held in a conference room for about an hour per day for six days. Challenges exposed by the process capability survey results were analyzed to formulate improvement action plans. The reported SMPA recommendations were discussed and actions proposed for the most applicable recommendations. The performance assessment results were analyzed, and plans were made to improve high-risk areas.

5.4.1 Incident Management

An incident is an unplanned interruption to a service. An interruption to a service is a reduction in quality below the agreed service levels. The purpose of Incident Management is to restore service to the user. Incident Management can be measured on the restoration of service (OGC 2007).

The primary goal of the Incident Management process is to restore normal service operation as quickly as possible and minimize the adverse impact on business operations, thus ensuring that the best possible levels of service quality and availability are maintained.

The following activities of Incident Management were identified and immediate potential improvements discussed.

Incident *Case* Creation

All communication (phone, email, instant messages) related to each incident should be captured in a *Case*. Anything that is actionable should be a *Case*, including all incidents and requests. All *Cases* should be logged into one system, for visibility, history of interaction, knowledge base correlation and metrics.

Categorization of Incidents

A new redesigned Zendesk *Case* Form was developed. The purpose was to capture key information such as requests vs. incidents, environment, and component. The expected benefits were:

- Reduced triage time (e.g., information needed to start investigations or process requests are immediately available), and
- Better metrics.

Prioritization of Incidents

A whiteboard session was organized by the researcher with Business Support and the VP of Trading Operations to discuss Company X's major incidents, the impact of them and how to prioritize the incidents. A prioritization matrix was developed to establish a hierarchy of elevation factors used to prioritize customer incidents and requests. Figure 5-11 shows a photo taken of the whiteboard illustration around the discussion of the following points:

- Financial risk to customer;
- Trading revenue;
- Service criticality;
- Number of customer organizations affected; and
- The reputation of Company X.

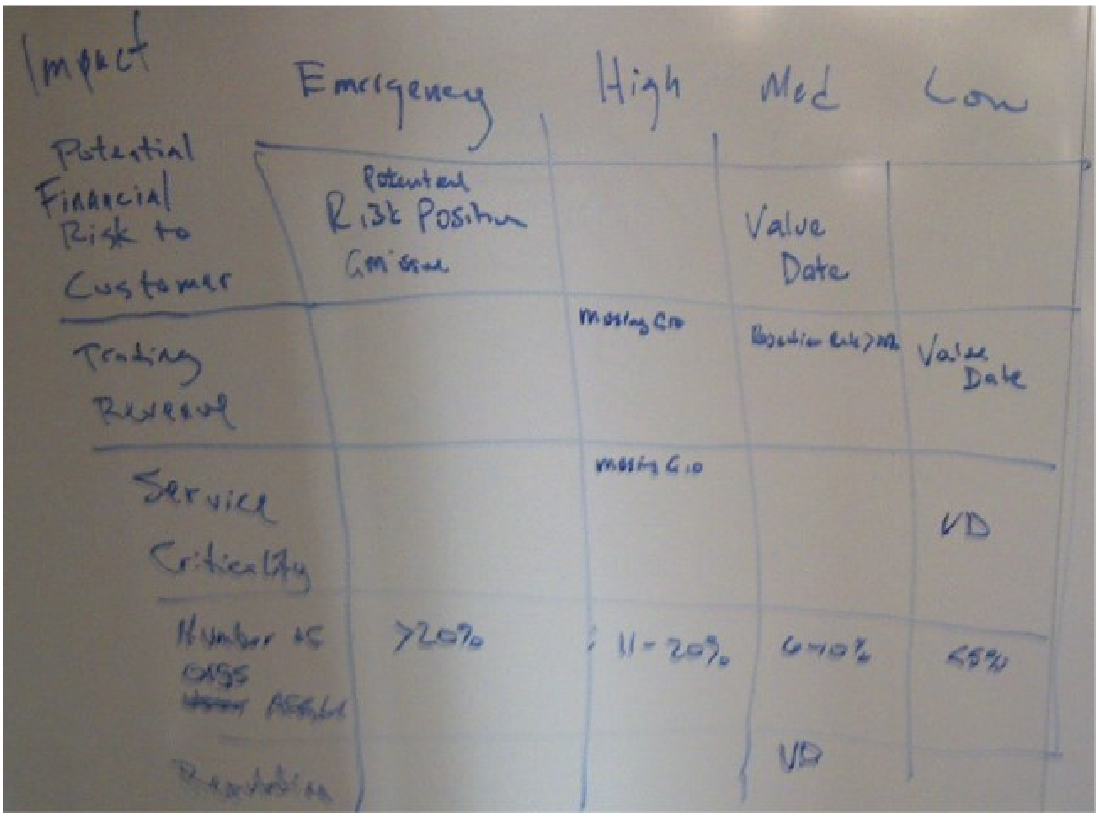


Figure 5-11 Prioritization matrix (Photo by researcher)

Recommendations and Plan of Action for Incident Management Improvement

Appendix C.6 presents the SMPA process capability assessment report on observations, recommendations, and comments entered by survey participants. Also included are the actions planned for each item.

5.4.2 Problem Management

Problem Management, as defined by Company X, is the ongoing service concerned with minimizing the impact of problems affecting the availability and services of the service delivery environment, whilst minimizing expenditure of resource and maintaining the highest level of client satisfaction.

The following activities and possible improvements of Problem Management were discussed.

Problem Identification, Classification, and Prioritization

It was agreed by all participants of the meeting that in most cases problems were being incorrectly identified. Incident Management performers were not linking incidents to problems, and most major incidents were being identified as problems. Although incidents were being resolved by the Service Desk, the root cause of the resolved incidents was not being tracked to prevent re-occurrence of the incident. A comment from the Incident Manager:

"Business Support tier 1 staff believe that incidents become problems, and so escalate what they believe to be a major incident to tier 2 as problems".

The following plan to improve problem identification, classification and prioritization were discussed and agreed upon by all participants of the meeting:

- To establish a clear definition of what is problem is for Company X;
- The process of creating a bug for the problem in Jira, linking one or more incidents to the bug and linking the SalesForce *Case* to the Zendesk ticket;
- To create an escalation process for problems not meeting customer service level agreements;
- To create internal operational level agreements;
- To establish a communication process to track the status and progress of the resolution of problems;
- To use the same classification scheme and prioritization matrix as Incident Management.

Recommendations and Plan of Action for Problem Management Improvement

Appendix C.7 presents the SMPA process capability assessment report on observations, recommendations, and comments entered by survey participants. Also included are the actions planned for each item.

5.4.3 Change Management

According to ISO/IEC 20000-4, the purpose of the change management process to ensure all changes are assessed, approved, implemented and reviewed in a controlled manner (ISO/IEC 2010).

The expected outcomes of a successful implementation of the Change Management process at Company X were discussed, and the following improvement plan was devised:

- All change requests should be recorded and classified in Zendesk;
- Change requests should be assessed at a weekly meeting;
- Change requests are formally approved by a manager before changes are developed and deployed;
- A schedule of changes and releases should be recorded in Zendesk and communicated to interested parties;
- A checkout plan should be developed;
- A rollback plan should be in place.

A new Zendesk *Case* Form was designed to capture change requests. The purpose was to capture key information such as listed above.

Recommendations and Plan of Action for Change Management Improvement

Appendix C.8 presents the SMPA process capability assessment report on observations, recommendations, and comments entered by survey participants. Also included are the actions planned for each item.

5.5 KISMET Phase 4: Design process improvement guidelines

The purpose of this phase is to define and document process roles and responsibilities, actions, metrics, and relationships to other ITSM processes.

In this phase, the researcher in collaboration with process managers developed a guideline for each process outlining the following items: definition of the main objectives, key process terminology, the scope of the process, the definition of the roles and responsibilities, process flow, escalation procedures, RACI charts, reporting requirements and the process policy.

These guidelines were deployed to an Intranet site to communicate the plan. The site was created using Google Sites as the platform. Appendix D.2, Appendix D.3, and Appendix D.4 list these guidelines.

5.6 KISMET Phase 5: Execute the process improvement plan

Phase 3 of the Action Research cycle implements the planned action. This phase involved active intervention by the researcher and process managers to ensure that the plan was executed and changes were made. The intervention strategy involved both directive intervention, where the researcher directed change, and non-directive where the change was initiated indirectly.

The actor-network theory was further applied to enroll actors in the network of change. Process managers tactfully enrolled key participants to enforce change, thus serving as catalysts for change.

Although the KISMET model calls for deploying an ITSM process in this phase, the researcher adapted this phase to implement improvement plans to an already deployed ITSM process.

An email communication was sent to all participants on 3rd March 2016 detailing the baseline findings and calling for action. Monthly schedule reports were generated by the researcher in collaboration with staff responsible for Zendesk input, for each of the three ITSM processes and for every KPI committed to by Company X.

5.6.1 Incident Management

Base Practices (Level 1)

Eight specific improvement actions were taken to improve base practices.

a) The incident logging workflow was reviewed periodically for improvement. Some Zendesk fields were made mandatory, while others were deleted. New email groups were created to facilitate the automation of *Case* updates to relevant parties. All relevant parties to an Incident were added to the incident's watch list for automated updates. A new incident logging workflow diagram was created and communicated to process performers.

b) A new mandatory field (Support Subtype) was added to the incident ticket form in Zendesk on 15 May 2016. Incidents are now classified by component type. The aim was to introduce an incident classification scheme to add visibility to identify software components that cause the most incidents. This new classification type was communicated to process performers and stakeholders on 1 June 2016. Figure 5-12 shows the number of incidents by subtype.

Subtypes	# Tickets
Admin	66
Connection Issue	32
Integral Analytics	7
Order Analysis	39
Platform	7
Rate Analysis	36
Risk Position	6
Settlement	32
Total	225

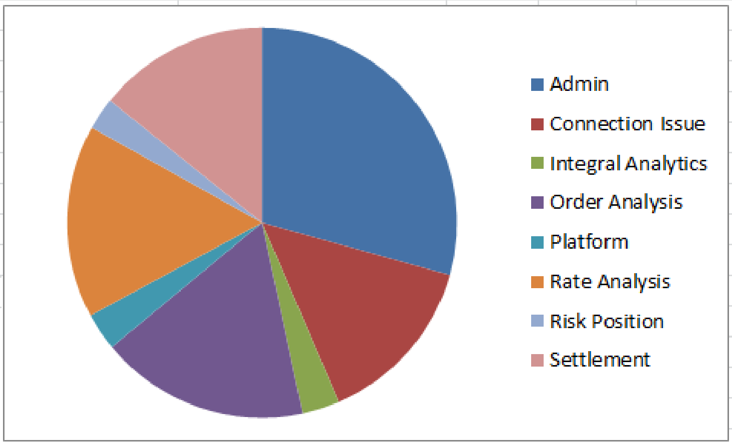


Figure 5-12 Number of Incidents by subtype for the period 16 May 2016 to 27 May 2016

c) Process managers conducted online training with staff on how to prioritize incidents by walking through examples of historical incidents. A matrix to define the criteria for each priority was developed and communicated. The impact/urgency matrix was also made available to all process performers.

d) In collaboration with the Engineering, Operations and Quality Assurance groups, process managers were tasked to scrutinize the number of incidents being logged. Analysis of reports revealed that there were hundreds of internal alerts being inappropriately categorized as incidents. As part of the DevOps initiative, engineers are required to include automated alerts in critical paths of their code. When this code path is executed, an alert is triggered that automatically notifies Operations and the appropriate engineering component owner. The alert is categorized by component and may be logged as an incident in Zendesk.

The following is an example of an alert inappropriately logged as a *Case* with an incorrect component:

ERROR PROD ppfxiadp123 ERR0060: Trade ValueDate mismatch detected in /CompanyX/logs/broker-adap-ISYAT/companyX.out.2015-12-30-07

This Zendesk *Case* was closed as [Grid Monitor/Value Date Issue] when in fact it should have been marked as [Admin/Value Date Issue] and as an alert rather than a *Case*.

Alerts could now be correctly categorized so that the metrics reported are accurate. A repository of actions to take for each alert was set up in GoogleDocs™.

e) The incident resolution closure workflow was modified to fit the business and SLAs.

f) Process performers were trained to use an in-house developed online tool, FX CloudWatch, to monitor the system health in real time. Figure 5-13 shows a screenshot of the FX CloudWatch interface. FX CloudWatch collects business, application and infrastructure data in real time, makes them easily accessible through a very clean user interface so all data can be used together by staff and also notifies support desk when something is not working correctly.

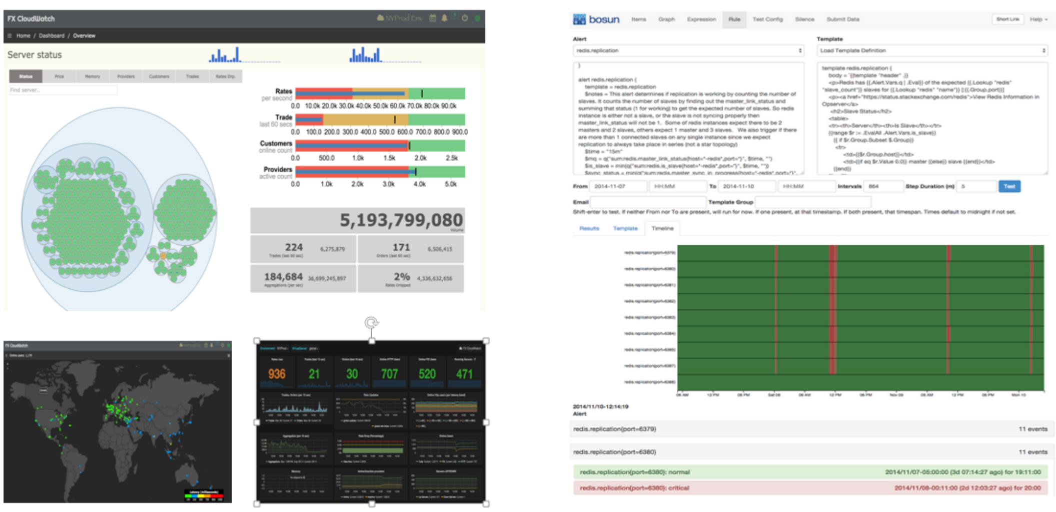


Figure 5-13 FX CloudWatch Interface

Features of the FX CloudWatch Interface include:

1. System-wide visibility of all applications running in any environment (UAT/Production);
2. Single click monitoring of any server, service or component in the system;
3. Shows real-time grid-wide aggregated updates of rates, trades, customers and providers in the bullet graph;
4. Access months of historical business, system and infrastructure data;
5. Interactive rich graphing;
6. Advanced alerting system to trigger notifications of anomalies;
7. Integrated release checkout process; and
8. Integrated *Capacity Planning Tool* and *FX LogViewer* to this portal.

g) A knowledgebase was not explicitly created, but the search functionality of Zendesk and Jira was reviewed and communicated to process performers.

h) The improvement actions called for improved collaboration between DevOps and process performers.

Generic Practices (Levels 2 to 3)

Four specific actions across *PA 2.1 Performance Management*, *PA 3.1 Process Definition*, and *PA 3.2 Process Deployment* were undertaken to improve the generic practices of Incident Management.

<u>CL2 – PA 2.1 Performance Management</u>

a) The scope of the Incident Management KPIs was defined and all stakeholders in the process informed of the scope. The assumptions and constraints were considered while identifying Incident Management KPIs so that the resultant KPIs were specific, measurable, achievable, relevant and timely (S.M.A.R.T.). Tracking dashboards were created in Zendesk and made available to all stakeholders. Figure 5-14 shows an example of the dashboard for Incident Management.

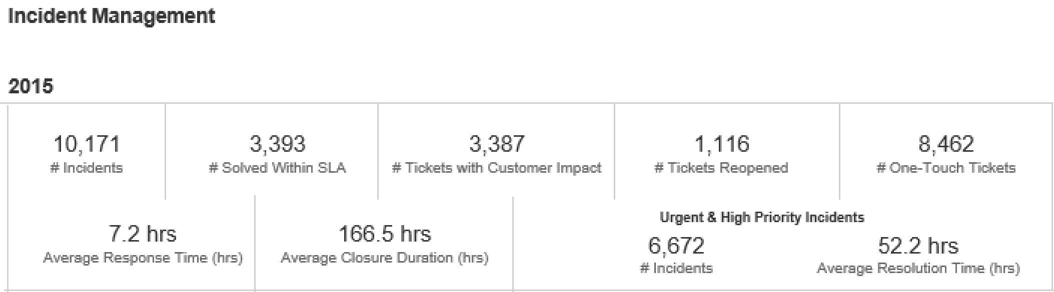


Figure 5-14 Incident Management Dashboard (May-Oct 2015)

<u>CL3 – PA 3.1 Process Definition</u>

b) The standard Incident Management process workflow was modified to address interfaces with other processes. These visible interfaces were defined in the process workflow to maintain integrity with the related processes. The Incident Management process workflow is illustrated in Figure 5-15 (below).

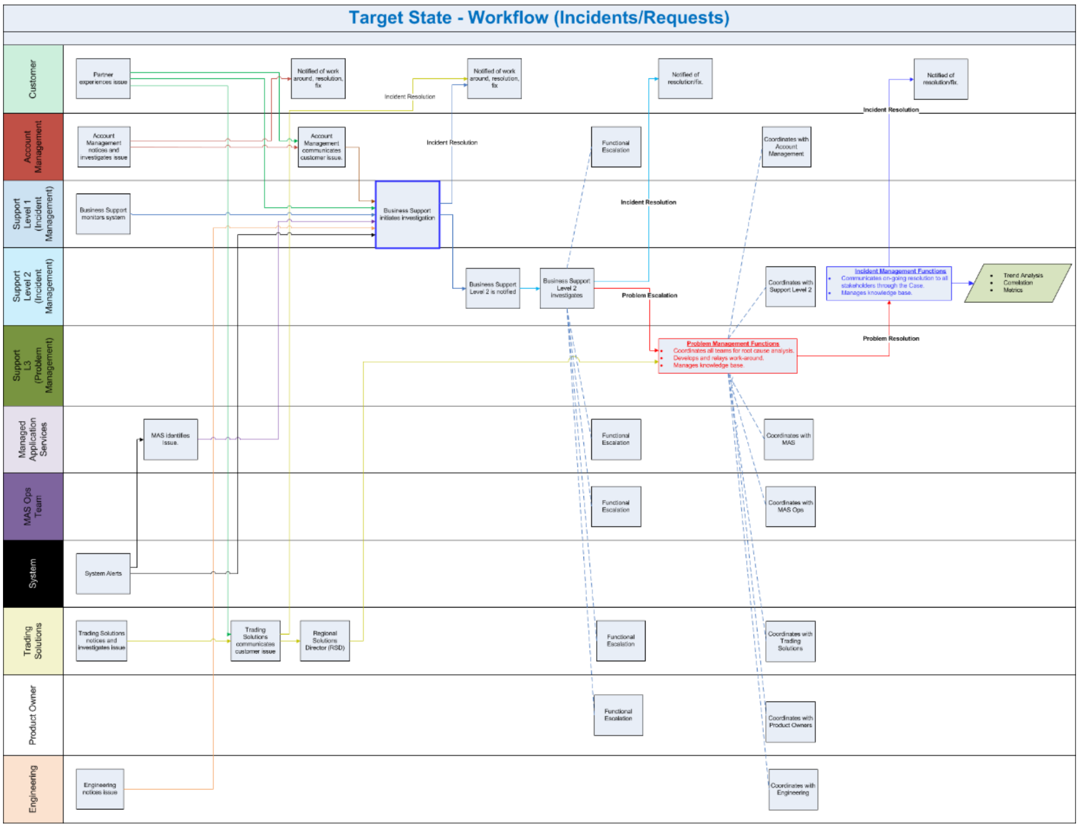


Figure 5-15 Incident Management Process Workflow

CL3 – PA 3.2 Process Deployment

c) The competencies of Incident Management staff were ascertained to determine if they are adequate to perform Incident Management activities. Training was provided to support staff.

d) The analysis of appropriate data regarding implementation of the Incident Management process was conducted to provide a basis for understanding the behavior of the process and its compliance with the standard Incident Management process. This, in turn, contributed to the ongoing improvement of the implemented process and the standard Incident Management process upon which the implemented process is based.

5.6.2 Problem Management

Base Practices (Level 1)

Three action items were undertaken to improve the base practices of Problem Management.

a) Problem identification was modified to include:

- detection of an unknown root cause of one or more incidents;
- the analysis of one or more incidents revealing an underlying problem;
- a notification from an internal group of a problem with a component of the service.

b) The problem records include relevant details of the problem, including the date and time, and a cross-reference to the incident(s) that initiated the problem record. Jira has a linked *Case* field that clearly indicates the incident(s) that caused the problem.

c) Problem classification and prioritization ensure that:

- each problem is categorized to help determine its nature and to provide meaningful information, making use of the same classification criteria that are used in the incident and service request management process;
- each problem is given priority for resolution according to its urgency and the impact of related incidents;
- time and resources for investigating the problem and identifying the best options for resolution are allocated according to the priority of the problem;
- the resolution of the problem is allocated time and resources according to the priority of the problem and the benefit of making the change in order to fulfill service requirements.

Generic Practices (Levels 2 to 3)

Four generic practice recommendations were implemented.

CL2 – PA 2.1 Performance Management

a) The objectives of Problem Management KPIs were identified based on the business goals of the process and customer requirements for the service that uses Problem Management process. The objectives of Problem Management KPIs define deadlines, constraints, and targets to achieve for a process in regards to quality, process cycle time or resource usage.

b) The scope of the Problem Management KPIs was defined and all stakeholders in the process informed of the scope.

c) The assumptions and constraints were considered while identifying Problem Management KPIs so that the resultant KPIs are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).

d) The activities of Problem Management are driven by the identified performance targets so that the Problem Management could be monitored against the plans. Process performance KPIs were established.

5.6.3 Change Management

One generic practice recommendation and two Performance Management recommendations were implemented for Change Management.

Base Practices (Level 1)

Company X schedules major changes for patch releases on a 2 weekly cycle.

Generic Practices (Levels 2 to 3)

CL2 – PA 2.1 Performance Management

a) The objectives of Change Management KPIs were identified based on the business goals of the process and customer requirements for the service that uses Change Management process. The objectives of Change Management KPIs define deadlines, constraints, and targets to achieve for a process in regards to quality, process cycle time or resource usage.

b) The scope of the Change Management KPIs was defined and all stakeholders in the process informed of the scope. The KPIs defined are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).

It was found during the focus group workshop that the activities and tasks of Change Management are not clearly defined for staff to perform them effectively. The Change Management guideline was reviewed and modified by the Change Management process managers and emailed to all Change Management process performers.

5.7 KISMET Phase 6: Evaluate process improvement

The "evaluate process improvement" step of the KISMET model involves collecting feedback regarding an improved process, tools, and training, and conducting fine-tuning if applicable (Suhonen et al. 2013). The evaluate action phase served to review and reflect on the improvement programs implemented and to evaluate the outcomes of the process improvement programs. The aim was to identify changes in each of the three ITSM process improvement areas, the effect on the processes, as well as the challenges that occurred during implementation of the changes, and to make suggestions for improvement. Detailed observation, monitoring, and recording enabled the researcher to assess the effect of the action or intervention and hence the effectiveness of the proposed change. In addition to the planned observations, additional observations and insights were recorded in a journal on a regular basis.

5.7.1 Incident Management

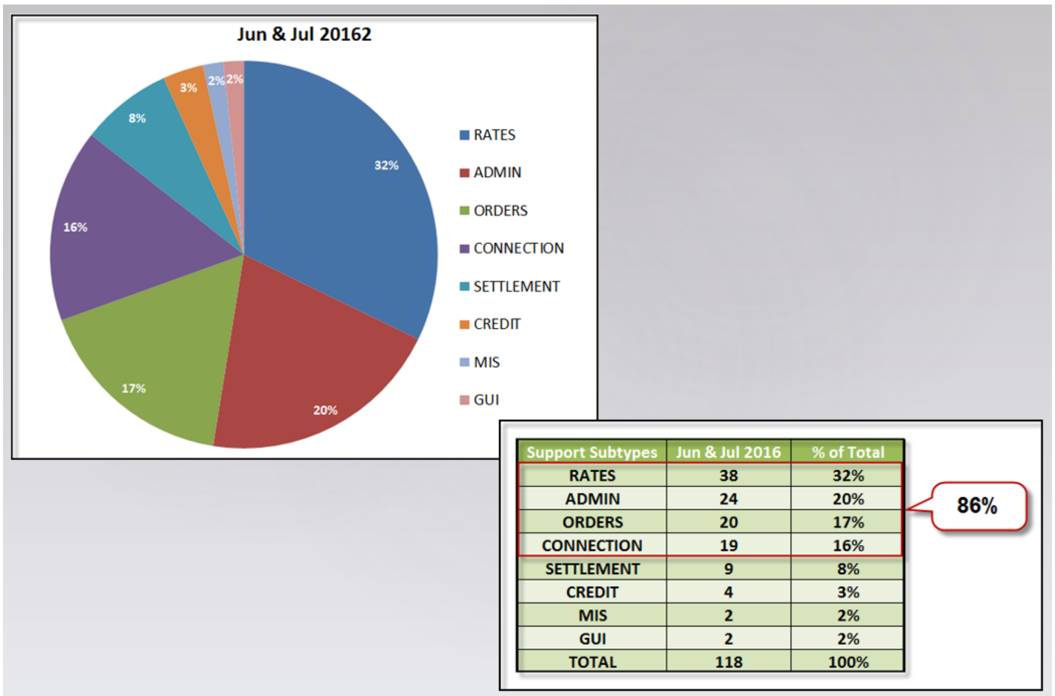
Base Practices (Level 1)

The addition of the new Zendesk ticket field (Support Subtype) helped identify common customer issues and most problematic software components. Incident *Case* analysis of the top ten customers (with respect to revenue) helped reveal software and process deficiencies.

The following are examples of incident *Case* analyses for the period June 2015 to July 2015 for two of the top ten customers.

Customer A

An analysis of incidents for Customer A over the period of June and July 2015, showed that the top 86 percent of issues for Customer A was related to Rates, the Admin Portal application, Orders and Connectivity issues. Figure 5-16 shows the breakdown of incident subtypes for Customer A.



Support Subtypes	Jun & Jul 2016	% of Total
RATES	38	32%
ADMIN	24	20%
ORDERS	20	17%
CONNECTION	19	16%
SETTLEMENT	9	8%
CREDIT	4	3%
MIS	2	2%
GUI	2	2%
TOTAL	118	100%

Figure 5-16 Breakdown of Incident Subtype for Customer A

A further breakdown of the number of incidents by component showed the problem areas with more granularity, as illustrated in Figure 5-17.

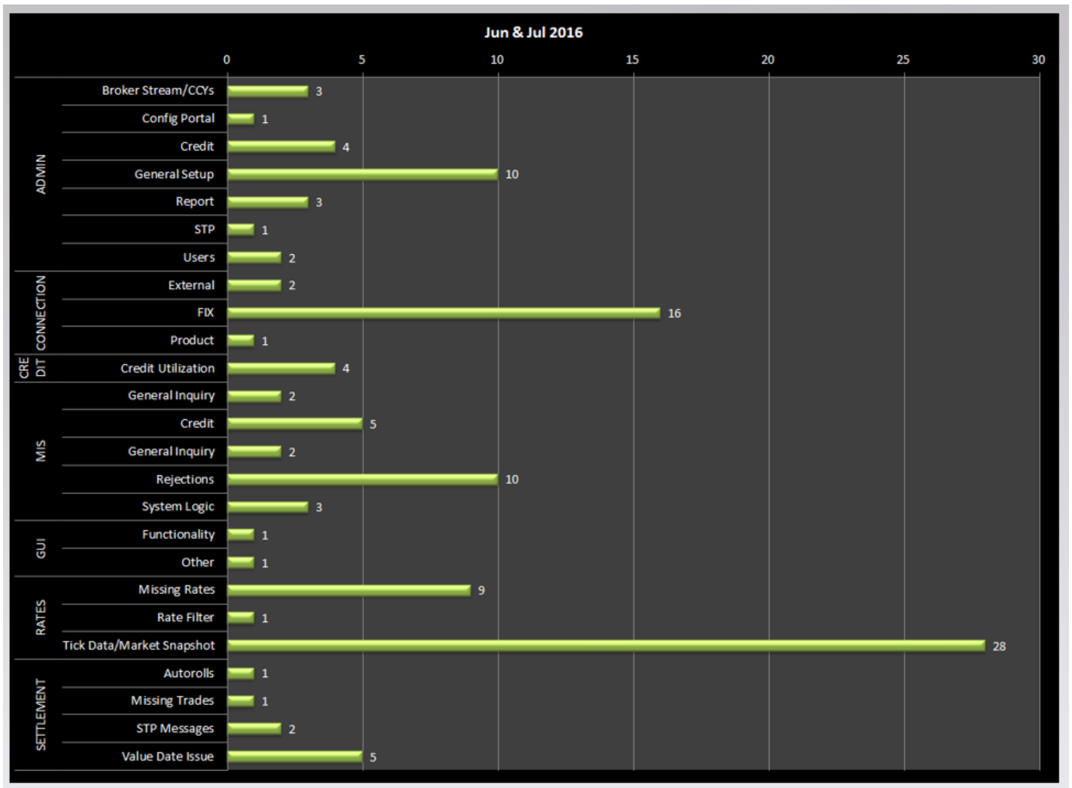


Figure 5-17 Top 50% of Customer A tickets

The top 50 percent of tickets for Customer A was broken down and is shown in Table 5-44

Table 5-44 Top 50% of Customer A Tickets

Support Subtypes	# Tickets	% of Total
Rate Analysis: Tick Data/Market Snapshot	28	23.7%
Connection Issue: FIX	16	13.6%
Admin: General Setup	10	8.5%
Order Analysis: Rejections	10	8.5%

The action of adding the new Support Subtype Zendesk field helped identify an Incident Management deficiency (handling general setup requests from Customer A), and problems with three main software components (Tick Data Service, FIX Gateway, and Execution Management Service).

Customer B

The analysis showed that the top 74 percent of issues for Customer B was related to the Admin Portal application, Orders and Platform issues as shown in Figure 5-18.

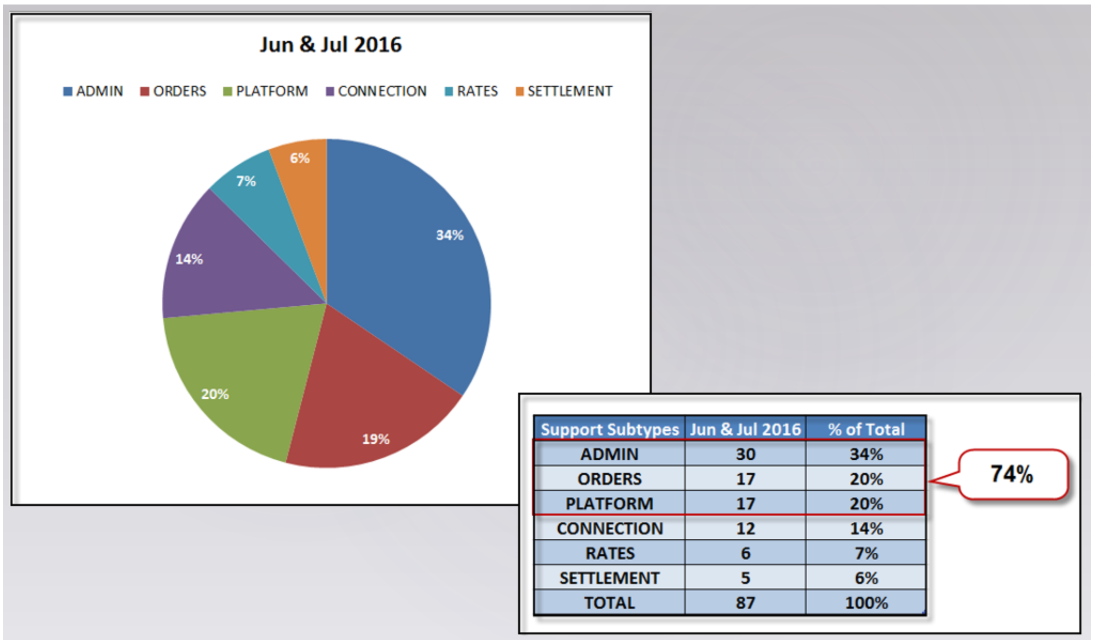


Figure 5-18 Breakdown of Incident Subtype for Customer B

A further breakdown by Support Subtype showed the problem areas with more granularity (see Figure 5-19).

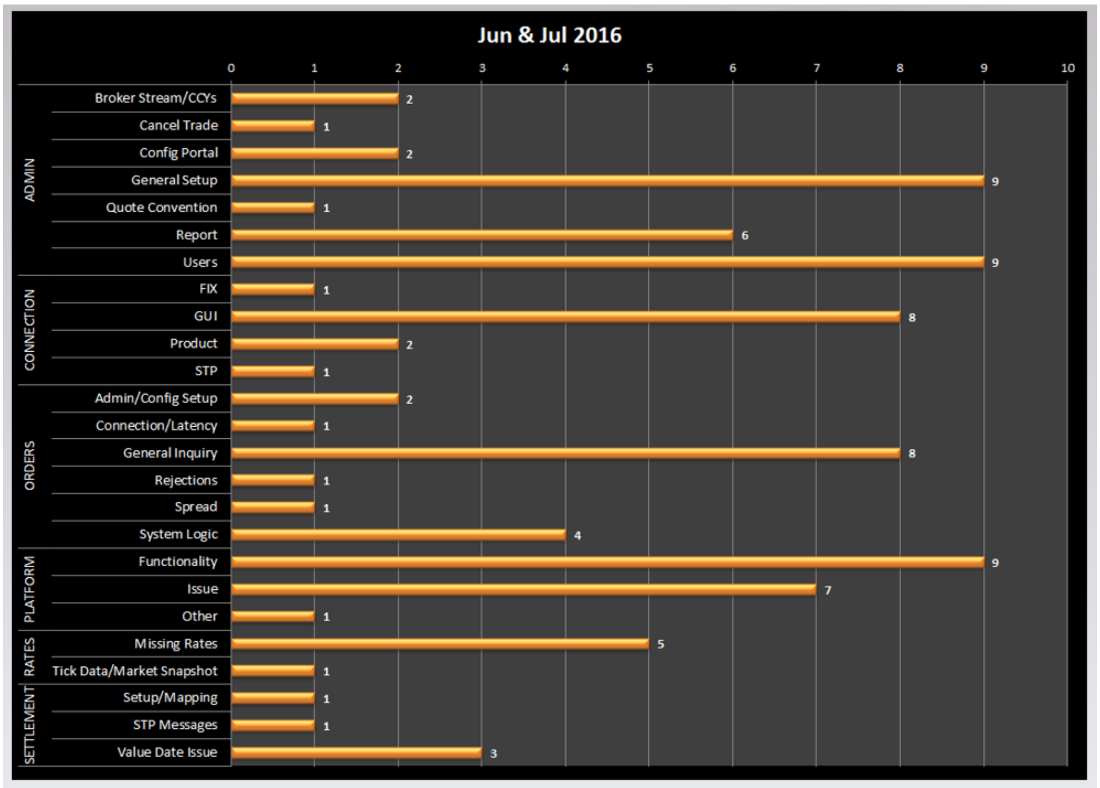


Figure 5-19 Top 50% of Customer B tickets

The top 50 percent of tickets for Customer B was broken down and is shown in Table 5-45.

Table 5-45 Top 50% of Customer B Tickets

Support Subtypes	# Tickets	% of Total
Admin: General Setup	9	10.3%
Admin: Users	9	10.3%
Platform: Functionality	9	10.3%
Connection: GUI	8	9.2%
Order Analysis: General Inquiry	8	9.2%

By adding the Support Subtype Zendesk field, Company X was able to detect three areas of Incident Management deficiency (handling Customer B's general setup issues, provisioning of users, and general order analysis inquiries), and problems with two software components (Trading Application and the Platform Infrastructure).

An analysis on a case by case basis was conducted for the Support Subtypes that made up the top 50 percent of issues.

The analysis revealed the following areas that required action:

- Password resets;
- Trading application user permissions;
- Access to IP restrictions for White Labelled customers;
- Tickets not properly showing "Cancelled" status; and
- Inquiries about the source of Order Cancellations.

The work performed to reclassify alerts helped reduce the number of incidents reported month over month and provided more accurate metrics for reporting. The graph in Figure 5-20 shows the decline in the number of incidents month-over-month for the assessment period.

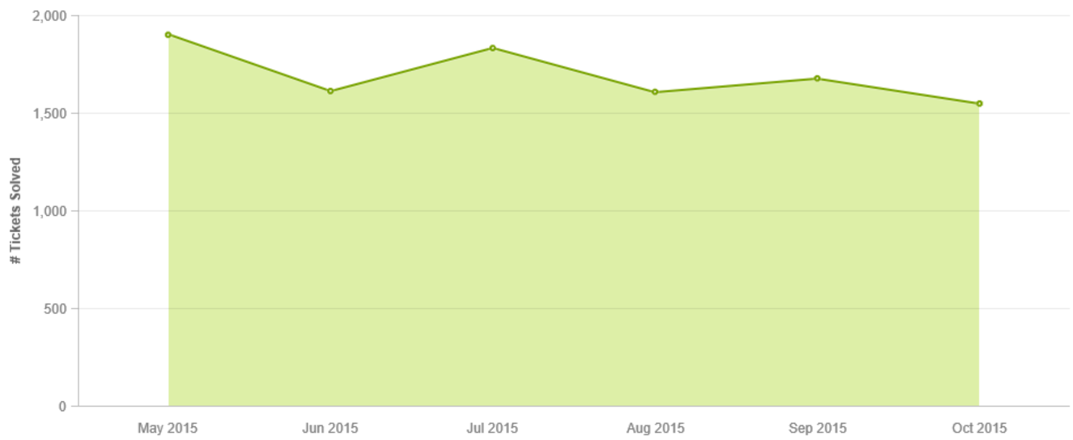


Figure 5-20 Total Number of Incidents per Month (May-Oct 2015)

Although the action plan called for the adherence to the impact/urgency matrix, an evaluation revealed that this was not followed by all process performers.

After randomly selecting a few Zendesk *Cases* for analysis, it became apparent that inappropriate priority was set for a high number of *Cases* without following the guidelines to use urgency and impact to prioritize *Cases*. Most of these *Cases* were logged by the Trading Solutions business unit, who are closest to customers and naturally escalated the priority based on their relationships with customers.

The adoption of DevOps by the IT organization created a sense of collaboration amongst staff and helped to proactively monitor for potential incidents. Only alerts that had an external impact (customer exposed) were being logged as incidents in Zendesk, while internal alerts were being logged as Jira bugs for further engineering and operations analysis.

Generic Practices (Levels 2 and 3)

The Incident Management KPIs were evaluated for accuracy and relevance by analyzing how the reporting criteria in Zendesk derived them from operational metrics. The KPIs were considered by the process managers to be accurate and relevant.

5.7.2 Problem Management

Base Practices (Level 1)

After evaluating the changes to the Problem Management process, it was evident that incident identification included:

- detection of an unknown root cause of one or more incidents;
- the analysis of one or more incidents revealing an underlying problem; and
- a notification from an internal group of a problem with a component of the service.

The problem records included relevant details of the problem, including the date and time, and a cross-reference to the incident(s) that initiated the problem record. The linking of Jira and Zendesk clearly identified the problems that were causing incidents.

By using the same classification criteria that are used in the incident and service request management process, each problem was categorized appropriately with detailed information for problem diagnosis. Problems were in most part prioritized correctly according to urgency and impact of related incidents. The time and resources for investigating problems were appropriately allocated based on the priority of the problems.

Generic Practices (Levels 2 and 3)

The activities of Problem Management are driven by the identified performance targets so that the Problem Management can now be monitored against the plans. Process performance KPIs are now established.

5.7.3 Change Management

Base Practices (Level 1)

Major changes were scheduled for patch releases every two weeks instead of the four-week release cycle.

Generic Practices (Levels 2 and 3)

The objectives of Change Management KPIs were identified based on the business goals of the process and customer requirements for the service that uses Change Management process. The objectives of Change Management KPIs define deadlines, constraints, and targets to achieve the process in regards to quality, process cycle time or resource usage.

The scope of the Change Management KPIs was defined and all stakeholders in the process informed of the scope. The KPIs defined are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).

It was concluded that the activities and tasks of Change Management are not clearly defined for staff to perform them effectively.

5.8 Kismet Phase 7 – Continual Process Improvement

This activity of the KISMET model included the following steps: conduct process reviews frequently, identify and report process improvement ideas, and plan and implement improvement actions (Suhonen et al. 2013).

Process reviews were diligently conducted on a regular basis. Ad-hoc reviews initiated by the financial market events were also conducted through researcher intervention. The planned reviews served as a checkpoint through the phases of the cycle, to determine how Company X was performing and whether an intervention was required.

Although service improvement ideas and actions were identified by various participants at different points in time, these ideas were never formally documented. These ideas were expressed in the review meetings and tracked by email as minutes of the meeting. Upon reflection, the researcher believes that these ideas and opportunities should have been recorded in a Continuous Service Improvement (CSI) register for evaluation and possible implementation. A CSI register is a database or structured document used to log and manage improvement opportunities throughout their lifecycle (Cabinet Office, 2011).

As explained in §3.5.2 the next phase of the Action Research cycle is Reflect. However, the researcher realized that it is not only imperative to reflect at the end of a given cycle; effective action researchers reflect on and critically scrutinize their practice *during* the process of research (Baskerville 1999).

5.8.1 Process Capability

As shown in Table 5-46, the majority of the rating scores at Company X demonstrated a very strong reliability score (12 *High*; one *Moderate* and two *Poor* reliability scores). This meant that survey respondents predominantly agreed on their ratings.

Table 5-46 Process Assessment Reliability Scores

	Level 1	Level 2		Level 3	
Profile	**Process Performance**	**Performance Management**	**Work Product Management**	**Process Definition**	**Process Deployment**
Incident Management					
Score Reliability	High	High	High	High	High
Problem Management					
Score Reliability	High	Poor	High	High	Moderate
Change Management					
Score Reliability	High	High	High	High	Poor

As discussed in §5.2.2.1, a focus group discussion was held at Company X with senior staff to discuss the results of the SMPA assessment. The results for Problem and Change Management were deemed inconsistent with the views held by the focus group participants about the capability of these processes. However, the results for Incident Management were in line with Company X expectations. After some probing questions, the researcher discovered that five different business units were performing the three assessed processes. Two of the business units are based at Company X′s head office, while the other three business units are located in different countries. The focus group discussed how the SMPA process capability assessment report results might have been influenced by the specific characteristics of the five groups of staff.

Although all business units use the same process management tool (Zendesk), each unit follows its own set of procedures and workflows. Only two business units, Business Support, and Operations follow the same procedures and workflows.

Table 5-47 shows the distribution of the number of participants by organization business unit per process assessed.

Table 5-47 Distribution of the number of participants by organization business unit per process assessed

Organization Business Unit	Change Management	Incident Management	Problem Management	Geographic Region
Business Support	3	9	3	US, UK, Singapore
Operations	12	12	0	US, India
Trading Solutions	19	0	0	US, UK, Singapore, India
Execution Services	7	1	1	US
Engineering	0	0	14	US, India
Stakeholders	4	4	3	US

The Executive Management at Company X was very aware that Change Management is the most immature process and it frequently causes financial loss and customer dissatisfaction. It was surprising that the survey results gave Change Management a rating score of *Largely* for all five process attributes, with a high reliability score for all the process attributes except for PA3.2 (Process Deployment) which scored *Poor* reliability.

Feedback after the assessment revealed that some of the participants were allocated three surveys and they were unsure if they were responding on behalf of their business unit or the entire organization. One of the participants mentioned that because some of the questions seemed to be the same, he provided the same response without thinking about it – so one can question the reliability in this case. Here is an example of two similar questions: *Do you know if requests for change (RFCs) are assessed to identify new or changed information security risks?* and *Do you know if requests for change (RFCs) are assessed to identify potential impact on the existing information security policy and controls?*

The same respondent explained that if he had printed all the questions, he would have had a better understanding of what was being assessed and some questions may have helped him understand others.

When processes are performed by multiple business units within an organization, each unit may have a very different perspective on its process capability, especially if there is no consistency in the procedures and workflows followed. This may result in disparate results when assessing the organization as a whole. The focus group members expressed the view that capability level 1 for Change Management may not be accurate, as the largest business unit (Trading Solutions) may have biased the result by being overly positive in their responses. The focus group members suggested that overall PA1.1 (Process Performance) was only *Partially* attained. Similar views were expressed for Problem Management, where the Engineering unit made up the largest response group, and this may have influenced the results of this process.

5.8.2 Process Performance

The process performance data collected over the assessment period of 1 May 2015 to 31 October 2015 exhibited anomalies and required further analysis. Charts were generated from Zendesk to enable visual analysis of trends. A deeper analysis was conducted to explore possible causes of the peaks and troughs charted.

The number of incidents logged in Zendesk increased for the Business Support Level 1 unit for the months of May, June and July 2015, and then dropped in August and stabilized over the following 3 months, while the Operations unit saw a significant decrease in the number of incidents after May 2015. Figure 5-21 shows the number of incidents per business unit over the assessment period.

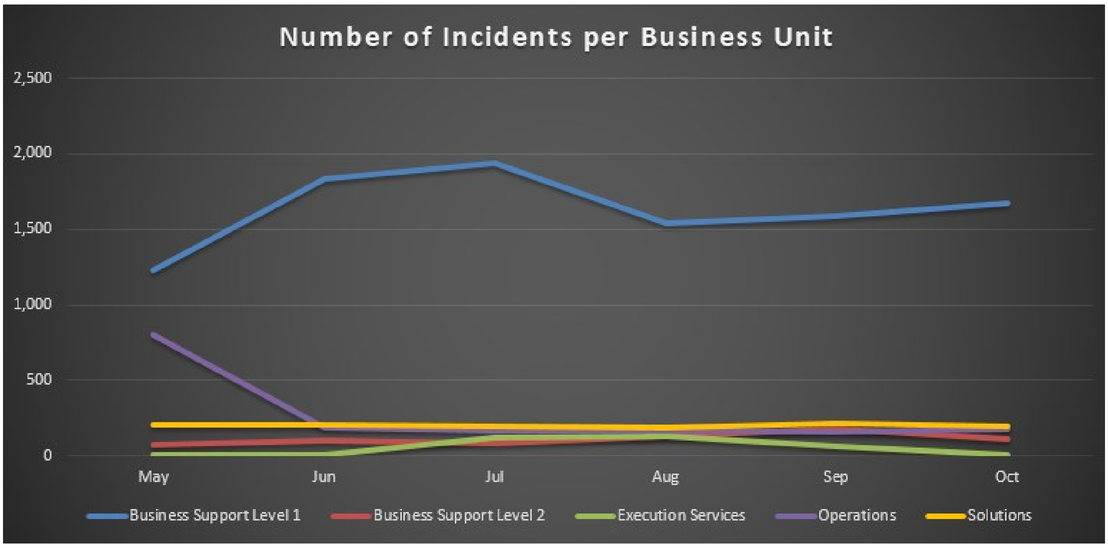


Figure 5-21 Seasonality of Number of Incidents per Business Unit

Breaking down the number of Business Support Level 1 incidents created per day for the months of June and July showed a spike on 28 June 2015 (see Figure 5-22).

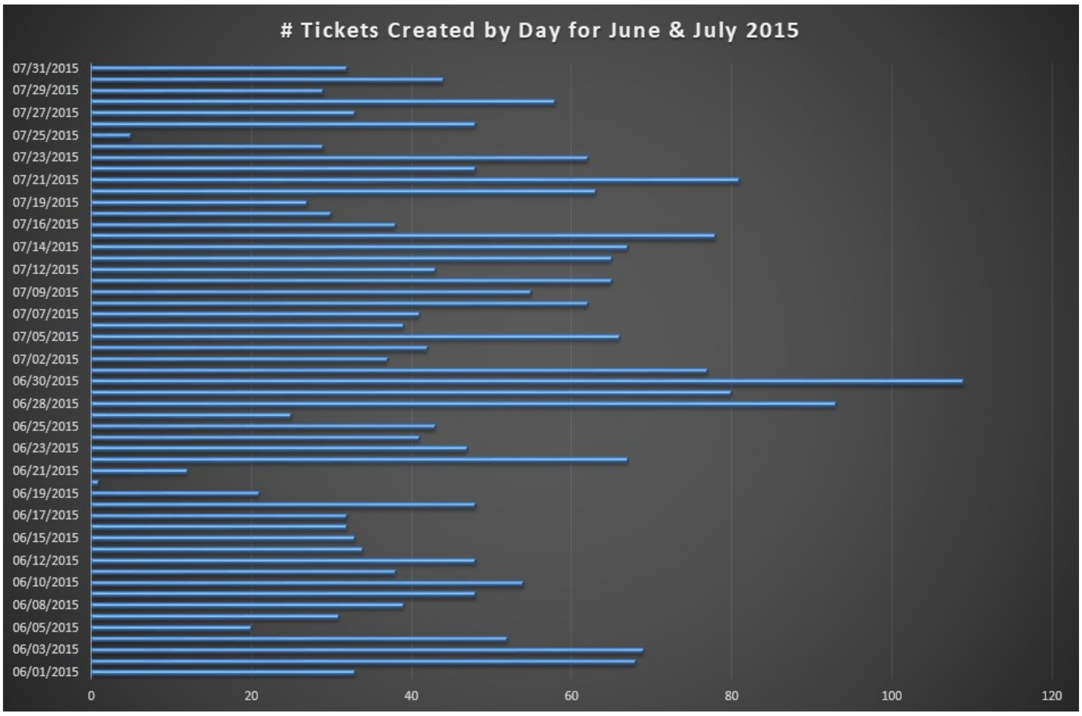


Figure 5-22 Breakdown of the number of Business Support Level 1 incidents

Further analysis of this spike for this day revealed that the malfunction of the service component Trading UI caused the most incidents (see Figure 5-23).

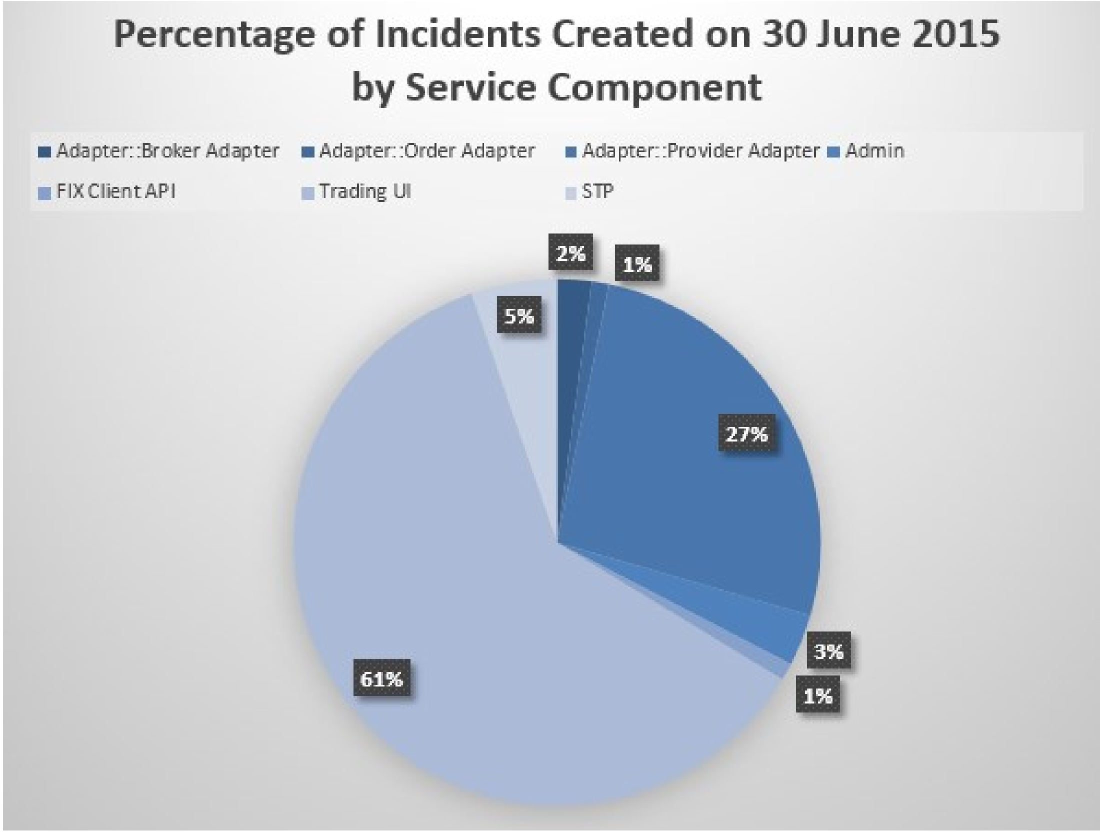


Figure 5-23 Breakdown by Service Component for 28 June 2015

The Trading UI Client is the trading application that customers use to interact with the rest of the system. It is the User Interface into the Cloud service provided by Company X. Deeper analysis revealed that a major update to the Cloud software was deployed to Production by Company X on 28 June 2015 and the system went live the Sunday 28 June 2015.

The discovery of this event led to the historical analysis of operational metrics around major software release dates at Company X. It was found that the number of incidents, problems, and changes spiked soon after a major software release. Figure 5-24 historically charts the number of incidents, problems, and changes when major software was released (highlighted).

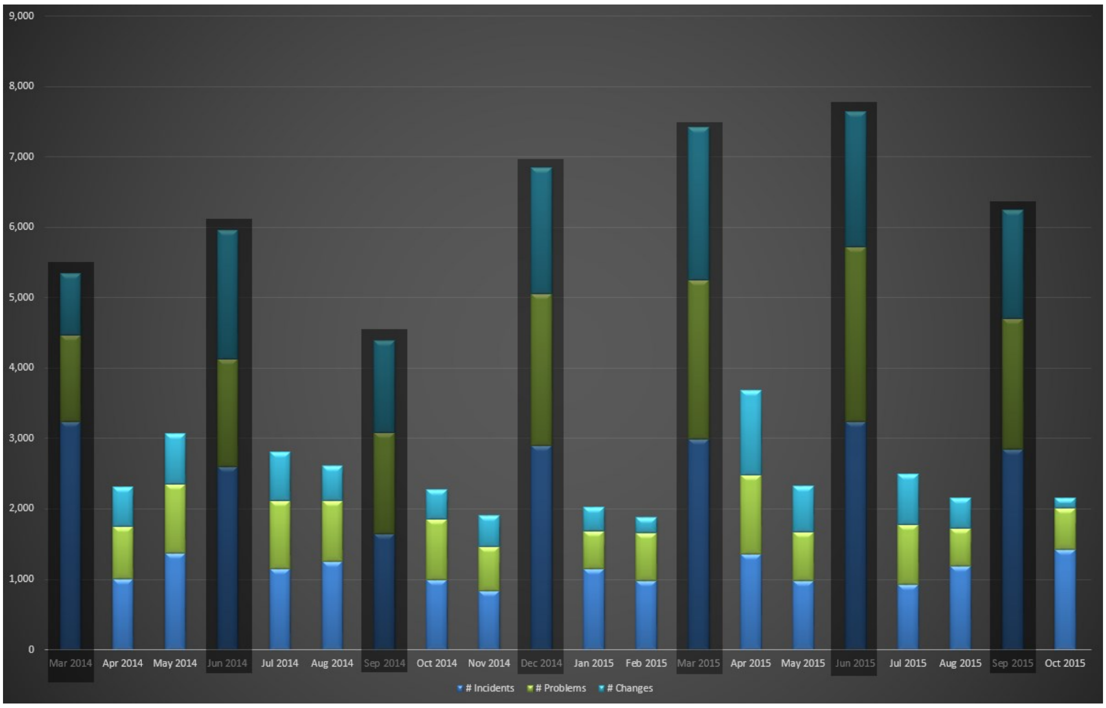


Figure 5-24 Number of Incidents, Problems, and Changes around Major Software Releases (Mar 2014-Oct 2015)

The analysis of the number of incidents, problems and changes identified a trough for August and unveiled a seasonal influence. A historical trading volume report generated by Company X's internal analytics tool revealed that trading volume to Company X decreased from July to August year over year from 2012. Further analysis unveiled the fact that European FX traders usually take summer holidays at this time, thus the lower trading volume. The decrease in the number of incidents reported for August may be attributed to this. Figure 5-25 shows the trading volume trend month-by-month year-over-year without the actual dollar amounts on the Y axis to preserve the anonymity of Company X.

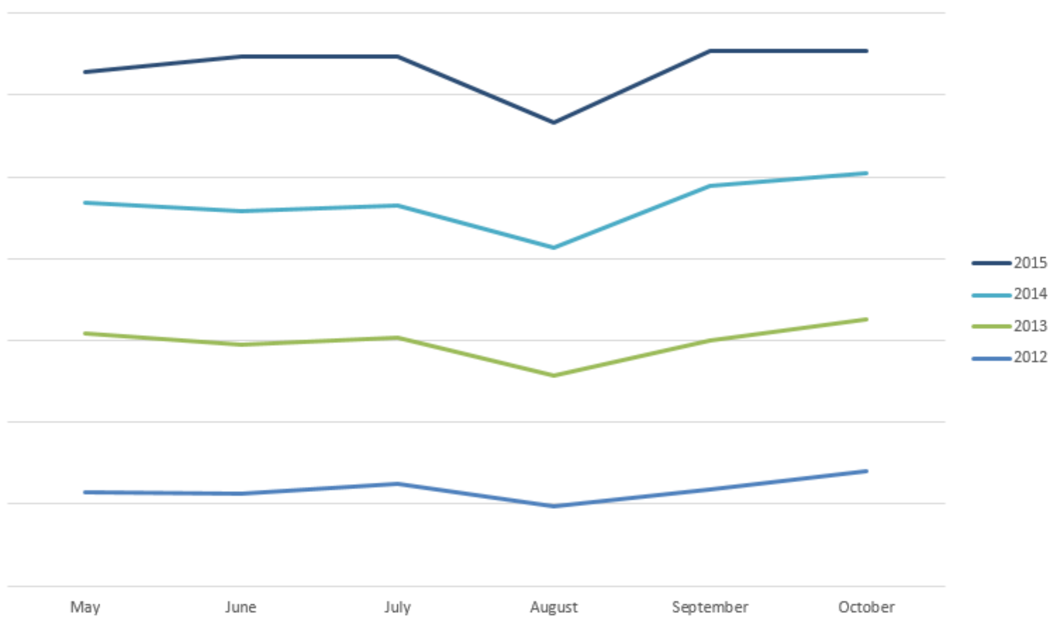


Figure 5-25 Seasonal Influence on Trading volume (May-Oct; 2012-2015)

5.8.3 Market Events

On 15 January 2015, the Swiss National Bank (SNB) abandoned a cap limiting the value of the Swiss franc against the Euro sending the EUR/CHF to a record low. This unexpected event sent shock waves through the financial markets. The Swiss franc rocketed past the euro overnight causing chaos across the currency markets (see Figure 5-26).

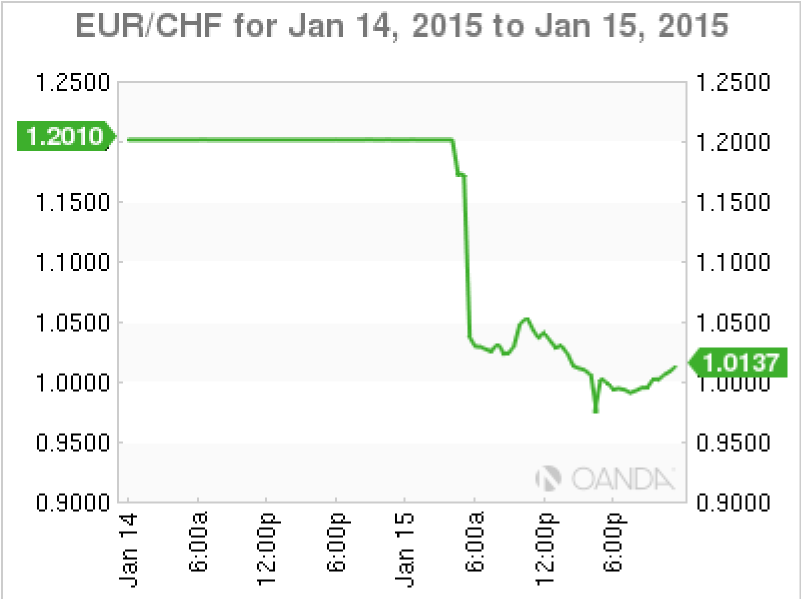


Figure 5-26 Chart of EUR/CHF (Popplewell 2015)

The event wiped out many small-scale investors and the brokerages that cater to them and forced regulators to take a closer look at the sector. Some major banks also suffered losses when the SNB scrapped its three-year-old cap on the franc against the euro. The shutting down of retail brokerages added pressure on other market players, taking on more volume and risk associated with it.

This event caused the trading volume for Company X to surge to its all-time high in its 20+ years of existence. This event caused two major issues for multiple customers. Table 5-48 lists the events of Issue A while Table 5-49 lists the events of Issue B.

Table 5-48 Events of Issue A for 15 January 2015

Issue A	
Time (GMT)	09:31 – 09:54 GMT and 22:05 – 22:26 GMT
Server(s) Affected	All
	09:30 Swiss National Bank (SNB) announced the end of the three-year-old cap for Swiss franc against Euro. 09:30 High volatility observed across all CHF crosses following the SNB announcement. 09:31 Company X Rate Filters for liquidity providers took effect and filtered the CHF prices as they breached the filter threshold. Customers stopped receiving prices in CHF crosses. 09:54 Company X's Support team modified the rate filters for CHF crosses to allow trading to resume. 22:05 Another movement across CHF crosses observed. Company X's rate filters took effect and filtered the CHF prices as they breached the filter threshold. Customers stopped receiving prices in CHF crosses. 22:05 Customers continued to submit Market orders to Company X's system. 22:26 Company X's Support team modified the rate filters for CHF crosses to allow trading to resume.
Root Cause	This is a similar occurrence of the event which happened on December 17 for EUR/NOK where customers submitted market orders to Company X system when Company X's price feed did not have active rates. Company X rate filters have been configured to safeguard against any off-market spikes in currency pairs, and the system behaved as expected during the CHF news announcement. This behavior and the recommended change to customer applications was already communicated to customers by Company X's Sales and Account management team.

Table 5-49 Events of Issue B for 15 January 2015

Issue B	
Time (GMT)	09:30 – 09:54 GMT
Server(s) Affected	All
	09:30 Swiss National Bank (SNB) announced the end of the three-year-old cap for Swiss franc against Euro. 09:30 Starting at this time, the System could not validate the integrity of many of the providers' rates due to the extreme nature of the market volatility and providers pulling back their rates. As a result, the trading in CHF based currency pairs was sporadic. Pricing in all other currency pairs was not interrupted. 09:54 Manual intervention was required to validate rates based on new market range. More normal pricing and trading in CHF-based currencies resumed.
Root Cause	Extreme Market Volatility and the systems' inherent functionality to provide pricing streams only when the rates can be validated to safeguard against invalid prices. Additionally, many market makers were making their rates inactive during these intervals.

These issues caused both financial loss and customer reputation for Company X. Drawing on this event, senior management established a renewed focus on customer service and process performance. There was a sense of urgency to scrutinize key processes and evaluate whether changes were required. The researcher used this as an opportune time to take advantage of this common interest and set up the kick-off meeting with senior management to introduce the research study and its benefits.

5.9 Chapter Summary

Chapter 5 described the events of each step of the KISMET model within each phase of the first cycle of the action research. The KISMET model was used as a process improvement tool to guide the action research phases. ANT was used as the underlying guiding theory in this first action research cycle.

The Diagnose phase detailed the activities involved in setting up of the process improvement infrastructure at Company X. The process capability assessment survey, the performance assessment, and the financial measurement were conducted in this phase. A focus group workshop was conducted to assess the SMPA tool, discuss the findings of the process capability assessment report, and to triangulate the data reported. This phase also operationalized the Behari ITSM Measurement Model described in Chapter 3.

The Plan phase used the output of the Diagnose phase to detail the process improvement activities. Meetings were conducted with key stakeholders to formulate and document action plans for each ITSM process.

The Take Action phase served to deploy the documented plan from the Plan phase. This phase involved active intervention by the researcher, to ensure that the process improvement plans were being followed, and to make adjustments as deemed necessary. Principles from ANT were used in this phase to build the network of actors.

The Evaluate Action phase served to review and reflect on the improvement program implemented in the previous phase and to evaluate the outcomes of the process improvement program.

The Reflect phase involved reflection of all the previous phases of the first cycle of the action research.

The process capability, process performance, and financial performance results of cycle 1 provided the benchmark data required to measure against the results of cycle 2. The outcome of cycle 1 forms the basis to answering RQ1. *"How can the association of ITSM process capability and process performance with financial performance of an organization be determined?*"

The application of the KISMET phases with the active intervention of the researcher demonstrated how the ITSM measurement framework can be effectively applied for CSI, thus contributing to RQ2. *How can the ITSM measurement framework be demonstrated for CSI?*

Through cycle 1 the researcher realized that it is not only imperative to reflect at the end of a given cycle; effective action researchers reflect on and critically scrutinize their practice during the process of research (Baskerville, 1999). This led to the redesign of cycle 2 by incorporating Reflection into every phase of KISMET

CHAPTER 6 ACTION RESEARCH - CYCLE 2 (ARC2)

6.1 Introduction

Chapter 5 presented the first cycle of the action research study using the KISMET model as a guide. This chapter aims to describe the events of the second cycle of the action research. Chapter 6 comprises nine main sections. *Section 6.1* introduces the chapter. *Section* 6.*2* details the activities of the first phase (*Create a process improvement infrastructure*) of the KISMET model. *Section* 6.*3* walks through the second phase *Assess process capability and performance*, followed by *section 6.4 Plan process improvement action*, and *section 6.5* the *Design process improvement guidelines* phase of KISMET. *Section* 6.*6* details the activities of *Execute the process improvement plan* followed by *section 6.7 Evaluate process improvement* and *section 6.8 Continual process improvement*. Finally, *section 6.9* summarizes this chapter. Figure 6-1 shows an overview of chapter 6.

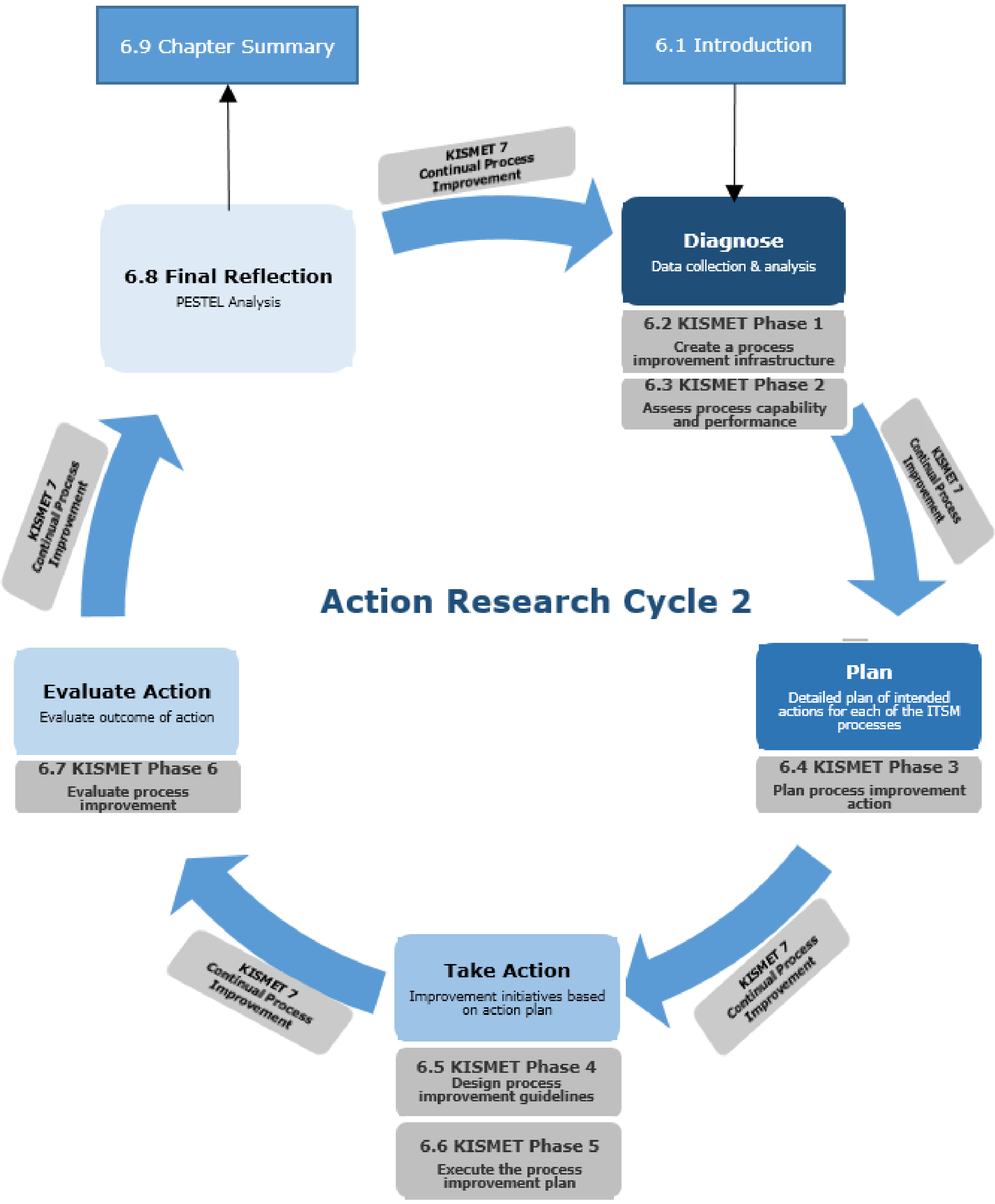


Figure 6-1 Overview of Chapter 6

The timeline of activities for the second action research cycle is presented in Figure 6-2.

Timeline -->	2016												2017											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Action Research Phase	KISMET Phase & Activity	Start Date	End Date
Diagnose	**KISMET Phase 1: Create a process improvement infrastructure**	**1-Oct-16**	**30-Nov-16**
	Meeting to identidy process assessment survey participants	1-Oct-16	1-Oct-16
	Strategic planning meeting to review CSFs	10-Oct-16	10-Oct-16
	KISMET Phase 2: Assess process capability and performance	**17-Oct-16**	**29-Feb-16**
	Process assessment preparation	17-Oct-16	17-Oct-16
	Process assessment data collection	17-Oct-16	14-Nov-16
	Analysis of process capability assessment report	15-Nov-16	31-Dec-16
	Financial measurement	1-Jan-17	31-Jan-17
	Process performance assessment	1-Feb-17	02/29/2017
	Focus group workshop	21-Mar-17	21-Mar-17
Plan	**KISMET Phase 3: Plan process improvement action**	**04/03/217**	**21-Apr-17**
	Interviews/Meetings to discuss process improvment action	3-Apr-17	21-Apr-17
Take Action	**KISMET Phase 4: Design process improvement guidelines**	**24-Apr-17**	**30-Apr-17**
	Development of process guidelines	24-Apr-17	30-Apr-17
	KISMET Phase 5: Execute the process improvement plan	**1-May-16**	**31-Oct-16**
	Execute on improvement plan	1-May-16	31-Oct-16
Evaluate Action	**KISMET Phase 6: Evaluate process improvement**	**1-Nov-17**	**30-Nov-17**
	Evaluate the outcomes of the process improvement program	1-Nov-17	30-Nov-17
Reflect	**KISMET Phase 7: Continual service improvement**	**1-Oct-16**	**31-Dec-17**
	Conduct process reviews and report process improvement ideas	1-Oct-16	31-Dec-17

Figure 6-2 Action Research Cycle 2 Timeline

6.2 KISMET Phase 1: Create a process improvement infrastructure

The diagnose phase of this second cycle of the action research focused on measuring process capability, process performance and financial costs for the period 1 May 2016 to 31 October 2016, 12 months after the initial assessment. The measurement model presented in chapter 4 was applied, and the results from this cycle are compared with the results of cycle 1 (chapter 5).

Sixty-five assessment participants were identified by the process facilitator and process managers and selected from each of the following six business units at Company X: Business Support, Operations, Trading Solutions, Execution Services, Engineering, and Program Management.

Several assessment participants were involved in multiple processes. The number of participants in each business unit and process, as well as their geographical dispersion, are listed in Table 6-1.

Table 6-1 Number of participants across business units, processes, and geographic region

Organization Business Unit	Change Management	Incident Management	Problem Management	Geographic Region
Business Support	3	9	2	US, UK, Singapore
Operations	15	15	4	US, India
Trading Solutions	15	1	2	US, UK, Singapore, India
Execution Services	7	1	2	US
Engineering	2	2	13	US, India
Program Management	4	3	4	US
Total	46	31	27	

Process managers and the VP of Operations reviewed the CSFs that were defined in cycle 1. It was agreed that the CSFs identified in ARC1 (Table 5.2) were still applicable to Company X's goals.

6.2.1 Reflection on creating a process improvement infrastructure

The reflection of process capability and specifically the reliability scores for Change Management in §5.8.1 revealed that work procedures and workflows needed to be consistent across business units irrespective of the unit's geographical location. The Trading Solutions business unit was identified in cycle 1 as an integral part of the engineering function of Company X. To improve the assessment reliability in cycle 2, the researcher recommended a change to the organization structure to relocate the Trading Solutions business unit from Sales to Engineering at Company X. From January 2016 the Trading Solutions unit was transferred to the Engineering business unit. Figure 6-3 shows the organizational chart for Company X after the transfer of the Trading Solutions unit.

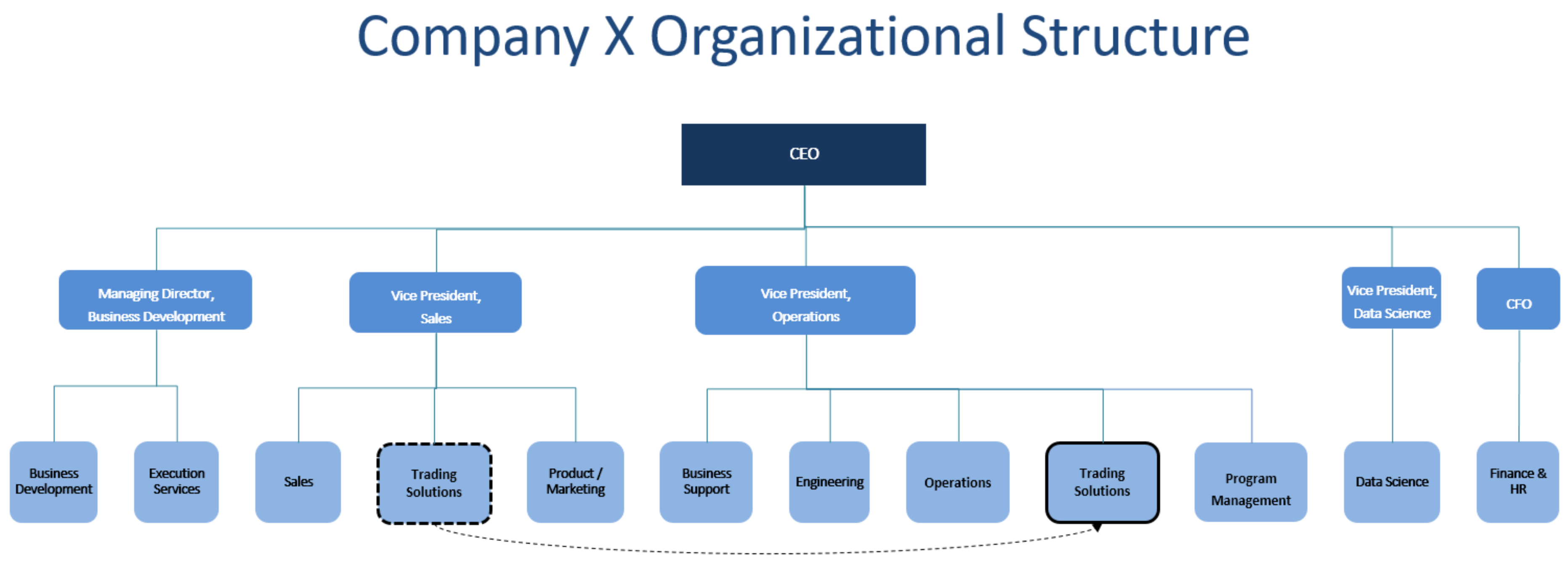


Figure 6-3 Change to organizational structure

Most participants from the first assessment were selected for the second round. However, some participants played different roles in different processes in cycle 2. Two participants from assessment one had left the company, and ten new participants were identified for this round of assessment.

6.3 KISMET Phase 2: Assess process capability and performance

6.3.1 Process Capability Assessment

SMPA Surveys

Prior to the commencement of the assessment, the researcher contacted all survey 1 participants by email on 11 October 2016, to communicate the process capability results of assessment 1 (see Appendix C.5). To commence the assessment, the researcher contacted selected participants by email on 17 October 2016 (see Appendix E.1). The email described the research project, explained the details of participant's involvement and advised to expect an email from the survey portal. An auto-generated survey invitation email was sent to all participants (see Appendix E.2). On 27 October 2016, an automated email was sent from the SMPA tool to remind participants to complete the surveys by the 7 November 2016 deadline (see Appendix E.3). The survey deadline was extended to 14 November 2016 and advised to all participants. All surveys were completed by the revised deadline, and the assessment report was generated. An email was sent to all participants on 10 January 2017 to thank them for their participation (Appendix E.4).

The report stated that all three processes were rated at capability level 1, indicating that the process activities are performed.

Table 6-2 shows a summary of the process capability results for the second assessment.

Table 6-2 Summary of process capability for assessment 2

Incident Management					
	Level 1	Level 2		Level 3	
Profile	Process Performance	Performance Management	Work Product Management	Process Definition	Process Deployment
Attribute Rating Score	L	L	L	L	L
Score Reliability	High	High	High	High	High
Number of responses	29	29	29	29	29
Problem Management					
Attribute Rating Score	L	L	L	L	L
Score Reliability	High	High	High	High	Poor
Number of responses	27	27	27	27	27
Change Management					
Attribute Rating Score	L	L	L	L	L
Score Reliability	High	High	High	High	High
Number of responses	46	46	46	46	46

Legend

"Fully"	F
"Largely"	L
"Partially"	P
"Not"	N

The generated assessment profile for Incident Management considered 81 percent of assessment survey responses as valid answers as 19 percent of respondents selected the *Do not know* option. Problem management had 90 percent valid assessment survey responses. All participants understood the questions with 10 percent choosing the *Do not know* option. Eighty percent of assessment survey responses were considered in generating the assessment profile for Change Management. The *Do not know* option was selected by 20 percent of participants while less than 1 percent did not understand the question. Two of the 31 invited participants for the Incident Management survey did not attempt the survey, while all invited participants for Problem Management and Change Management completed their respective surveys.

The comparison of the assessment results for all three processes is detailed in §6.2.2.2.

Focus Group Workshop

The researcher facilitated a focus group workshop at Company X on 21 March 2017. The workshop was held to enable group level discussion to evaluate the SMPA tool and discuss and refine the process capability assessment report results. A cross-section of survey participants was selected to participate in the focus group. The participant breakdown and coding are shown in Table 6-3.

Table 6-3 Coded participant breakdown

ITSM Process	Process Manager	Process Performer	Process Stakeholder
Incident Management	IMPM2	IMPP1	IMPS2
Problem Management	PMPM1	PMPP1	IMPS2
Change Management	CMPM1	CMPP2	IMPS2

An invitation email was sent to seven participants to outline the purpose of the focus group and provide the Participant Information Sheet and Consent Form as attachments (see Appendix A.1, Appendix B.5, and Appendix B.6). The focus group participants signed the consent forms before proceeding. The meeting was video and audio recorded with the facilitator taking notes as necessary. The meeting took about one hour.

The researcher conducted the workshop with seven participants representing the six business units to discuss the process capability results and triangulate the data. The focus group reviewed the comments entered in the surveys for specific details of perceptions of process challenges.

SMPA Tool Evaluation

An evaluation of the SMPA tool, using the same set of questions from the first workshop, was conducted, and the participants agreed on the following evaluation of the SMPA Tool:

- Online surveys to access processes facilitate speedy responses;
- Single-choice answer options were easy to follow;
- It was convenient to pause the survey and restart later;
- The examples allowed for a better understanding of the questions as they were Company X specific.

During the workshop, time constraints permitted only the evaluation of survey responses for Incident Management using the probing questions. Table 6-4 shows the evaluation criteria and probing questions for Incident Management discussed in the workshop.

Table 6-4 Incident Management Survey Results Evaluation

Evaluation Criteria	Probing Discussion Questions	Summary of Responses
Communication	Do you believe that the information on Company X's Incident Management Process was communicated to all participants?	The focus group felt that communication of the Incident Management process was a problem and that some business units had more insight into the process than others.
Knowledge	Do you believe that all participants have sufficient knowledge to understand the questions?	The Incident Management process manager felt that only senior staff members had the knowledge to comprehend the questions.
Rating Score	Why do you think the rating score was ranked *Largely* for all 3 capability levels? i.e., Process activities are performed in the majority of cases.	The focus group felt that this is true and expected as incidents are dealt with by many people at Company X.
Score Reliability	Why do you think there is high reliability of responses across all 3 levels?	Most people feel that Incident Management is the most mature process.
Answer Breakdown	Why do you think 19 percent of participants chose the *Do not know* answer?	Lack of communication of the process.

The focus group reviewed the survey comments entered by participants for Incident Management. Table 6-5 shows the assessment question, selected option and related comment entered.

Table 6-5 Survey Comments: Incident Management

Question	Selected Option	Comment
Do you know if incidents that are not progressed according to agreed service levels are escalated?	L	Such cases have probably been escalated to engineers. Question is if there is an ETA on the engineering side to resolve these cases.
Do you know if the status and progress of incidents are communicated to interested parties as needed?	P	Depends on who is on the cc list (i.e., TAMs, Support) to revert back to the parties when enquired.
Do you know if required experience, knowledge and skills are clearly defined to perform process activities?	L	Knowledge of system plays the major role in my opinion.
Do you know if dependencies between process outcomes are identified and understood?	L	I will think so...
Do you know if process outcomes are documented and controlled in accordance with defined requirements?	L	As long as the backlog/work done have been diligently noted down.
Do you know if the standard process that includes typical activities is formally described in a reference guide or a procedure?	L	I will think so...
Do you think the incident management process overall fulfills its current or expected outcomes?	F	Incident Management is very good. Problem definition/categorization may not be documented in a fine grain, but incident management is overall very good.
Do you know if incidents are prioritized and analyzed, taking into account the impact and urgency of the incident or service request?	L	Sometimes it takes some diagnostic effort to even understand the severity of the service issue in order to assign the appropriate priority

Question	Selected Option	Comment
Do you know if incidents are managed until they are resolved and closed?	F	On occasion, it takes multiple attempts at resolution before a functional solution is reached and the incident log will be closed and reopened.
Do you know if the status and progress of incidents are communicated to interested parties as needed?	L	Yes, when it is clear who the parties are that should be communicated with.
Do you know if there is effective communication between individuals and groups involved in performing process activities?	L	Making better use of group communication tools could make joint investigation efforts more productive; last time there was a major issue, everyone gathered on a conference line, and the number of participants with their open lines made it difficult to hear.

Overall, the focus group participants agreed with the survey comments recorded for Incident Management. The central theme that came out of the discussion was the importance of establishing SLAs between business units and the need for improved communication.

The focus group reviewed the survey comments entered by participants for Problem Management. Table 6-6 shows the selected option for the related survey question, and the comment entered.

Table 6-6 Survey Comments: Problem Management

Question	Selected Option	Comment
Do you know if key milestones are established to perform process activities?	P	There aren't any "written" milestones. this part is a bit loose in our system

Question	Selected Option	Comment
Do you know if process activities and tasks are clearly defined?	N	we do all these, but not clearly demarcated or documented into buckets defined
Do you know if roles and responsibilities are clearly defined, assigned and communicated to perform process activities?	F	well defined, not sure if documented somewhere
Do you know if required experience, knowledge and skills are clearly defined to perform process activities?	P	Expertise is localized to individuals, and not shared across the organization
Do you think problems are carefully analyzed?	L	Engineering analyses it better and puts more effort. Hence Yes, Most of the times. Else my answer would have been Yes, but only sometimes.

Focus group participants agreed with all the survey comments for Problem Management and felt that the lack of documentation was the main area of concern.

Finally, the survey comments entered by participants for Change Management were analyzed. Table 6-7 shows the selected option for the related survey question, and the comments entered.

Table 6-7 Survey Comments: Change Management

Question	Selected Option	Comment
Do you know if dependencies between process outcomes are identified and understood?	L	All the dependencies are not always apparent beforehand
Do you know if the standard process that includes typical activities is formally described in a reference guide or a procedure?	Do not know	Suren has created an internal site that has process guides, but those use some heavy-duty jargon. Other than Suren's site I am not aware of any internal doc site that explains these processes.

Focus group participants felt that the intranet site created by the researcher was helpful, but not all staff are familiar with the language used on the site.

A summary of the number of comments per selected option for each process is shown in Table 6-8.

Table 6-8 Survey Comments: Summary by Process and Selected Option

Process	Selection					Total Comments
	F	L	P	N	Don't Know	
Incident Management	2	8	1	0	0	11
Problem Management	1	1	2	1	0	5
Change Management	0	1	0	0	1	2

6.3.2 Reflection on the process capability assessment results

Process Attribute Scores

Following the transformation process described in §5.2.2.1, the survey responses were averaged by the SMPA tool to calculate the attribute achievement rating.

Incident management and change management scored *Largely* for all process attributes in both assessments, while problem management scored *Largely* for Performance Management (PA 2.1) in both assessments, and *Partially* for all other process attributes in assessment 1 with *Largely* in assessment 2. Without the actual raw scores for each process attribute, it is not evident whether there was a process capability improvement or not.

Table 6-9 shows the comparison of process attribute ratings for assessment 1 and assessment 2.

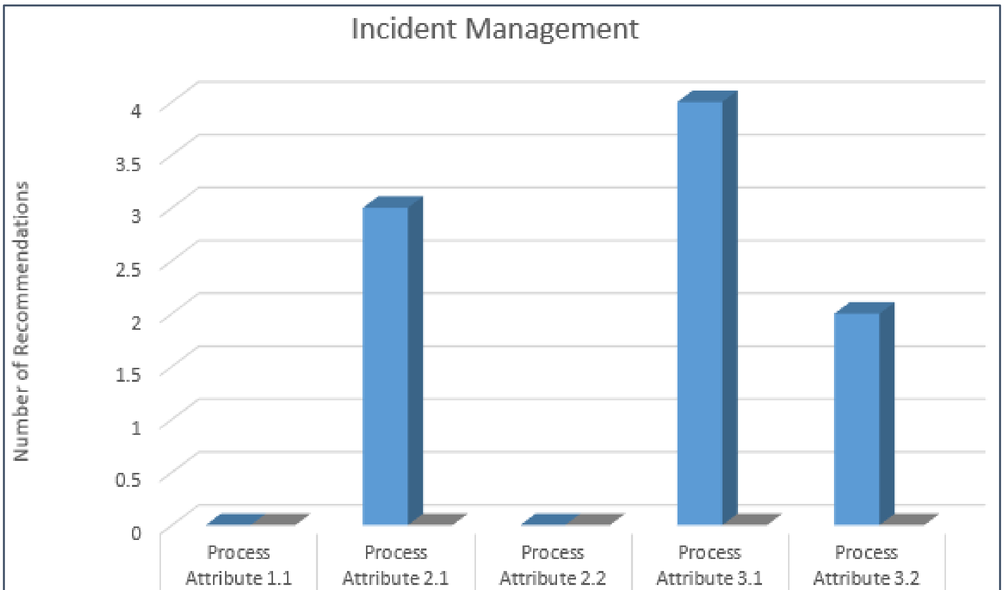
Table 6-9 Comparison of process attribute ratings for assessment 1 and assessment 2

		Level 1	Level 2		Level 3	
Process	Action Research Cycle	PA1.1 Process Performance	PA2.1 Performance Management	PA2.2 Work Product Management	PA3.1 Process Definition	PA3.2 Process Deployment
Incident Management	1	L	L	L	L	L
	2	L	L	L	L	L
Problem Management	1	L	P	P	P	P
	2	L	L	L	L	L
Change Management	1	L	L	L	L	L
	2	L	L	L	L	L

A comparative analysis of the number of recommendations/observations was conducted to determine if the process capability improved year-over-year.

Incident Management

Figure 6-4 shows a comparison of the number of SMPA recommendations between assessment 1 and 2 for Incident Management. The SMPA tool generates recommendations/observations for every question for PA 1.1, and from PA 2.1 onwards recommendation items are only generated when the process rating score is “Partially” (P) or “Not” (N). So, to determine if there was an improvement at PA 1.1, only the questions that scored P and N were considered. In assessment 1 and assessment 2 there were no recommendations for Process Performance (PA 1.1). There were three recommendations/observations for Performance Management (PA 2.1) in assessment 1 compared to none in assessment 2. Work Product Management (PA 2.2) had no recommendations/observations in both assessments, while there were four recommendations/observations for Process Definition (PA 3.1) in assessment 1 with none in assessment 2. Process Deployment (PA 3.2) in assessment 1 reported two recommendations/observations, with none for assessment 2. This indicates that the incident management process improved from assessment 1 to assessment 2.

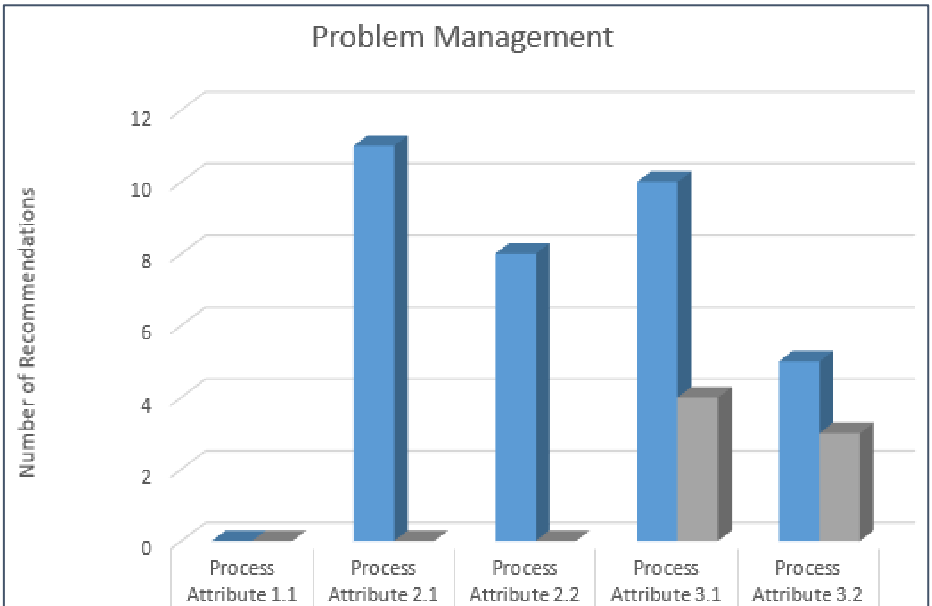


	Process Attribute 1.1	Process Attribute 2.1	Process Attribute 2.2	Process Attribute 3.1	Process Attribute 3.2
Assessment 1	0	3	0	4	2
Assessment2	0	0	0	0	0

Figure 6-4 A comparison of the number of SMPA recommendations between assessment 1 and 2 for Incident Management

Problem Management

Figure 6-5 shows a comparison of the number of SMPA recommendations/observations between assessment 1 and 2 for Problem Management. In both assessments there were no recommendations for Process Performance (PA 1.1) while there were 11 recommendations for Performance Management (PA 2.1) in assessment 1 with none in assessment 2. Eight recommendations were reported in assessment 1 for Work Product Management (PA 2.2), and none in assessment 2. Process Definition (PA 3.1) had ten recommendations in assessment 1 with four in assessment 2, while Process Deployment (PA 3.2) had five recommendations in assessment 1 versus 3 in assessment 2. The decrease in recommendations/observations indicates that the problem management process had improved.



	Process Attribute 1.1	Process Attribute 2.1	Process Attribute 2.2	Process Attribute 3.1	Process Attribute 3.2
Assessment 1	0	11	8	10	5
Assessment2	0	0	0	4	3

Figure 6-5 A comparison of the number of SMPA recommendations between assessment 1 and 2 for Problem Management

<u>Change Management</u>

The Attribute Rating Scores for Change Management were identical for assessment 1 and assessment 2. However, a breakdown of the number of recommendations/observations year-over-year revealed that the process improved in cycle 2. Figure 6-6 shows a comparison of the number of SMPA recommendations/observations for assessment 1 and 2 for Change Management. In assessment 1 there was one recommendation that scored *Partially* (P) for Process Performance (PA 1.1) with none in assessment 2. There were three recommendations for Performance Management (PA 2.1) in assessment 1 and none in assessment 2. Work Product Management (PA 2.2) had three recommendations in assessment 1 with two in assessment 2. Process Definition (PA 3.1) had four recommendations in assessment 1 with one in assessment 2, and Process Deployment (PA 3.2) had three recommendations in assessment 1 with one in assessment 2.

	Process Attribute 1.1	Process Attribute 2.1	Process Attribute 2.2	Process Attribute 3.1	Process Attribute 3.2
Assessment 1	1	3	3	4	3
Assessment2	0	0	2	1	1

Figure 6-6 A comparison of the number of SMPA recommendations between assessment 1 and 2 for Change Management

At the Process Performance (PA 1.1) level every survey question had a corresponding one-to-one knowledge item. However at higher process attributes the same knowledge item was used for multiple questions in a number of instances since some of the questions were closely related and could be addressed by a single knowledge item. At Process Performance (PA 1.1) the recommendations are specific to the process in question. From Performance Management (PA 2.1) onwards, the recommendations are developed as general guidelines that may apply to any process.

The average of the number of recommendations as a percentage of the total number of knowledge items for each process was used as the KPI, with 30 percent as the target and 50 percent for the warning.

Table 6-10 shows the average percentage of recommendations per process over both assessments. The average recommendation ratio decreased considerably from cycle 1 to cycle 2 demonstrating process improvement. These measures were plugged into the enhanced the ITSM^3 for all three processes, as shown in Table 6-40, Table 6-41 and Table 6-42.

Table 6-10 Average Recommendation Ratio for the three processes

	Incident Management			Problem Management			Change Management		
Process Attributes	# of Knowledge Items	Cycle 1	Cycle 2	# of Knowledge Items	Cycle 1	Cycle 2	# of Knowledge Items	Cycle 1	Cycle 2
PA 1.1 Process Performance	8	0	0	11	0	0	14	1	0
PA2.1 Performance Management	21	3	0	21	11	0	21	3	0
PA2.2 Work Product Management	13	0	0	13	8	0	13	3	2
PA3.1 Process Definition	11	4	0	11	10	4	11	4	1
PA3.2 Process Deployment	9	2	0	9	5	3	9	3	1
Total # of Knowledge Items	62			65			68		
Total # of Recommendations		9	0		34	7		14	4
Average Recommendation Ratio		14.5%	0%		52.3%	10.8%		20.6%	5.9%

Score reliability

In cycle 1, the focus group workshop discussed the reliability scores of the SMPA assessment, as reported in §5.3. Table 6-11 shows a comparison of assessment reliability scores for assessment 1 versus assessment 2 for all three processes. Incident management demonstrated a high reliability score across all three capability levels in cycle 1 and cycle 2. This meant that survey respondents predominantly agreed on their ratings. When comparing reliability scores for Problem Management between assessments, the Performance Management (PA 2.1) attribute increased from *Poor* to *High*, and decreased from a *Moderate* score for Process Deployment (PA 3.2) to *Poor*. Change Management reliability scores remained unchanged between assessment 1 and assessment 2, except for an improvement in reliability from *Poor* to *High* for the Process Deployment (PA 3.2) attribute.

Table 6-11 A comparison of assessment reliability scores for Incident Management, Problem Management and Change Management

Process	Assessment	Level 1	Level 2		Level 3	
		Process Performance	Performance Management	Work Product Management	Process Definition	Process Deployment
Incident Management	1	**High**	**High**	**High**	**High**	**High**
	2	**High**	**High**	**High**	**High**	**High**
Problem Management	1	**High**	**Poor**	**High**	**High**	**Moderate**
	2	**High**	**High**	**High**	**High**	**Poor**
Change Management	1	**High**	**High**	**High**	**High**	**Poor**
	2	**High**	**High**	**High**	**High**	**High**

6.3.3 Financial Measurement

Cost of Outages/Major Incidents

For the six month period 1 May 2016 to 31 October 2016, there was one major incident and two outages at the case organization. As shown in Table 6-12 the penalty cost of outages and major incidents at Company X during this period totalled $5,443.

Table 6-12 Cost of outages and major incidents at Company X (May-Oct 2016)

Category	Date/Duration	Events	Financial Measure	Opportunity Cost
Major Incident	03/05/2016 40 minutes	FX Rates price feed for Customer A stopped updating due to an unresponsive Operating System. The physical hypervisor hardware was restarted to bring all servers online and resume the price feed.	Average loss in trading volume	$255,000,000 @ $5/million = $1,275
Outage	04/05/2016 1 hr 20 mins	Various customers reported connection issues to the Cloud and Operations escalated the issue to the on-call Network Engineer. Network team checked the ISP routes for issues and worked with one of the affected customers to troubleshoot connectivity issue. Customers were able to connect to the Internet.	Average loss in trading volume	$145,000,000 @ $7/million = $1,015

Category	Date/Duration	Events	Financial Measure	Opportunity Cost
Outage	18/10/2016 52 minutes	Operations received an alert for power strip failure on one enclosure in the Data Center. On-site datacenter engineer switched the power supply to an alternate power circuit. Customers were able to connect to the Internet.	Average loss in trading volume	$485,000,000 @ an average of $6.50/million = $3,153
Total cost of outages and major incidents				$5,443

Process Costs

The same labor assumptions used in Table 5-18 were applied in cycle 2. Table 6-13 shows the calculations for Company X's on-cost to calculate the fully-burdened annual cost per employee across six groups of staff. The total fully-burdened annual cost was $817,138.

Process Stakeholders (Program Management), as identified in §6.2.1, do not directly engage in process activities, but manage programs that track incidents, problems, and changes. The calculation of process costs did not include this business unit.

The Business Support unit comprises two levels of support personnel (as described in §5.2.1), and process costs were tracked per level.

Table 6-13 Company X's fully-burdened annual costs per employee for six groups of staff

Cost Item	Tier 1	Tier 2	Operations	Engineering	Trading Solutions	Execution Services
Average annual salary	$88,874	$108,927	$83,790	$144,744	$137,002	$127,836
Add: On-cost items:						
Payroll taxes (8%)	$7,110	$8,714	$6,703	$11,580	$10,960	$10,227
Insurance (5%)	$4,444	$5,446	$4,190	$7,237	$6,850	$6,392
Medical benefits (1%)	$889	$1,089	$838	$1,447	$1,370	$1,278
Onsite lunch	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Equipment	$579	$550	$1,563	$2,300	$588	$489
Software licenses	$1,200	$1,212	$1,750	$2,100	$1,200	$1,200
Supplies	$100	$100	$150	$150	$150	$150
Training costs	$0	$500	$500	$670	$0	$0
Total on-costs	$16,321	$19,612	$17,694	$27,484	$23,118	$21,736
Total fully-burdened cost	$105,195	$128,539	$101,484	$172,228	$160,120	$149,572

Table 6-14, Table 6-15and Table 6-16 show the costs per business unit for each of the processes after applying the formula described in §4.3.3.1.

Table 6-14 Incident Management Costs per Business Unit at Company X (May-Oct 2016)

Business Unit	Time[a]	# Staff	Hours Spent on Incidents	Cost/Hour	Total Cost
Support Tier 1	70%	6	3,864	$47.56	$183,769
Support Tier 2	25%	3	690	$58.12	$40,100
Operations	25%	15	3,450	$45.48	$156,912
Engineering	20%	14	2,576	$76.39	$196,775
Execution Services	30%	7	1,932	$72.96	$140,956
Trading Solutions	30%	15	4,140	$67.66	$280,100
Total cost of Incidents					$998,611
a) Proportion of Time Spent on Incidents					

Table 6-15 Problem Management Costs per Business Unit at Company X (May-Oct 2016)

Business Unit	Time[a]	# Staff	Hours Spent on Incidents	Cost/Hour	Total Cost
Support Tier 1	2%	6	110	$47.56	$5,251
Support Tier 2	35%	3	966	$58.12	$56,140
Operations	20%	15	2,760	$45.48	$125,529
Engineering	30%	14	3,864	$76.39	$295,162
Execution Services	10%	7	644	$72.96	$46,985
Trading Solutions	20%	15	2,760	$67.66	$186,733
Total cost of Incidents					$715,800
a) Proportion of Time Spent on Problems					

Table 6-16 Change Management Costs per Business Unit at Company X (May-Oct 2016)

Business Unit	Time[a]	# Staff	Hours Spent on Incidents	Cost/Hour	Total Cost
Support Tier 1	1%	6	55	$47.56	$2,625
Support Tier 2	5%	3	138	$58.12	$8,020
Operations	35%	15	4,830	$45.48	$219,676
Engineering	10%	14	1,288	$76.39	$98,387
Execution Services	10%	7	644	$72.96	$46,985
Trading Solutions	20%	15	2,760	$67.66	$186,733
Total cost of Incidents					$562,427
a) Proportion of Time Spent on Changes					

6.3.3.1 Reflection on financial measurement

Employee salaries increased and on-costs changed between cycle 1 and cycle 2. Table 6-17 shows the comparison of annual salaries per employee per business unit year-over-year and Figure 6-7 shows a graph comparing the salaries by cycle. Annual salaries increased by an average of 8.04 percent.

Table 6-17 A comparison of employee annual salaries by business unit for cycle 1 and 2

Business Unit	Cycle 1 Salary 2015 (Table 5-19)	Cycle 2 Salary 2016 (Table 6-13)	Salary Increase	Percent Increase
Tier 1	$97,691	$105,195	$7,504	7.68%
Tier 2	$119,375	$128,539	$9,164	7.68%
Operations	$93,423	$101,484	$8,061	8.63%

Business Unit	Cycle 1 Salary 2015 (Table 5-19)	Cycle 2 Salary 2016 (Table 6-13)	Salary Increase	Percent Increase
Engineering	$156,907	$172,228	$15,321	9.76%
Trading Solutions	$149,864	$160,120	$10,256	6.84%
Execution Services	$138,973	$149,572	$10,599	7.63%

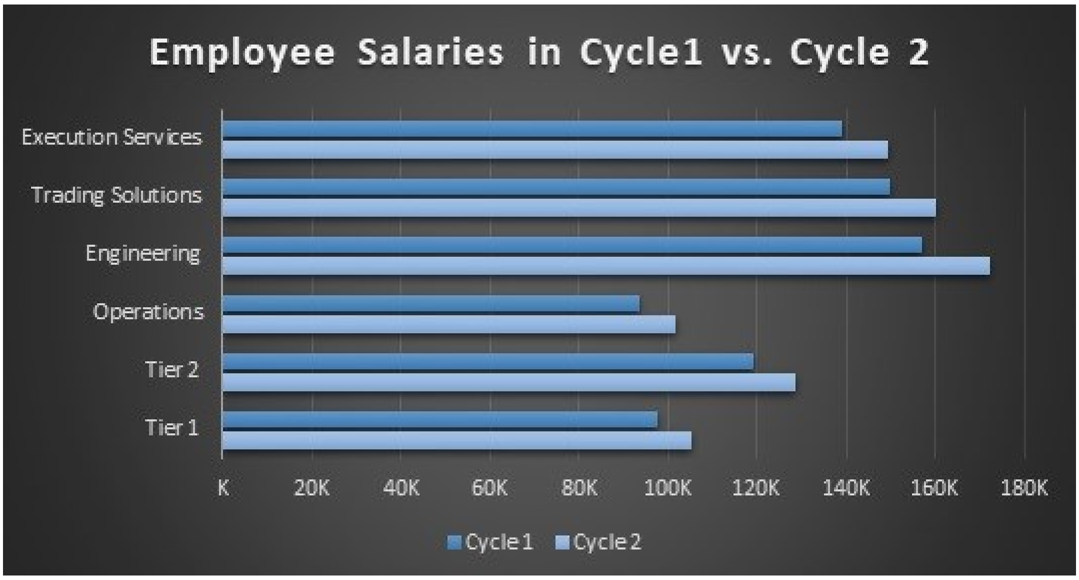


Figure 6-7 Employee salaries in cycle 1 vs. cycle 2

To enable an accurate comparison of salaries, the Consumer Price Index (CPI) was used to normalize the salaries in cycle 2. The CPI is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services, reported monthly by the Bureau of Labor Statistics (Bureau of Labor Statistics 2017a). The Bureau of Labor Statistics uses the CPI for urban households (CPI-U) to adjust hourly compensation and uses the CPI for urban workers (CPI-W) to adjust hourly earnings (Bosworth, Perry & Shapiro 1994). The annual average CPI-W for the San Francisco Bay Area (location of Company X's headquarters) for 2015 was 253.91 and 260.83 in 2016 (Bureau of Labor Statistics 2017b).

The percentage increase (x) of the average 2016 CPI-W over the average 2015 CPI-W was calculated as follows:

$$x = [(2016 \text{ CPI-W} - 2015 \text{ CPI-W}) / 2015 \text{ CPI-W}] * 100$$

$$= [(260.83 – 253.91) / 253.91] * 100$$

$$\approx 2.73\%$$

This percentage increase in CPI was applied to discount the 2016 fully-burdened annual cost to align with 2015 fully-burdened annual cost.

2016 CPI-W Adjusted Cost = 2016 Cost – (2016 Cost * x)

Table 6-18 shows the CPI-W adjusted employee salaries using the CPI-W for 2015 and 2016.

Table 6-18 Normalized 2016 salaries using CPI-W for 2015 & 2016

Business Unit	Cycle 1 Salary 2015	Cycle 2 Salary 2016	CPI-W Adjusted Salary
Tier 1	$97,691	$105,195	$102,328
Tier 2	$119,375	$128,539	$125,036
Operations	$93,423	$101,484	$98,718
Engineering	$156,907	$172,228	$167,534
Trading Solutions	$149,864	$160,120	$155,756
Execution Services	$138,973	$149,572	$145,496

Table 6-19, Table 6-20, and Table 6-21 show the costs per business unit for each of the processes.

Table 6-19 Incident Management Costs per Business Unit at Company X

Business Unit	Time[a]	# Staff	Hours on Incidents	CPI-Adjusted Cost/Hour	Total Cost
Support Tier 1	70%	6	3,864	$49.20	$190,095
Support Tier 2	25%	3	690	$60.11	$41,478
Operations	25%	15	3,450	$47.46	$163,739
Engineering	20%	14	2,576	$80.55	$207,485
Execution Services	30%	7	1,932	$74.88	$144,674
Trading Solutions	30%	15	4,140	$69.95	$289,592
Total cost of Incidents					$1,037,062
a) Proportion of Time Spent on Incidents					

Table 6-20 Problem Management Costs per Business Unit at Company X

Business Unit	Time[a]	# Staff	Hours on Problems	CPI-Adjusted Cost/Hour	Total Cost
Support Tier 1	2%	6	110	$49.20	$5,431
Support Tier 2	35%	3	966	$60.11	$58,069
Operations	20%	15	2,760	$47.46	$130,991
Engineering	30%	14	3,864	$80.55	$311,227
Execution Services	10%	7	644	$74.88	$48,225
Trading Solutions	20%	15	2,760	$69.95	$193,062
Total cost of Problems					$747,005
a) Proportion of Time Spent on Problems					

Table 6-21 Change Management Costs per Business Unit at Company X

Business Unit	Time[a]	# Staff	Hours on Changes	CPI-Adjusted Cost/Hour	Total Cost
Support Tier 1	1%	6	55	$49.20	$2,716
Support Tier 2	5%	3	138	$60.11	$8,296
Operations	35%	15	4,830	$47.46	$229,234
Engineering	10%	14	1,288	$80.55	$103,742
Execution Services	10%	7	644	$74.88	$48,225
Trading Solutions	20%	15	2,760	$69.95	$193,062
Total cost of Changes					$585,274
a) Proportion of Time Spent on Changes					

The labor cost per business unit was normalized for 2016 to align with the cost for 2015. Table 6-22 shows the comparison of the normalized labor costs per process for 2015 and 2016.

Table 6-22 Normalized costs per process for 2015 and 2916

ITSM Process	2015	2016
Incident Management	$1,303,416	$1,037,062
Problem Management	$1,141,073	$747,005
Change Management	$820,061	$585,274
Total Costs	$3,266,565.0051	$2,371,357.00

6.3.4 Operationalizing the Measurement Model

Operational metrics

Using the same operational metrics selected for cycle 1 data were collected from Zendesk for the six month period 1 May 2016 to 31 October 2016. Zendesk dashboards were created presenting the operational metrics for each process. The operational metrics selected for each process, with their source and actual data for the period assessed are shown in Table 6-23, Table 6-24 and Table 6-25.

Table 6-23 Incident Management Operational Metrics (May-Oct 2016)

Operational Metric	Data Source	Count	Time Hours
Total number of incidents	Zendesk	5,881	
Average time to resolve Severity 1 and Severity 2 incidents	Zendesk		63.4
Number of incidents resolved within agreed service levels	Zendesk	2,454	
Number of high severity/major incidents	Zendesk	912	
Number of incidents with customer impact	Zendesk	711	
Number of incidents reopened	Zendesk	397	
Average incident response time	Zendesk		2.5

Operational Metric	Data Source	Count	Time Hours
Average incident closure duration	Zendesk		60.5
Incidents completed without escalation	Zendesk	1,278	
Total available time to work on incidents	Zendesk		22,080
Total time spent resolving incidents	Labor reports		8,000

Table 6-24 Problem Management Operational Metrics (May-Oct 2016)

Operational Metric	Data Source	Count	Time in Hours
Number of repeat incidents	Zendesk	0	
Number of major problems	Zendesk	7	
Total number of incidents	Zendesk	1	
Total number of problems in pipeline	Zendesk	16	
Number of problems removed (error control)	Zendesk	14	
Number of known errors (root cause is known and workaround in place)	Zendesk	5	
Number of problems reopened	Zendesk	0	
Number of problems with customer impact	Zendesk	0	
Average problem resolution time - severity 1 and 2 problems (hours)	Zendesk		473.2
Total available labor hours to work on problems	Zendesk		1000
Total labor hours spent working on and coordinating problems	Labor reports		200

Table 6-25 Change Management Operational Metrics (May-Oct 2016)

Operational Metric	Data Source	Count	Time in Hours
Total Changes In Pipeline	Zendesk	1,252	
Total Changes Implemented	Zendesk	33	
Number of Failed Changes	Zendesk	17	
Number of Emergency Changes	Zendesk	24	

Operational Metric	Data Source	Count	Time in Hours
Number of Unauthorized Changes Detected	Zendesk	8	
Number of Changes Rescheduled	Zendesk	40	
Average Process Time Per Change	Zendesk		57
Number of Changes Resulting in Incidents	Zendesk	27	
Total Available Labor Hours To Coordinate (Not Implement) Changes	Staffing reports		49.1
Total Labor Hours Spent Coordinating Changes			40

Key Performance Indicators

The KPIs used in cycle 1 were used in cycle 2 as they remained important to meet the CSFs of Company X.

Tolerance Thresholds and KPI Scoring

Based on the KPI method detailed in chapter 4 §4.2.4, the KPI items, established threshold targets, the desirable result (polarity), the calculations of the KPI results, and the actual results for the case organization for the period May-Oct 2016 are shown below in Table 6-26**,** Table 6-27, and Table 6-28.

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Table 6-26 KPI Threshold Targets, Results, and Scores for Incident Management

KPI Item	Calculation	Target Level	Warning Level	Polarity[a]	KPI Result	KPI Score
Incident management process capability	Outcome of process assessment as described in §4.1	2	1	M	**1**	2
Process performance metrics						
Number of incident	Total number of incidents	10,000	12,000	L	**5,881**	1
Number of high severity/major incidents	Number of high severity/major incidents	5000	6000	L	**912**	1
Incident resolution rate	Number of incidents resolved within agreed timeframe/ Total number of incidents	50.0%	40.0%	M	**41.7%**	2
Customer incident impact rate	Number of incidents with customer impact/ Total number of incidents	30.0%	50.0%	L	**12.1%**	1
Incident reopen rate	Number of incidents reopened/ Total number of incidents	10.0%	20.0%	L	**6.8%**	1
Average time to resolve severity 1 and 2 incidents (hours)	Average time to resolve severity 1 and 2 incidents	40.00	60.00	L	**63.40**	3
Average incident response time (hours)	Average incident response time	4.0	8.0	L	**2.5**	1

KPI Item	Calculation	Target Level	Warning Level	Polarity[a]	KPI Result	KPI Score
Percentage of incidents completed without escalation	Incidents completed without escalation / Total number of incidents	90%	70%	M	**21.7%**	3
Incident labor utilization rate	Total labor hours spent resolving incidents/ Total available labor hours to work on incidents	50%	75%	L	**36.2%**	1
Financial Measures						
Incident management cost	Calculation shown in **Table 6-19**	$1,000,000	$1,200,000	L	**$1,037,062**	2
Cost of outages	Calculation shown in Table 6-12	$15,000	$20,000	L	**$5,443**	1
Note: a) Polarity: L indicates a lower value is desirable; M indicates a higher value is desirable						

Table 6-27 KPI Threshold Targets, Results, and Scores for Problem Management

KPI Item	Calculation	Target Level	Warning Level	Polarity[a]	KPI Result	KPI Score
Problem management process capability	Outcome of process assessment as described in §4.1	2	1	M	**1**	2
Process performance metrics						
Incident Repeat Rate	Total number of incidents	15%	20%	L	**0%**	1
Number Of Major Problems	Number of high severity/major incidents	10	12	L	**7**	1
Problem Resolution Rate	Number of incidents resolved within agreed timeframe/ Total number of incidents	90.0%	80.0%	M	**87.5%**	2
Problem Workaround Rate	Number of incidents with customer impact/ Total number of incidents	30.0%	50.0%	L	**31.3%**	2
Problem Reopen Rate	Number of incidents reopened/ Total number of incidents	10.0%	20.0%	L	**0%**	1
Customer Impact Rate	Average time to resolve severity 1 and 2 incidents	15.0	20.0	L	**0**	1
Average Problem Resolution Time - Severity 1 and 2 Problems (Hours)	Average incident response time	80.0	100.0	L	**473.2**	3
Problem Labor Utilization Rate	Incidents completed without escalation / Total number of incidents	50%	75%	L	**20%**	1
Financial Measures						

KPI Item	Calculation	Target Level	Warning Level	Polarity[a]	KPI Result	KPI Score
Problem management cost	Calculation shown in **Table 6-20**	$1,000,000	$1,200,000	L	**$747,005**	1
Cost of outages	Calculation shown in Table 6-12	$15,000	$20,000	L	**$5,443**	1
Note: a) Polarity: L indicates a lower value is desirable; M indicates a higher value is desirable						

Table 6-28 KPI Threshold Targets, Results, and Scores for Change Management

KPI Item	Calculation	Target Level	Warning Level	Polarity[a]	KPI Result	KPI Score
Change management process capability	Outcome of process assessment as described in §4.1	2	1	M	**1**	2
Process performance metrics						
Change Efficiency Rate	Total number of incidents	80%	65%	M	**2.6%**	3
Change Success Rate	Number of high severity/major incidents	80%	70%	L	**48%**	1
Emergency Change Rate	Number of incidents resolved within agreed timeframe/ Total number of incidents	60%	80%	L	**191.7%**	3
Change Reschedule Rate	Number of incidents with customer impact/ Total number of incidents	30%	50%	L	**3.2%**	1

KPI Item	Calculation	Target Level	Warning Level	Polarity[a]	KPI Result	KPI Score
Average Process Time Per Change (Hours)	Number of incidents reopened/ Total number of incidents	10%	20%	L	**57.4**	2
Unauthorized Change Rate	Average time to resolve severity 1 and 2 incidents	15%	20%	L	**1.9%**	1
Change Incident Rate	Average incident response time	5%	7%	L	**0.8%**	1
Change Labor Workforce Utilization	Incidents completed without escalation / Total number of incidents	50%	75%	L	**81%**	3
Financial Measures						
Change management cost	Calculation shown in **Table 6-21**	$1,000,000	$1,200,000	L	**$585,274**	1
Cost of outages	Calculation shown in Table 6-12	$15,000	$20,000	L	**$5,443**	1
Note: a) Polarity: L indicates a lower value is desirable; M indicates a higher value is desirable						

Linking KPIs to Critical Success Factors

Table 6-29 shows the CSF attainment level and scores derived from the highest value of the associated KPI scores for each process using Steinberg's scoring mechanism. All five CSFs for Incident Management attained a *Low* level score, Problem Management attained a *Low* level score for three CSFs with two *Medium* scores, while for Change Management, one CSF attained a *High* level score, one a *Medium* level, and three *Low* level scores.

Table 6-29 Incident Management: CSF Attainment and CSF Scores

Critical Success Factor	**CSF Attainment**	**CSF Score**
Incident Management		
Quickly resolve incidents	Low	3
Maintain IT service quality	Low	3
Improve IT and business productivity	Low	3
Effectively resolve incidents	Low	3
Cost savings	Low	3
Problem Management		
Minimize impact of problems (reduce incident frequency/duration)	Low	3
Reduce unplanned labor spent on incidents	Medium	2
Improve quality of services being delivered	Low	3
Effectively resolve problems and errors	Low	3
Cost savings	Medium	2
Change Management		
Protect services when making changes	Low	3
Make changes quickly and accurately in line with business needs	High	1
Make changes efficiently and effectively	Low	3
Utilize a repeatable process for handling changes	Low	3
Cost savings	Medium	2

Business Risks

Table 6-30 provides a list of Company X's outcome risks, derived risk levels and the associated CSF scores for the Incident Management process. To derive the risk levels of the CSFs, all non-zero values were replaced with the highest CSF score for that outcome risk, and then the average of the non-zero values for each CSF were calculated, as shown in the last row of Table 6-30. Table 6-31 and Table 6-32 provide a list of Company X's outcome risks, derived risk levels and the associated CSF scores for the Problem Management and Change Management processes.

Table 6-30 Incident Management: Mapping of Outcome Risks to CSF Scores

Outcome Risk Item	Quickly resolve incidents	Maintain IT service quality	Improve IT and business productivity	Effectively resolve incidents	Cost savings	Risk level
Service outages	0	3	0	3	3	**High**
Rework	3	0	3	3	3	**High**
Waste	3	0	3	3	3	**High**
Delayed solutions	0	0	3	3	0	**High**
Slow operational processes	0	0	3	3	0	**High**
Security breaches	0	3	0	0	3	**High**
Slow turnaround times	0	0	0	3	0	**Moderate**
Unexpected costs	3	3	3	3	3	**High**
Higher or escalating costs	3	3	3	3	3	**High**
Slow response to business needs and changes	3	0	3	3	3	**High**
Inability to scale	3	0	3	0	0	**High**
Fines and penalties	0	0	0	0	3	**High**
High levels of non-value labor	3	0	3	3	3	**High**
Loss of market share	0	3	3	3	3	**High**
Loss of revenue/sales	0	3	0	3	3	**High**

Table 6-31 Problem Management: Mapping of Outcome Risks to CSF Scores

Outcome Risk Item	Minimize Impact Of Problems (Reduce Incident Frequency/Duration)	Reduce Unplanned Labor Spent On Incidents	Improve Quality Of Services Being Delivered	Effectively Resolve Problems and Errors	Cost savings	Risk level
Service outages	0	2	0	3	2	High
Rework	3	0	3	3	2	High
Waste	3	0	3	3	2	High
Delayed solutions	0	0	3	3	0	High
Slow operational processes	0	0	3	3	0	High
Security breaches	0	0	0	3	2	High
Slow turnaround times	3	0	0	3	0	Moderate
Unexpected costs	3	2	3	3	2	High
Higher or escalating costs	3	2	3	3	2	High
Slow response to business needs and changes	0	0	3	3	2	High
Inability to scale	3	0	3	0	0	High
Fines and penalties	0	0	0	0	2	Moderate
High levels of non-value	3	0	3	3	2	High
Loss of market share	0	2	3	3	2	High
Loss of revenue/sales	3	0	3	0	2	High

Table 6-32 Change Management: Mapping of Outcome Risks to CSF Scores

Outcome Risk Item	Protect Services When Making Changes	Make Changes Quickly And Accurately In Line With Business Needs	Make Changes Efficiently And Effectively	Utilize A Repeatable Process For Handling Changes	Cost savings	Risk level
Service outages	0	1	0	3	2	High
Rework	3	0	3	3	2	High
Waste	3	0	3	3	2	High
Delayed solutions	0	0	3	3	0	High
Slow operational processes	0	0	3	3	0	High
Security breaches	0	0	0	3	2	Moderate
Slow turnaround	3	0	0	3	0	High
Unexpected costs	3	1	3	3	2	High
Higher or escalating	3	1	3	3	2	High
Slow response to business needs and	0	0	3	3	2	High
Inability to scale	3	0	3	0	0	High
Fines and penalties	0	0	0	0	2	Moderate
High levels of non-value labor	3	0	3	3	2	High
Loss of market share	0	1	3	3	2	High
Loss of revenue/sales	3	0	3	0	2	High

ITSMP² Risk Level Scores

For this cycle, as agreed by senior management, the target risk threshold level remained at 2.0 (moderate) for all dimensions of the ITSMP². Table 6-33 shows the ITSMP² Risk Level scores and Risk Levels derived from the associated Business Risk scores for all three processes.

Table 6-33 Incident Management: ITSMP² Risk Levels

ITSM Process	ITSMP² Performance Dimension	Risk Level Score	Risk Level
Incident Management	Operational	3.0	High
	Customer Satisfaction	3.0	High
	Productivity	3.0	High
	Market	3.0	High
	Financial	3.0	High
Problem Management	Operational	3.0	High
	Customer Satisfaction	3.0	High
	Productivity	3.0	High
	Market	2.8	High
	Financial	2.9	High
Change Management	Operational	3.0	High
	Customer Satisfaction	3.0	High
	Productivity	3.0	High
	Market	2.8	High
	Financial	2.9	High

ITSMP² Risk Level Scorecard

The ITSMP² Risk Level scores in Table 6-33 is represented graphically to show their deviation from their targets as shown in Figure 6-8, Figure 6-9, and Figure 6-10. As a result of this outcome, Incident management process improvement plans have been developed and are currently being executed on at Company X. Company X plans to evaluate the actions taken over the following six months and then rerun this measurement model to re-evaluate the ITSMP² risks.

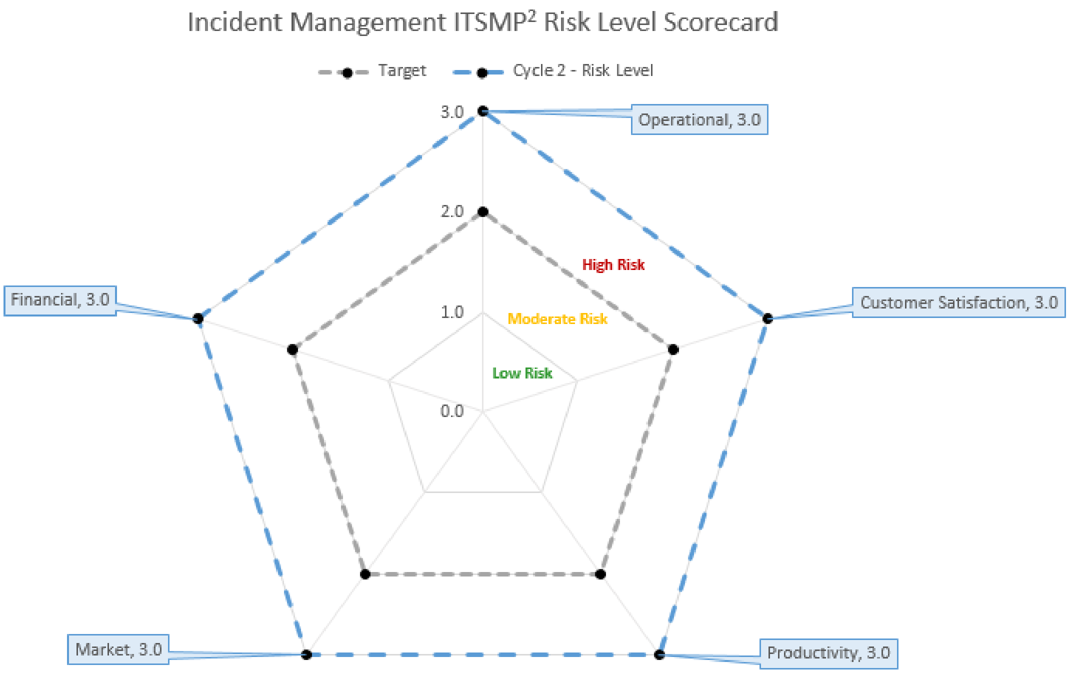


Figure 6-8 ITSMP² Risk Level Scorecard for Incident Management

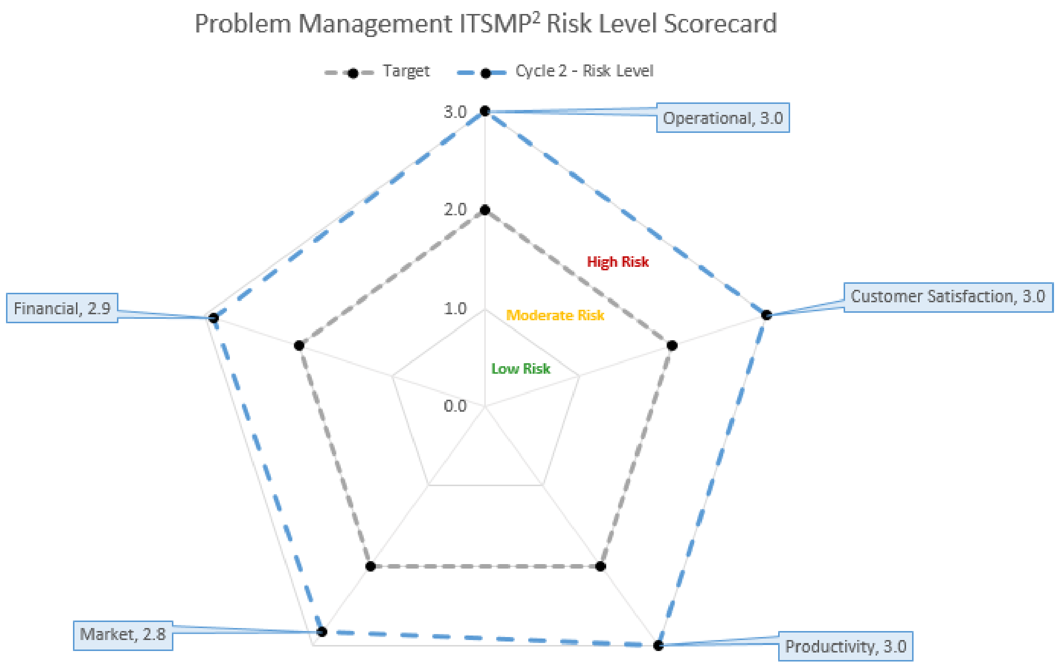


Figure 6-9 ITSMP² Risk Level Scorecard for Problem Management

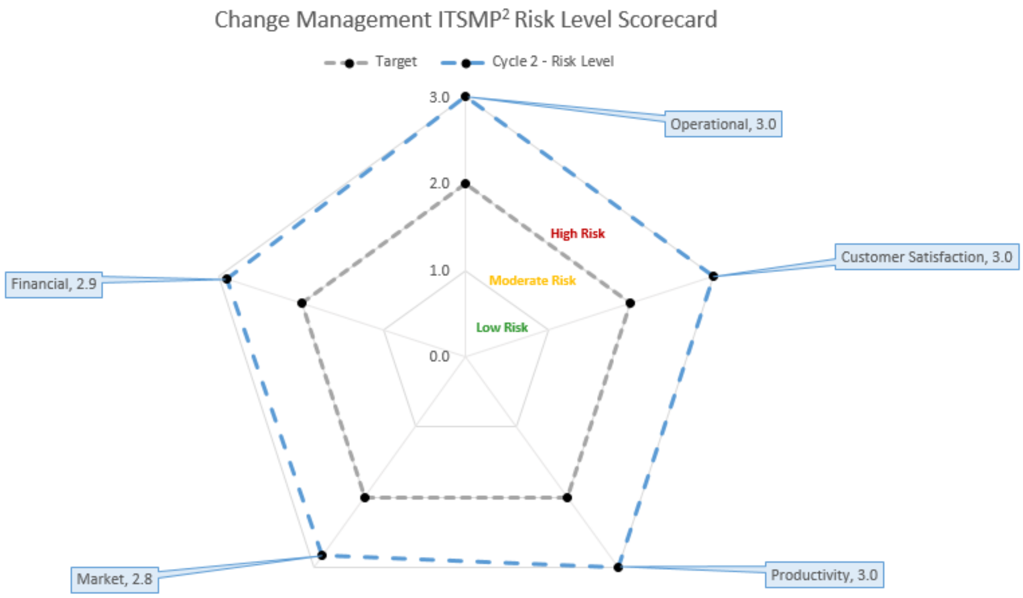


Figure 6-10 ITSMP² Risk Level Scorecard for Change Management

6.3.5 Reflection on operationalizing the measurement model

A comparison of the ITSMP² Risk Level scorecards for cycle 1 and cycle 2 revealed that for Incident Management four of the ITSMP² risk levels for cycle 2 were higher than that of cycle 1 and one remained the same, while Problem Management and Change Management risk levels were the same. Figure 6-11, Figure 6-12 and Figure 6-13 show a comparison of ITSMP² risk levels for Incident Management, Problem Management, and Change Management respectively cycle-over-cycle.

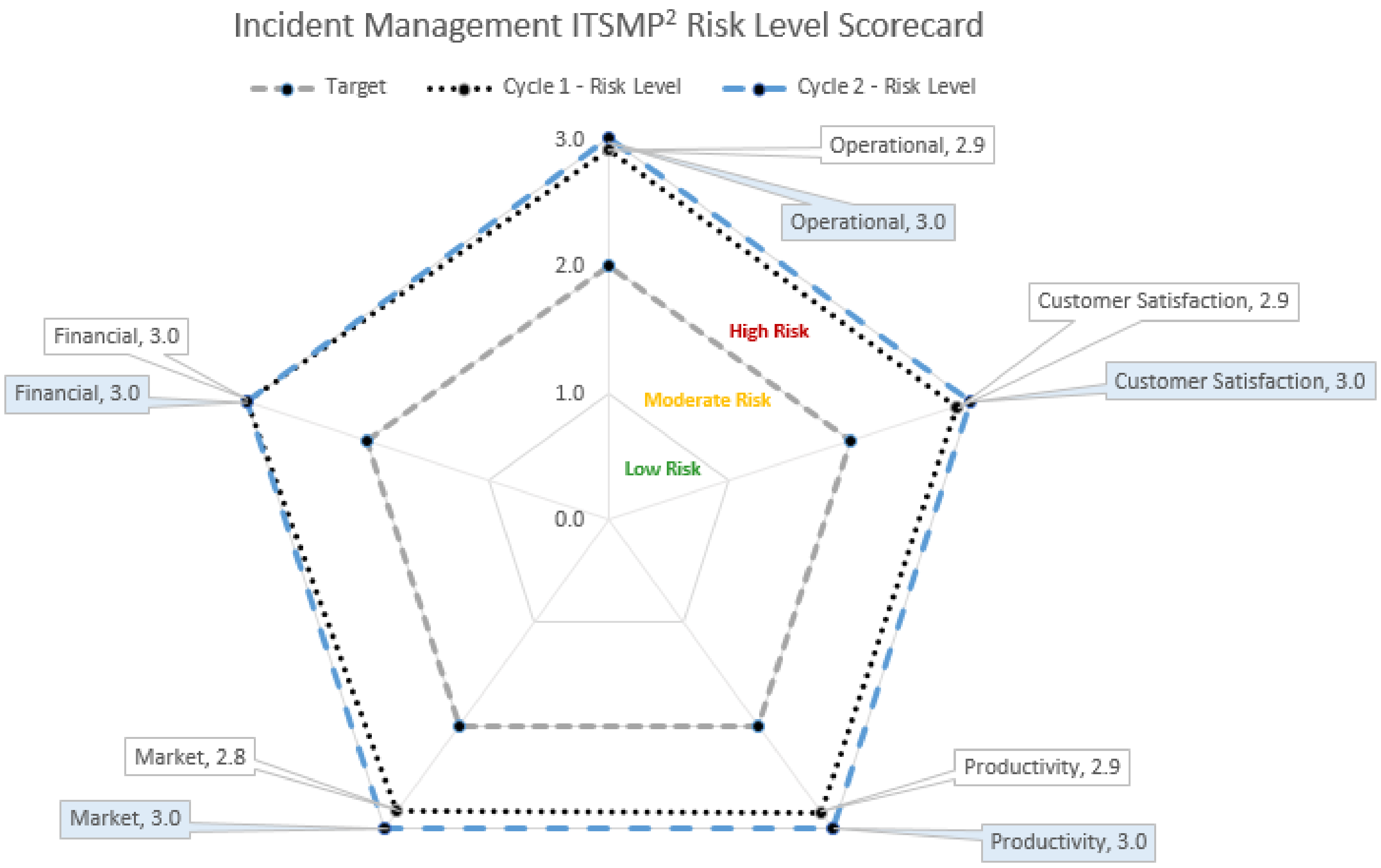


Figure 6-11 Incident Management ITSMP² Risk Level Scorecard for cycle 1 and cycle 2

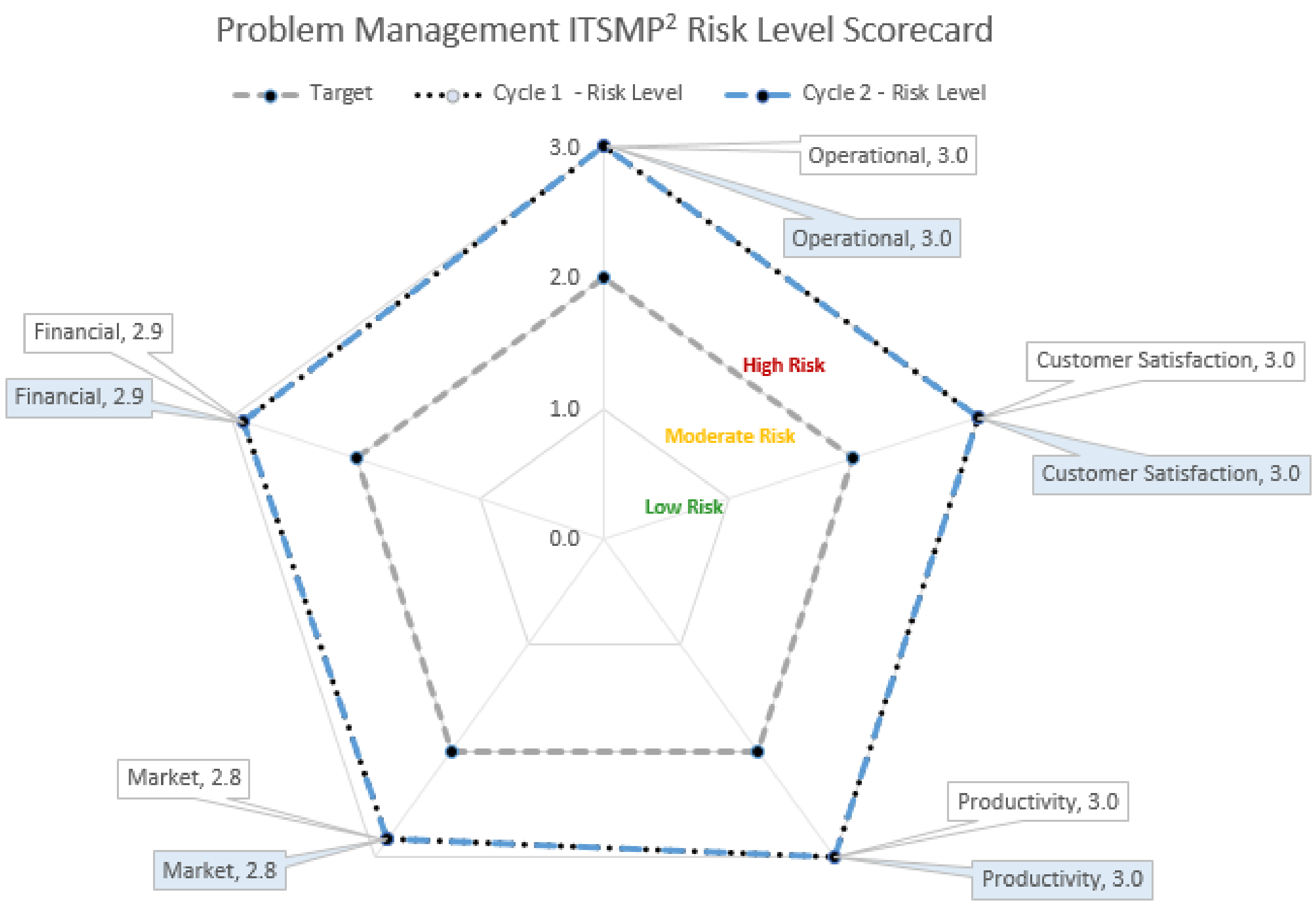


Figure 6-12 Problem Management ITSMP² Risk Level Scorecard for cycle 1 and cycle 2

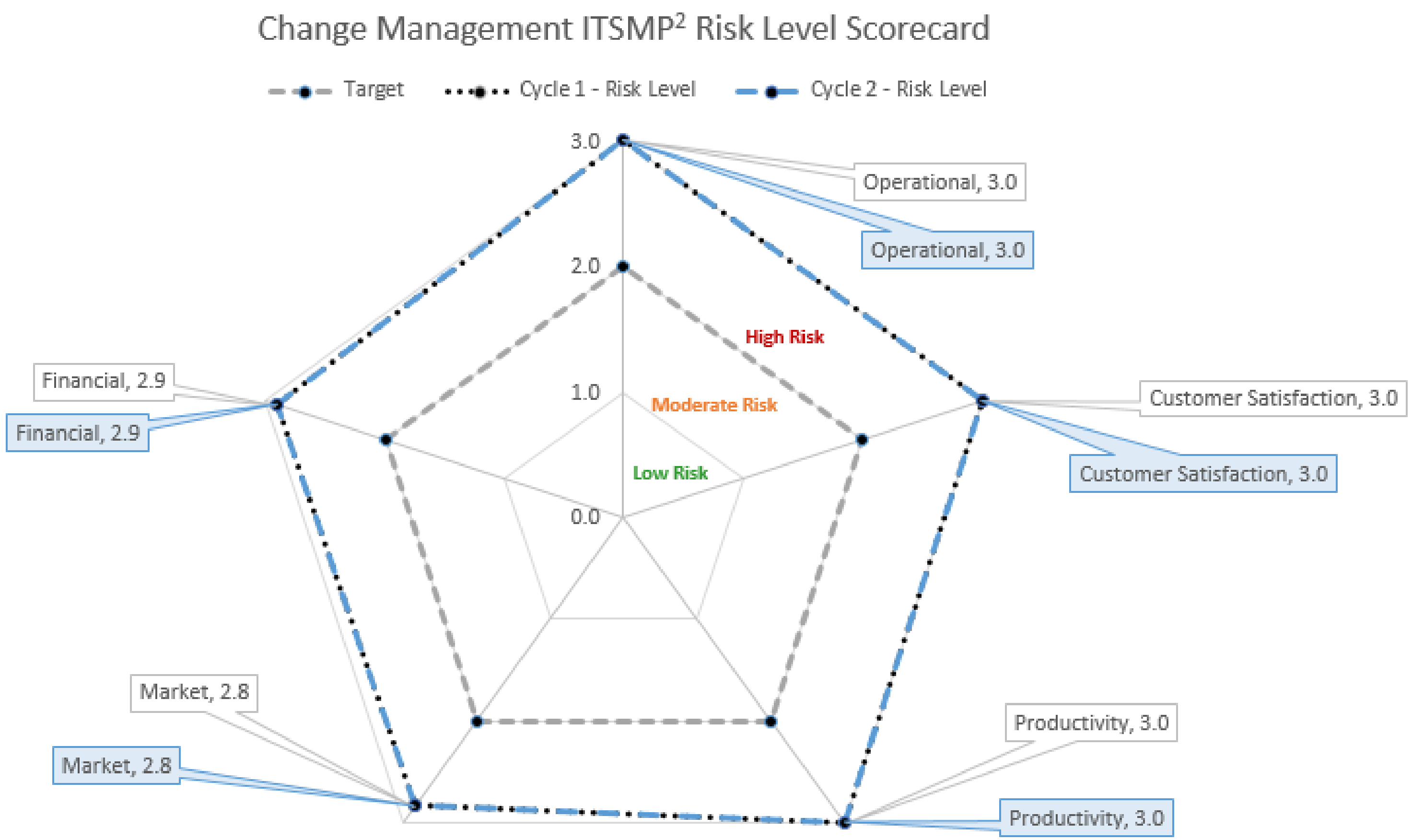


Figure 6-13 Change Management ITSMP² Risk Level Scorecard for cycle 1 and cycle 2

In the reflection of Process Capability, in §6.2.2.2, it was determined that by using the proportion of SMPA recommendations as a proxy measure for process capability, the processes did improve yielding fewer recommendations in cycle 2 when compared to cycle 1. In the reflection of process costs, in §6.2.2.4, the costs associated with running the processes decreased year over year. Despite these two positive indicators of improvement, the radar charts in Figure 6-11, Figure 6-12 and Figure 6-13 do not indicate improvements in ITSMP[2] risk levels.

This prompted further investigation into the underlying calculations of the ITSM[3].

<u>Incident Management</u>

There are twelve KPI items for Incident Management, of which eight showed improvement, two results remained the same and two scored worse when compared to the results of cycle 1. Table 6-34 shows a comparison of Incident Management KPI results between cycle 1 and cycle 2.

Table 6-34 A comparison of Incident Management KPI results between cycle 1 and cycle 2

			Cycle 1		Cycle 2		
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**	**Outcome**
Incident management process capability	2	1	1	2	1	2	=
Process performance metrics							
Number of incident occurrences	10,000	12,000	10,171	2	5,881	1	✓
Number of high severity/major incidents	5000	6000	6,672	3	912	1	✓
Incident resolution rate	50%	40%	33%	3	41.7%	2	✓
Customer incident impact rate	30%	50%	33%	2	12.1%	1	✓
Incident reopen rate	10%	20%	11%	2	6.8%	1	✓
Average time to resolve severity 1 and 2 incidents (hours)	40.00	60.00	52.20	2	63.40	3	X
Average incident response time (hours)	4	8	7.2	2	2.5	1	✓
Percentage of incidents completed without escalation	90%	70%	83%	2	21.7%	3	X
Incident labor utilization rate	50%	75%	36%	1	36.2%	1	=
Financial Measures							
Incident management cost	$1,000,000	$1,200,000	$1,303,416	3	$1,037,062	2	✓
Cost of outages	$15,000	$20,000	$17,370	2	$5,443	1	✓

✓ - indicates a KPI score improvement

= - indicates equal KPI scores

X – indicates a deterioration in KPI score

Although 67 percent (8 out of 12) of KPI scores improved cycle over cycle, of the five CSFs, one decreased in attainment while four remained the same cycle-over-cycle. Table 6-35 shows a comparison of Incident Management CSF attainment levels for between cycle 1 and cycle 2.

Table 6-35 A comparison of Incident Management CSF attainment levels for between cycle 1 and cycle 2

Critical Success Factor	Cycle 1 Attainment	Cycle 2 Attainment
Quickly Resolve Incidents	Low	Low
Maintain IT Service Quality	Low	Low
Improve IT And Business Productivity	Low	Low
Effectively Resolve Incidents	Moderate	Low
Cost Savings	Low	Low

Problem Management

There are eleven KPI items for Problem Management, of which four showed improvement, six results remained the same, and one scored worse when compared to the results of cycle 1. Table 6-36 shows a comparison of Problem Management KPI results between cycle 1 and cycle 2.

Table 6-36 A comparison of Problem Management KPI results between cycle 1 and cycle 2

			Cycle 1		Cycle 2		
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**	**Outcome**
Problem management process capability	2	1	1	2	1	2	=
Process performance metrics							
Incident Repeat Rate	15%	20%	28.57%	3	**0%**	1	✓
Number Of Major Problems	10	12	8	1	**7**	1	=
Problem Resolution Rate	90%	80%	19.3%	3	**87.5%**	2	✓
Problem Workaround Rate	30%	50%	6.0%	1	**31.3%**	2	X
Problem Reopen Rate	10%	20%	3.6%	1	**0%**	1	=
Customer Impact Rate	15%	20%	0%	1	**0%**	1	=
Average Problem Resolution Time - Severity 1 and 2 Problems (Hours)	80	120	664.5	3	**473.2**	3	=
Problem Labor Utilization Rate	50%	75%	20%	1	**20%**	1	=
Financial Measures							
Problem management cost	$1,000,00	$1,200,0	$1,141,073	2	**$747,005**	1	✓
Cost of outages	$15,000	$20,000	$17,370	2	**$5,443**	1	✓

✓ - indicates a KPI score improvement

= - indicates equal KPI scores

X – indicates a deterioration in KPI score

Although 36 percent (4 out of 11) of KPI scores improved cycle over cycle, of the five CSFs, only one increased in attainment while four remained the same cycle-over-cycle. Table 6-37 shows a comparison of Problem Management CSF attainment levels for cycle 1 and cycle 2

Table 6-37 A comparison of Problem Management CSF attainment levels for between cycle 1 and cycle 2

Critical Success Factor	Cycle 1 Attainment	Cycle 2 Attainment
Minimize Impact Of Problems (Reduce Incident Frequency/Duration)	Low	Low
Reduce Unplanned Labor Spent On Incidents	Low	Moderate
Improve Quality Of Services Being Delivered	Low	Low
Effectively Resolve Problems and Errors	Low	Low
Cost Savings	Moderate	Moderate

<u>Change Management</u>

There are 11 KPI items for Change Management, of which three showed improvement, seven results remained the same, and one scored worse when compared to the results of cycle 1. Table 6-38 shows a comparison of Change Management KPI results for cycle 1 and cycle 2.

Table 6-38 A comparison of Change Management KPI results between cycle 1 and cycle 2

			Cycle 1		Cycle 2		
KPI Item	Target Level	Warning Level	**KPI Result**	**KPI Score**	KPI Result	KPI Score	**Outcome**
Change management process capability	2	1	1	2	1	2	=
Process performance metrics							
Change Efficiency Rate	80%	65%	3.3%	3	2.6%	3	=
Change Success Rate	80%	70%	86%	1	48%	1	=
Emergency Change Rate	60%	80%	57.7%	1	191.7%	3	X
Change Reschedule Rate	30%	50%	65.5%	3	3.2%	1	✓
Average Process Time Per Change (Hours)	10%	20%	401.6	3	57.4	2	✓
Unauthorized Change Rate	15%	20%	0.6%	1	1.9%	1	=
Change Incident Rate	5%	7%	0.2%	1	0.8%	1	=
Change Labor Workforce Utilization	50%	75%	81%	3	81%	3	=
Financial Measures							
Change management cost	$1,000,000	$1,200,000	$820,061	1	$585,274	1	=
Cost of outages	$15,000	$20,000	$17,370	2	$5,443	1	✓

✓ - indicates a KPI score improvement

= - indicates equal KPI scores

X – indicates a deterioration in KPI score

27 percent (3 out of 11) of KPI scores improved cycle over cycle, but of the five CSFs, one increased in attainment while four remained the same cycle-over-cycle. Table 6-39 shows a comparison of Change Management CSF attainment levels for cycle 1 and cycle 2

Table 6-39 A comparison of Change Management CSF attainment levels for between cycle 1 and cycle 2

Critical Success Factor	Cycle 1 Attainment	Cycle 2 Attainment
Protect Services When Making Changes	Low	Low
Make Changes Quickly And Accurately In Line With Business Needs	Low	High
Make Changes Efficiently And Effectively	Low	Low
Utilize A Repeatable Process For Handling Changes	Low	Low
Cost Savings	Moderate	Moderate

To meet the quality requirements of data used to populate the ITSM[3], a first level analysis of the operational metrics data generated by the researcher were analyzed periodically by process managers for accuracy and applicability by reviewing the Zendesk metrics of what to measure, how to measure, and the filters applied.

As an example, Figure 6-14 shows the *What* was measured, and the SQL statement used to derive the metric. Figure 6-15 shows the filters applied to the query to derive the number of Incidents reported.

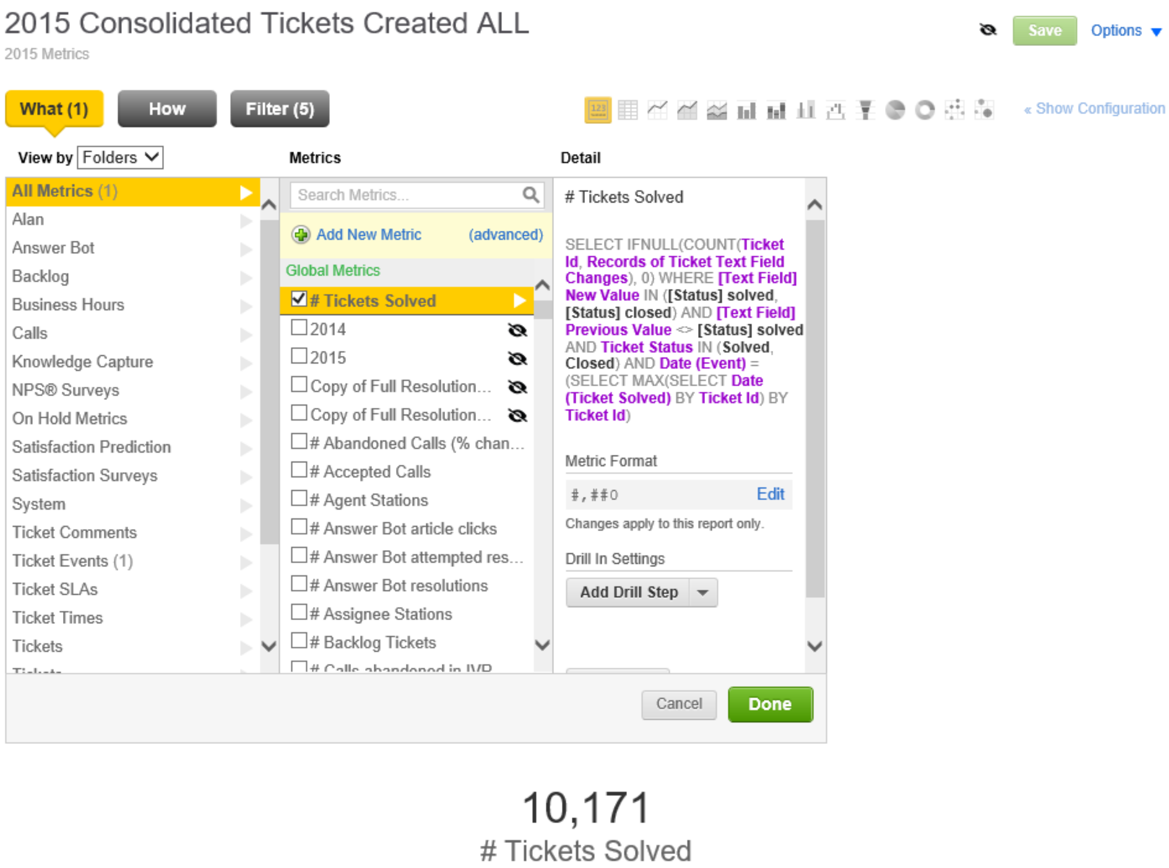


Figure 6-14 Zendesk metrics for number of Incidents

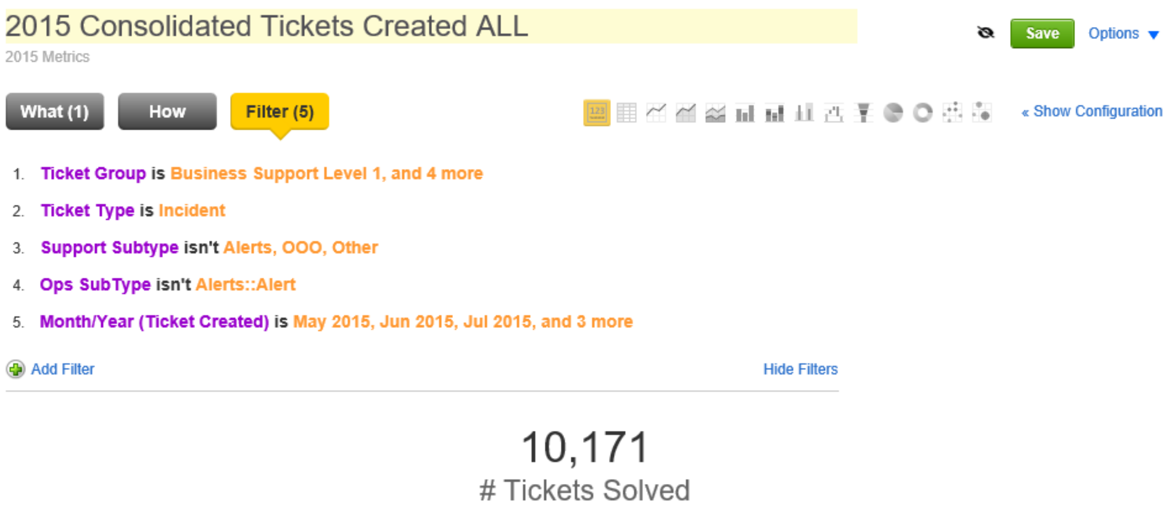


Figure 6-15 Zendesk metrics filters for number of Incidents

A second level of data quality analysis was conducted by the researcher and process managers on the derivation of the KPI results, by examining the Excel formulas for the KPI results column. A further analysis was conducted on the KPI scoring based on where the KPI result fell within the tolerance threshold range.

The third level of data quality analysis involved the scrutiny of how the KPIs contributed to their associated CSF. The anomaly evident in the Incident Management results prompted an analysis of the measurement model by the researcher. Steinberg's model assumes that all KPIs are equally valuable in achieving their associated CSF. In contrast, an analysis by the researcher and senior management of how the KPIs were scored and CSFs derived, revealed that in practice not all KPIs contribute equally to attaining their associated CSF. To incorporate this realization, Steinberg's approach was modified to weight the KPIs associated with each CSF to better align with the organization's strategic goal. Weighting factors can be used to define the level of importance of criteria (Paule & Mandel 1982). The attainment levels of CSFs are then re-determined using the weighted average of the KPIs associated with them.

The KPI weighted average ($\bar{x}$) is equal to the summation of the product of the KPI weight (w_i) times the KPI score (x_i) divided by the sum of the KPI weights. Figure 6-16 shows the KPI weighted average formula.

$$\bar{x} = \frac{\sum_{i=1}^{n} w_i \cdot x_i}{\sum_{i=1}^{n} w_i} = \frac{w_1 x_1 + w_2 x_2 + \ldots + w_n x_n}{w_1 + w_2 + \ldots + w_n}$$

Figure 6-16 KPI Weighted Average Formula

In a further modification to the Steinberg model, the CSFs were also weighted to determine the Business Risk Mitigation Level scores, and the ITSMP^2 Attainment Level scores were calculated as the weighted average of the associated CSFs scores.

The ITSMP^2 Attainment Levels were derived by applying the ordinal NPLF scale: *Not* (N); *Partially* (P); *Largely* (L) and *Fully* (F) as defined in the measurement framework of ISO/IEC 15504 standard (ISO/IEC 2004).

Steinberg's KPI scoring method scores the best outcome with a value of 1 and the worst outcome with a value of 3. As this method seemed counter-intuitive, it was reversed to score 3 for KPIs meeting their targets, 2 for KPIs between target and warning thresholds, and 1 for KPIs not meeting their target.

CSFs are scored by transforming the maximum score of the associated KPIs from the ordinal scale to an integer value for the attainment of the CSF. The scoring method was modified to align with the CSF NPLF scoring method.

Application of the enhanced ITSM^3

The recommendation ratio (described in §6.3.2), normalized salaries for cycle 2 (described in §6.3.3.1) and the enhanced scoring method described above was applied to the three ITSM processes at Company X. Table 6-40, Table 6-41, and Table 6-42 show a comparison of the KPI results for the three processes using the enhanced ITSM^3.

Table 6-40 A comparison of Incident Management KPI results using the enhanced ITSM[3]

			Cycle 1		Cycle 2	
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**
Incident management recommendation ratio	10%	20%	14.5%	2	0%	3
Process performance metrics						
Number of incident occurrences	10,000	12,000	10,171	2	5,881	3
Number of high severity/major incidents	5,000	6,000	6,672	1	912	3
Incident resolution rate	50%	40%	33%	1	42%	2
Customer incident impact rate	30%	50%	33%	2	12%	3
Incident reopen rate	10%	20%	11%	2	7%	3
Average time to resolve severity 1 and 2 incidents (hours)	40	60	52.20	2	63.40	1
Average incident response time (hours)	4	8	7.2	2	2.5	3
Percentage of incidents completed without escalation	90%	70%	83%	2	22%	1
Incident labor utilization rate	50%	75%	36%	3	36%	3

			Cycle 1		Cycle 2	
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**
Financial Measures						
Incident management cost	$1,000,000	$1,200,000	$1,303,416	1	$1,307,062	1
Cost of outages	$15,000	$20,000	$17,370	2	$5,443	3

Table 6-41 A comparison of Problem Management KPI results using the enhanced ITSM[3]

			Cycle 1		Cycle 2	
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**
Problem management recommendation ratio	10%	20%	52.3%	1	10.8%	2
Process performance metrics						
Incident repeat rate	15%	20%	10,171	2	5,881	3
Number of major problems	10	12	6,672	1	912	3
Problem resolution rate	90.0%	80.0%	33%	1	42%	2
Problem workaround rate	30.0%	50.0%	33%	2	12%	3
Problem reopen rate	10.0%	20.0%	11%	2	7%	3
Customer impact rate	15.0	20.0	52.20	2	63.40	1
Average problem resolution time - severity 1 and 2 problems (days)	80.0	100.0	7.2	2	2.5	3
Problem labor utilization rate	50%	75%	83%	2	22%	1
Incident repeat rate	15%	20%	36%	3	36%	3

			Cycle 1		Cycle 2	
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**
Financial Measures						
Problem management cost	$1,000,000	$1,200,000	$1,141,073	2	$747,005	3
Cost of outages	$15,000	$20,000	$17,370	2	$5,443	3

Table 6-42 A comparison of Change Management KPI results using the enhanced ITSM[3]

			Cycle 1		Cycle 2	
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**
Change management recommendation ratio	10%	20%	20.6%	1	5.9%	3
Process performance metrics						
Change Efficiency Rate	80%	65%	**3.3%**	1	**2.6%**	1
Change Success Rate	80%	70%	**86%**	3	**48%**	1
Emergency Change Rate	60%	80%	**57.7%**	3	**191.7%**	1
Change Reschedule Rate	30%	50%	**65.5%**	1	**3.2%**	3
Average Process Time Per Change (Hours)	160	200	**401.6**	1	**57.4**	2
Unauthorized Change Rate	15%	20%	**0.6%**	3	**1.9%**	3
Change Incident Rate	5%	7%	**0.2%**	3	**0.8%**	3
Change Labor Workforce Utilization	50%	75%	**81%**	1	**81%**	1
Financial Measures						
Change management cost	$1,000,000	$1,200,000	$820,061	3	$585,274	3

			Cycle 1		Cycle 2	
KPI Item	**Target Level**	**Warning Level**	**KPI Result**	**KPI Score**	**KPI Result**	**KPI Score**
Cost of outages	$15,000	$20,000	$17,370	2	$5,443	3

The researcher met with process managers and the VP of Operations to assign weights to the KPI items that contributed to a CSF. The sum of the weights of the contributing KPI must equal one. Table 6-43, Table 6-44, and Table 6-45 show the weighted KPI items for the related CSFs and the weighted average for each CSF (bottom row) for the three processes.

Table 6-43 Incident Management CSFs and related weighted KPIs

KPI Item	KPI Score	Quickly Resolve Incidents	Maintain IT Service Quality	Improve IT And Business Productivity	Effectively Resolve Incidents	Cost Savings
Incident management process capability	3	0.00	0.00	0.10	0.00	0.15
Number of incident occurrences	3	0.00	0.00	0.15	0.00	0.00
Number of high severity/major incidents	3	0.10	0.15	0.00	0.00	0.10
Incident resolution rate	2	0.25	0.00	0.10	0.00	0.10
Customer incident impact rate	3	0.00	0.15	0.00	0.00	0.00
Incident reopen rate	3	0.15	0.00	0.15	0.00	0.00
Average time to resolve severity 1 and 2 incidents (hours)	1	0.15	0.20	0.00	0.25	0.00
Average incident response time (hours)	3	0.00	0.30	0.20	0.00	0.00

KPI Item	KPI Score	Quickly Resolve Incidents	Maintain IT Service Quality	Improve IT And Business Productivity	Effectively Resolve Incidents	Cost Savings
Percentage of incidents completed without escalation	1	0.10	0.00	0.10	0.20	0.05
Incident labor utilization rate	3	0.05	0.20	0.00	0.20	0.10
Incident management cost	2	0.20	0.00	0.15	0.15	0.25
Cost of outages	3	0.00	0.00	0.00	0.20	0.25
Sum of weights		1	1	1	1	1
Weighted average score		2.05	2.60	2.53	1.95	2.55

Table 6-44 Problem Management CSFs and related weighted KPIs

KPI Item	KPI Score	Minimize Impact Of Problems (Reduce Incident Frequency/Duration)	Reduce Unplanned Labor Spent On Incidents	Improve Quality Of Services Being Delivered	Effectively Resolve Problems and Errors	Cost Savings
Problem management process capability	2	0.00	0.00	0.00	0.00	0.15
Incident Repeat Rate	3	0.30	0.25	0.00	0.00	0.00
Number Of Major Problems	3	0.25	0.00	0.00	0.00	0.00
Problem Resolution Rate	2	0.00	0.20	0.00	0.00	0.00
Problem Workaround Rate	2	0.25	0.00	0.15	0.00	0.00
Problem Reopen Rate	3	0.10	0.15	0.00	0.35	0.00
Customer Impact Rate	3	0.00	0.10	0.20	0.00	0.20
Average Problem Resolution Time - Severity 1 and 2 Problems (Hours)	1	0.10	0.00	0.45	0.15	0.00

KPI Item	KPI Score	Minimize Impact Of Problems (Reduce Incident Frequency/Duration)	Reduce Unplanned Labor Spent On Incidents	Improve Quality Of Services Being Delivered	Effectively Resolve Problems and Errors	Cost Savings
Problem Labor Utilization Rate	3	0.00	0.30	0.00	0.30	0.35
Incident Repeat Rate	3	0.30	0.25	0.00	0.00	0.00
Incident management cost	3	0.00	0.00	0.20	0.00	0.30
Cost of outages	3	0.00	0.00	0.00	0.20	0.00
Sum of weights		1	1	1	1	1
Weighted average score		2.55	2.80	1.95	2.70	2.85

Table 6-45 Change Management CSFs and related weighted KPIs

KPI Item	**KPI Score**	Protect Services When Making Changes	Make Changes Quickly And Accurately In Line With Business Needs	Make Changes Efficiently And Effectively	Utilize A Repeatable Process For Handling Changes	Cost Savings
Incident management process capability	3	0.00	0.00	0.00	0.25	0.35
Number of incident occurrences	1	0.00	0.00	0.00	0.00	0.00
Number of high severity/major incidents	1	0.00	0.00	0.00	0.00	0.00
Incident resolution rate	1	0.35	0.00	0.00	0.00	0.00
Customer incident impact rate	3	0.00	0.20	0.00	0.00	0.00
Incident reopen rate	2	0.20	0.00	0.25	0.00	0.00
Average time to resolve severity 1 and 2 incidents (hours)	3	0.20	0.30	0.00	0.25	0.00
Average incident response time (hours)	3	0.00	0.20	0.20	0.00	0.15
Percentage of incidents completed without escalation	1	0.25	0.00	0.25	0.25	0.00
Incident labor utilization rate	1	0.00	0.00	0.00	0.00	0.00

KPI Item	**KPI Score**	Protect Services When Making Changes	Make Changes Quickly And Accurately In Line With Business Needs	Make Changes Efficiently And Effectively	Utilize A Repeatable Process For Handling Changes	Cost Savings
Incident management cost	3	0.00	0.30	0.00	0.25	0.20
Cost of outages	3	0.00	0.00	0.30	0.00	0.30
	Sum of weights	1	1	1	1	1
	Weighted average score	1.60	3.00	2.25	2.50	3.00

The formula presented in Figure 6-16 was applied to derive the weighted average score for each CSF. Using the Change Management process and the CSF *Cost Savings* as an example, the score was derived as follows:

$\bar{x}$ = [(0.35*3) + (0.15*3) + (0.2*3) + (0.3*3)] / 1

= 3.00

To derive the CSF attainment level for a process, the weighted average score for each CSF (as shown in the last row of Table 6-43, Table 6-44, and Table 6-45) was divided by the maximum attainable score of 3, and the attainment level was derived by determining the point in ordinal NPLF scale that the result fell. If the result was greater than 0.85, an attainment level of *Fully* (F) was assigned to the CSF. If the result was greater than 0.50 and less than or equal to 0.85, an attainment level of *Largely* (L) was assigned to the CSF. If the result was greater than 0.15 and less than or equal to 0.50, an attainment level of *Partially* (P) was assigned to the CSF. If the result was less than or equal to 0.15, an attainment level of *Not* (N) was assigned to the CSF.

The comparison of the CSF attainment levels for the three processes for cycle 1 and cycle 2 after applying the enhanced ITSM3 is shown in Table 6-46, Table 6-47 and Table 6-48.

Table 6-46 Comparison of Incident Management CSF attainment levels for cycle 1 and cycle 2 using the enhanced ITSM3

Critical Success Factor	Cycle 1 Attainment	Cycle 2 Attainment
Quickly resolve incidents	P	L
Maintain IT service quality	L	F
Improve IT and business productivity	L	F
Effectively resolve incidents	L	L
Cost savings	L	L

Table 6-46 shows that three CSFs achieved a higher attainment level in cycle 2 compared to cycle 1, and two CSFs remained at the same level. However, in §6.2.2.6 in reflecting on operationalizing the measurement model, Table 6-35 shows that one CSF lowered its attainment levels while four remained the same.

Table 6-47 Comparison of Problem Management CSF attainment levels for cycle 1 and cycle 2 using the enhanced ITSM³

Critical Success Factor	Cycle 1 Attainment	Cycle 2 Attainment
Minimize Impact Of Problems (Reduce Incident Frequency/Duration)	F	L
Reduce Unplanned Labor Spent On Incidents	L	F
Improve Quality Of Services Being Delivered	L	L
Effectively Resolve Problems and Errors	L	F
Cost Savings	L	F

Table 6-47 shows that three CSFs achieved higher attainment levels in cycle 2 compared to cycle 1, one CSF remained at the same level, and one achieved a lower attainment level. However, in §6.2.2.6 in reflecting on operationalizing the measurement model, Table 6-37 shows that one CSF increased its attainment level while four remained the same.

Table 6-48 Comparison of Change Management CSF attainment levels for cycle 1 and cycle 2 using the enhanced ITSM³

Critical Success Factor	Cycle 1 Attainment	Cycle 2 Attainment
Quickly resolve incidents	L	L
Maintain IT service quality	F	F
Improve IT and business productivity	L	L
Effectively resolve incidents	L	L
Cost savings	L	F

Table 6-48 shows that one CSF achieved a higher attainment level in cycle 2 compared to cycle 1, and four CSFs remained at the same level. However, in §6.2.2.6 in reflecting on operationalizing the measurement model, Table 6-39 shows that one CSF increased its attainment level while four remained the same.

For the business risks that are associated with a CSF, the weighted averages of the applicable CSF scores were used to determine the Business Risk Mitigation Level scores. Table 6-49, Table 6-50, and Table 6-51 show the CSF weighted averages for those CSFs associated with business risks in cycle 1 (last column) for all three processes.

Table 6-49 Weighted average of Incident Management CSFs associated with business risks

Business Risk	Operational	Customer Satisfaction	Productivity	Market	Financial	Weighted Average
Service outages	0.00	0.15	0.00	0.10	0.05	0.82
Rework	0.15	0.00	0.15	0.05	0.05	0.75
Waste	0.10	0.00	0.20	0.05	0.05	0.75
Delayed solutions	0.00	0.00	0.15	0.10	0.00	0.81
Slow operational processes	0.00	0.00	0.15	0.05	0.00	0.79
Security breaches	0.00	0.25	0.00	0.00	0.05	0.79
Slow turnaround times	0.00	0.00	0.00	0.05	0.00	0.67
Unexpected costs	0.20	0.20	0.05	0.05	0.15	0.82
Higher or escalating costs	0.10	0.10	0.05	0.10	0.15	0.82
Slow response to business needs and changes	0.10	0.00	0.05	0.05	0.05	0.81
Inability to scale	0.15	0.00	0.10	0.00	0.00	0.78
Fines and penalties	0.00	0.00	0.00	0.00	0.15	0.85
High levels of non-value labor	0.20	0.00	0.05	0.05	0.05	0.77
Loss of market share	0.00	0.15	0.05	0.20	0.05	0.82
Loss of revenue/sales	0.00	0.15	0.00	0.15	0.20	0.82

Table 6-50 Weighted average of Problem Management CSFs associated with business risks

Business Risk	Operational	Customer Satisfaction	Productivity	Market	Financial	Weighted Average
Service outages	0.00	0.15	0.00	0.10	0.05	0.94
Rework	0.15	0.00	0.15	0.05	0.05	0.84
Waste	0.10	0.00	0.20	0.05	0.05	0.84
Delayed solutions	0.00	0.00	0.15	0.10	0.00	0.83
Slow operational processes	0.00	0.00	0.15	0.05	0.00	0.83
Security breaches	0.00	0.25	0.00	0.00	0.05	0.94
Slow turnaround times	0.00	0.00	0.00	0.05	0.00	0.83
Unexpected costs	0.20	0.20	0.05	0.05	0.15	0.90
Higher or escalating costs	0.10	0.10	0.05	0.10	0.15	0.90
Slow response to business needs and changes	0.10	0.00	0.05	0.05	0.05	0.85
Inability to scale	0.15	0.00	0.10	0.00	0.00	0.78
Fines and penalties	0.00	0.00	0.00	0.00	0.15	0.95
High levels of non-value labor	0.20	0.00	0.05	0.05	0.05	0.85
Loss of market share	0.00	0.15	0.05	0.20	0.05	0.88
Loss of revenue/sales	0.00	0.15	0.00	0.15	0.20	0.87

Table 6-51 Weighted average of Change Management CSFs associated with business risks

Business Risk	Operational	Customer Satisfaction	Productivity	Market	Financial	Weighted Average
Service outages	0.00	0.15	0.00	0.10	0.05	0.97
Rework	0.15	0.00	0.15	0.05	0.05	0.73
Waste	0.10	0.00	0.20	0.05	0.05	0.73
Delayed solutions	0.00	0.00	0.15	0.10	0.00	0.78
Slow operational processes	0.00	0.00	0.15	0.05	0.00	0.78
Security breaches	0.00	0.25	0.00	0.00	0.05	0.95
Slow turnaround times	0.00	0.00	0.00	0.05	0.00	0.65
Unexpected costs	0.20	0.20	0.05	0.05	0.15	0.90
Higher or escalating costs	0.10	0.10	0.05	0.10	0.15	0.90
Slow response to business needs and changes	0.10	0.00	0.05	0.05	0.05	0.83
Inability to scale	0.15	0.00	0.10	0.00	0.00	0.64
Fines and penalties	0.00	0.00	0.00	0.00	0.15	1.00
High levels of non-value labor	0.20	0.00	0.05	0.05	0.05	0.78
Loss of market share	0.00	0.15	0.05	0.20	0.05	0.88
Loss of revenue/sales	0.00	0.15	0.00	0.15	0.20	0.82

Business Risk mitigation levels were derived using the weighted average scores of the associated CSFs. Using the same NPLF scale, higher weighted average scores mean business risk mitigation levels. Table 6-52 shows the mapping of the NPLF scale to business risk levels.

Table 6-52 Mapping of the NPLF scale to business risk mitigation levels

Business Risk Mitigation Level	Scale %
N	0 - 15
P	>15 - 50
L	>50 - 85
F	>85 - 100

The business risk mitigation levels of cycle 1 were compared to that of cycle 2. Table 6-53 shows a comparison of Incident Management business risk mitigation levels between cycle 1 and cycle 2. All of the Incident Management business risks remained at the same business risk mitigation level of *Largely*.

Table 6-53 Comparison of Incident Management business risk levels for cycle 1 and cycle 2

Business Risk	Cycle 1 Business Risk Mitigation Level	Cycle 2 Business Risk Mitigation Level
Service outages	L	L
Rework	L	L
Waste	L	L
Delayed solutions	L	L
Slow operational processes	L	L
Security breaches	L	L
Slow turnaround times	L	L
Unexpected costs	L	L
Higher or escalating costs	L	L
Slow response to business needs and changes	L	L
Inability to scale	L	L
Fines and penalties	L	L
High levels of non-value labor	L	L

Business Risk	Cycle 1 Business Risk Mitigation Level	Cycle 2 Business Risk Mitigation Level
Loss of market share	L	L
Loss of revenue/sales	L	L

Table 6-54 shows a comparison of Problem Management business risk mitigation levels between cycle 1 and cycle 2. Eight of the fifteen Problem Management business risks improved in risk mitigation level from *Largely* to *Fully,* while six remained the same at *Largely* and one risk declined in mitigation level from *Fully* to *Largely*.

Table 6-54 Comparison of Problem Management business risk levels for cycle 1 and cycle 2

Business Risk	Cycle 1 Business Risk Mitigation Level	Cycle 2 Business Risk Mitigation Level
Service outages	L	F
Rework	L	L
Waste	L	L
Delayed solutions	L	L
Slow operational processes	L	L
Security breaches	L	F
Slow turnaround times	L	L
Unexpected costs	L	F
Higher or escalating costs	L	F
Slow response to business needs and changes	L	L
Inability to scale	L	L
Fines and penalties	L	F
High levels of non-value labor	L	L
Loss of market share	L	F
Loss of revenue/sales	L	L

Table 6-55 shows a comparison of Change Management business risk mitigation levels between cycle 1 and cycle 2. Six of the fifteen Change Management business risks improved in risk mitigation level from *Largely* to *Fully* while nine remained at *Largely*.

Table 6-55 Comparison of Change Management business risk levels for cycle 1 and cycle 2

Business Risk	Cycle 1 Business Risk Mitigation Level	Cycle 2 Business Risk Mitigation Level
Service outages	L	F
Rework	L	L
Waste	L	L
Delayed solutions	L	L
Slow operational processes	L	L
Security breaches	L	F
Slow turnaround times	L	L
Unexpected costs	L	F
Higher or escalating costs	L	F
Slow response to business needs and changes	L	L
Inability to scale	L	L
Fines and penalties	L	F
High levels of non-value labor	L	L
Loss of market share	L	F
Loss of revenue/sales	L	L

For the business risks that are associated with an ITSMP² Performance Dimension, the weighted averages of the applicable Business Risk Mitigation scores were used to determine the ITSMP² Attainment Level scores. Table 6-56, Table 6-57, and Table 6-58 show the Business Risk Mitigation weighted averages for those business risks associated with ITSMP² dimensions in cycle 2 (second last row), and the ITSMP² Attainment Level (last row) for the three processes.

Table 6-56 Weighted average of Incident Management Business Risk Mitigation scores associated with ITSMP[2] dimensions

Business Risk	**Operational**	**Customer Satisfaction**	**Productivity**	**Market**	**Financial**
Service outages	0.00	0.15	0.00	0.10	0.05
Rework	0.15	0.00	0.15	0.05	0.05
Waste	0.10	0.00	0.20	0.05	0.05
Delayed solutions	0.00	0.00	0.15	0.10	0.00
Slow operational processes	0.00	0.00	0.15	0.05	0.00
Security breaches	0.00	0.25	0.00	0.00	0.05
Slow turnaround times	0.00	0.00	0.00	0.05	0.00
Unexpected costs	0.20	0.20	0.05	0.05	0.15
Higher or escalating costs	0.10	0.10	0.05	0.10	0.15
Slow response to business needs and changes	0.10	0.00	0.05	0.05	0.05
Inability to scale	0.15	0.00	0.10	0.00	0.00
Fines and penalties	0.00	0.00	0.00	0.00	0.15
High levels of non-value labor	0.20	0.00	0.05	0.05	0.05
Loss of market share	0.00	0.15	0.05	0.20	0.05
Loss of revenue/sales	0.00	0.15	0.00	0.15	0.20
Weighted Average	0.78	0.81	0.78	0.80	0.81
ITSMP[2] Attainment	L	L	L	L	L

Table 6-57 Weighted average of Problem Management Business Risk Mitigation scores associated with ITSMP² dimensions

Business Risk	**Operational**	**Customer Satisfaction**	**Productivity**	**Market**	**Financial**
Service outages	0.00	0.15	0.00	0.10	0.05
Rework	0.15	0.00	0.15	0.05	0.05
Waste	0.10	0.00	0.20	0.05	0.05
Delayed solutions	0.00	0.00	0.15	0.10	0.00
Slow operational processes	0.00	0.00	0.15	0.05	0.00
Security breaches	0.00	0.25	0.00	0.00	0.05
Slow turnaround times	0.00	0.00	0.00	0.05	0.00
Unexpected costs	0.20	0.20	0.05	0.05	0.15
Higher or escalating costs	0.10	0.10	0.05	0.10	0.15
Slow response to business needs and changes	0.10	0.00	0.05	0.05	0.05
Inability to scale	0.15	0.00	0.10	0.00	0.00
Fines and penalties	0.00	0.00	0.00	0.00	0.15
High levels of non-value labor	0.20	0.00	0.05	0.05	0.05
Loss of market share	0.00	0.15	0.05	0.20	0.05
Loss of revenue/sales	0.00	0.15	0.00	0.15	0.20
Weighted Average	0.85	0.91	0.84	0.87	0.89
ITSMP² Attainment	F	F	L	F	F

Table 6-58 Weighted average of Change Management Business Risk Mitigation scores associated with ITSMP² dimensions

Business Risk	Operational	Customer Satisfaction	Productivity	Market	Financial
Service outages	0.00	0.15	0.00	0.10	0.05
Rework	0.15	0.00	0.15	0.05	0.05
Waste	0.10	0.00	0.20	0.05	0.05
Delayed solutions	0.00	0.00	0.15	0.10	0.00
Slow operational processes	0.00	0.00	0.15	0.05	0.00
Security breaches	0.00	0.25	0.00	0.00	0.05
Slow turnaround times	0.00	0.00	0.00	0.05	0.00
Unexpected costs	0.20	0.20	0.05	0.05	0.15
Higher or escalating costs	0.10	0.10	0.05	0.10	0.15
Slow response to business needs and changes	0.10	0.00	0.05	0.05	0.05
Inability to scale	0.15	0.00	0.10	0.00	0.00
Fines and penalties	0.00	0.00	0.00	0.00	0.15
High levels of non-value labor	0.20	0.00	0.05	0.05	0.05
Loss of market share	0.00	0.15	0.05	0.20	0.05
Loss of revenue/sales	0.00	0.15	0.00	0.15	0.20
Weighted Average	0.79	0.91	0.77	0.83	0.88
ITSMP² Attainment	L	F	L	L	F

Table 6-59 shows a comparison of Incident Management ITSMP² Attainment Levels between cycle 1 and cycle 2.

Table 6-59 Comparison of Incident Management ITSMP² attainment levels for cycle 1 and cycle 2

ITSMP² Scorecard	Cycle 1 Attainment Level	Cycle 2 Attainment Level
Operational	L	L
Customer Satisfaction	L	L
Productivity	L	L
Market	L	L
Financial	L	L

Table 6-60 shows a comparison of Problem Management ITSMP² Attainment Levels between cycle 1 and cycle 2.

Table 6-60 Comparison of Problem Management ITSMP² attainment levels for cycle 1 and cycle 2

ITSMP² Scorecard	Cycle 1 Attainment Level	Cycle 2 Attainment Level
Operational	L	F
Customer Satisfaction	L	F
Productivity	L	L
Market	L	F
Financial	L	F

Table 6-61 shows a comparison of Change Management ITSMP² Attainment Levels between cycle 1 and cycle 2.

Table 6-61 Comparison of Change Management ITSMP² attainment levels for cycle 1 and cycle 2

ITSMP² Scorecard	Cycle 1 Attainment Level	Cycle 2 Attainment Level
Operational	L	L
Customer Satisfaction	L	F
Productivity	L	L

$ITSMP^2$ Scorecard	Cycle 1 Attainment Level	Cycle 2 Attainment Level
Market	L	L
Financial	L	F

The $ITSMP^2$ Scorecards from cycle 1 and cycle 2 were merged to chart the differences. Figure 6-17, Figure 6-18 and Figure 6-19 show $ITSMP^2$ Scorecard of cycle 1 and cycle 2 for all three processes.

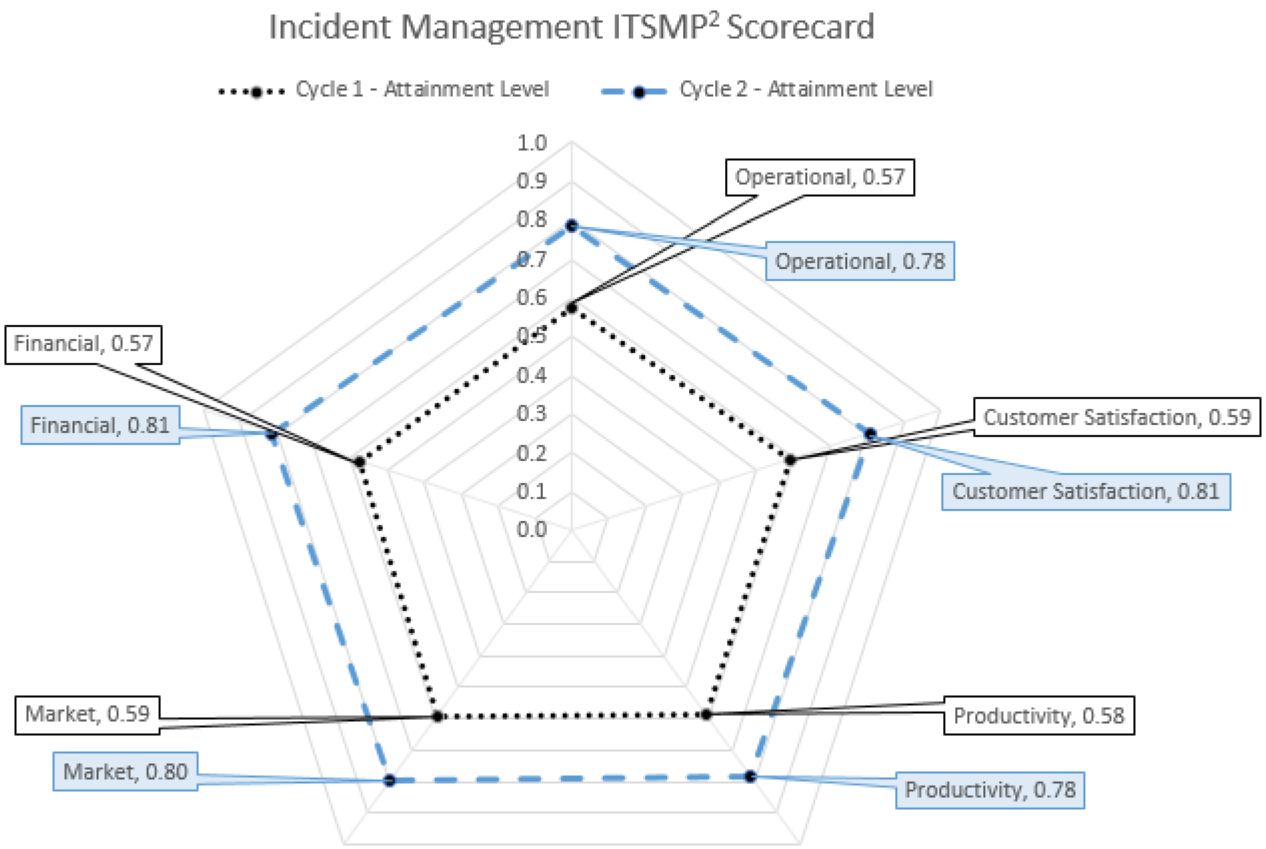


Figure 6-17 Comparison of the Incident Management ITSMP2 attainment between cycle 1 and cycle 2

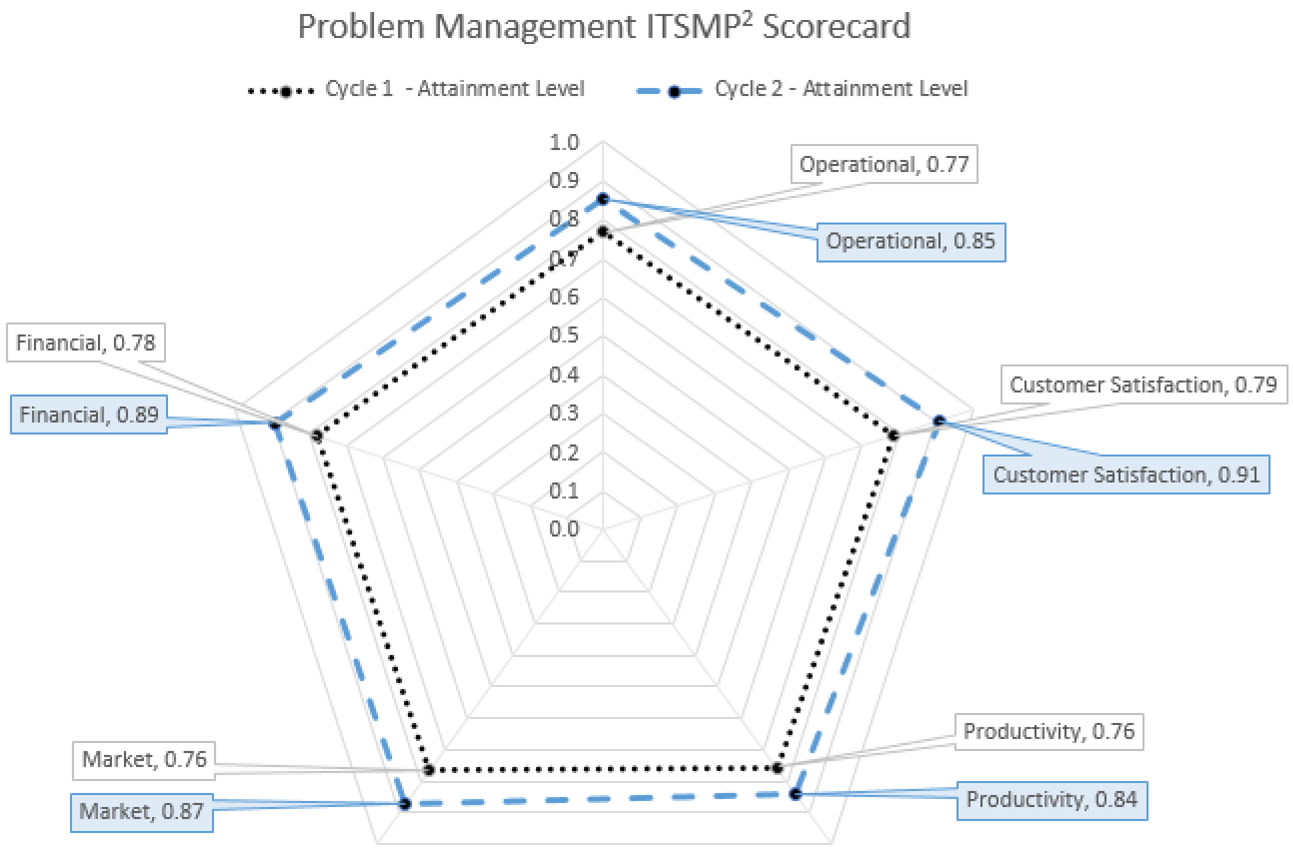


Figure 6-18 Comparison of the Problem Management ITSMP² attainment for cycle 1 and cycle 2

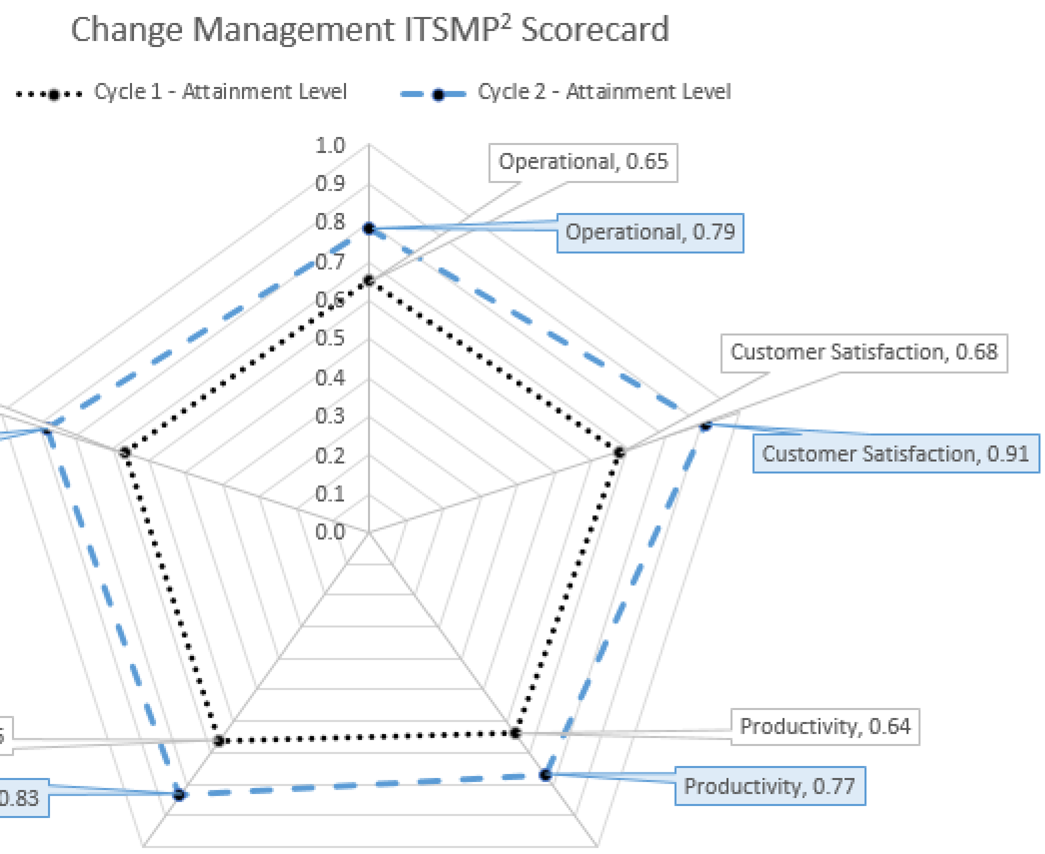


Figure 6-19 Comparison of the Change Management ITSMP² attainment for cycle 1 and cycle 2

6.4 KISMET Phase 3: Plan process improvement action

The SMPA report and the outcome of the focus group workshop served as a guide to the process improvement meetings. The researcher conducted semi-structured interviews/meetings with the process managers from 3rd April 2017 to 21st April 2017. Participants were provided with an interview information sheet and a consent form before the meetings (see Appendices C.1 and C.2). The researcher met with process managers at their desk for about 30 minutes per day. Challenges exposed by the process capability survey results were analyzed to formulate improvement action plans. The researcher and process managers discussed the reported SMPA recommendations and actions were proposed for the most applicable recommendations. The performance assessment results were analyzed, and plans were made to improve high-risk areas.

Incident Management

Since the SMPA report for Incident Management did not generate any recommendations for the generic practices, the process improvement meetings for Incident Management focused on revising the action plan for capability level 1 from cycle 1. An analysis was also conducted of why 19 percent of survey participants responded *Do not know*.

Process managers agreed on the following three actions:

- Regular review of incident prioritization and classification;
- More communication on process status;
- Conduct training when necessary.

Problem Management

The SMPA report generated recommendations for levels 3.1 and 3.2. The planning meetings were used to evaluate possible actions for these recommendations.

Process managers decided to execute the following two actions:

- Communicate the Problem Management process workflow to all business units;
- Audit data should be available in real time for management review;
- More frequent analysis of appropriate data regarding implementation of the Problem Management process to provide a basis for understanding the behavior of the process and its compliance with the standard Problem Management process.

Change Management

The SMPA report generated recommendations for levels 2.2, 3.1 and 3.2. The planning meetings were used to evaluate possible actions for these recommendations.

The following actions were deemed necessary:

- Integration of incident and problem performers;
- Definition of a change review plan;
- Definition of corrective action procedures.

6.4.1 Reflection on plan process improvement action

Process managers were more comfortable with identifying areas of process improvement and discussing challenges. Less time was spent on these planning meetings when compared to cycle 1. Process managers appeared to be complacent about the results of cycle 2, as they were aware of the effort put in improving processes.

6.5 KISMET Phase 4: Design process improvement guidelines

In this phase, the researcher and process managers reviewed the roles and responsibilities, actions, metrics, and relationships to other ITSM processes that were defined in cycle 1. The guidelines developed in cycle 1 were reviewed and modifications made where appropriate. These guidelines were later deployed to the Intranet site to communicate the plan.

6.5.1 Reflection on design process improvement guidelines

The roles and responsibilities of staff had organically changed from cycle 1 to cycle 2 due to the creation of the RACI charts in cycle 1 and the enforcement of roles and accountability.

6.6 KISMET Phase 5: Execute the process improvement plan

An email communication was sent to all participants detailing the cycle 2 findings and call for action. Monthly schedules reports were generated in collaboration with staff responsible for Zendesk input, for each of the three ITSM processes and for every KPI committed to by Company X. This phase involved active intervention by the researcher and process managers to ensure that the plan was executed and changes were made.

6.6.1 Incident Management

The following actions were undertaken for the Base Practices (Level 1):

- Zendesk codes for incident classification were reviewed, and ten cases were analyzed for appropriate coding based on incident type;
- The priority of incidents was analyzed for accuracy based on the revised guideline of the KISMET4 activity;
- The DevOps virtual team was tasked with automating case analysis for incident classification and prioritization.

The following actions were undertaken for the Generic Practices (Levels 2 and 3):

- Incident Management KPIs were evaluated by the researcher and process managers for accuracy and relevance by analyzing how the reporting criteria in Zendesk derived them from operational metrics;
- Tracking dashboards were created in Zendesk and communicated to all stakeholders;
- The Incident Management process workflow was reviewed by process managers to include other interfaces.

6.6.2 Problem Management

The following actions were undertaken for the Base Practices (Level 1):

- Zendesk dashboards were created by the researcher for real-time management review.
- Zendesk metrics were reviewed by process managers;
- Zendesk dashboards were made generally available to all business units;
- Problem records were analyzed for relevant details of the problem, including the date and time, and a cross-reference to the incident(s) that initiated the problem record;
- Jira has a linked case field that clearly indicates the incident(s) that caused the problem.

The following actions were undertaken for the Generic Practices (Levels 2 and 3):

- The scope of the Problem Management KPIs was defined and all stakeholders in the process informed of the scope;
- The assumptions and constraints were considered while identifying Problem Management KPIs so that the resultant KPIs are specific, measurable, achievable, relevant and timely (S.M.A.R.T.);
- Tracking dashboards were created in Zendesk and communicated to all stakeholders;
- The activities of Problem Management are driven by the identified performance targets so that the Problem Management could be monitored against the plans.

6.6.3 Change Management

The following actions were undertaken for the Base Practices (Level 1):

- Action was taken to ensure that all relevant staff attended the weekly change management meeting;
- Training was performed on the scope and impact of change requests ;
- Regular review of change requests was performed;

- A communication process was established to communicate approved changes to Product Owners and other stakeholders prior to making changes.

The following actions were undertaken for the Generic Practices (Levels 2 and 3):

- The scope of the Change Management KPIs was defined and all stakeholders in the process informed of the scope;
- All the required deliverables (documents) which are necessary for performing Change Management activities were adequately reviewed.

6.6.4 Reflection on execute the process improvement plan

Staff at Company X was more receptive to the process improvement plans deployed in this cycle of the action research, as they were familiar with the process improvement plans from cycle 1. The intranet site that hosts the process improvement plans and guidelines received more page visits by unique desktops, which indicated that more staff members were interested in improving the processes.

6.7 KISMET Phase 6: Evaluate process improvement

6.7.1 Incident Management

The following evaluation was undertaken for the Base Practices (Level 1):

- The intervention of case analyses helped reinforce the Zendesk classification system, and made Incident process performers aware of the fact that their work was being internally audited;
- The DevOps virtual team did not automate the case analysis, however, process managers felt that random case analysis was now a trivial task for them.

The following evaluation was undertaken for the Generic Practices (Levels 2 to 3):

- The Incident Management KPIs were evaluated for accuracy and relevance by analyzing how the reporting criteria in Zendesk derived them from operational metrics;
- The KPIs were accurate and relevant.

6.7.2 Problem Management

The following evaluation was undertaken for the Base Practices (Level 1):

- The analysis of Problem records showed more detailed description and a cross-reference to the incident(s) that initiated the problem record.

The following evaluation was undertaken for the Generic Practices (Levels 2 to 3):

- By tracking Zendesk page visits, it was evident that more people were viewing the dashboards;
- The activities of Problem Management were driven by the predefined performance targets.

6.7.3 Change Management

The following evaluation was undertaken for the Base Practices (Level 1):

- All invited staff members attended the weekly change management meeting;

The following evaluation was undertaken for the Generic Practices (Levels 2 to 3):

- All the required deliverables (documents) which are necessary in performing Change Management activities were adequately reviewed regularly by process managers and performers.

6.7.4 Reflection on evaluate process improvement

In this cycle of the action research, it was evident that more staff members showed interest in objectively evaluating the process improvements.

6.8 Final Reflection

In order to externally and strategically analyze the attractiveness of forex trading market and its different macroenvironmental factors a final reflection based on PESTEL framework (Ho 2014) was conducted for understanding market movements, business potential and further directions for operations.

At odds, the forex market is equally positively affected by political, environmental and economic factors over large and abrupt changes. Abruptness and uncertainty create volatility thus rapid movements on currency markets which attracts speculative capital. For example in contrary to expectations, the ongoing crisis has fueled the market.

The reflection on market events as described in § 5.8.3 revealed that external factors play an important role in process performance. The reflection in § 5.8.3 highlighted one major economic event that caused both financial loss and loss of customer reputation for Company X. A PESTEL analysis was conducted to explore other external factors that affected the performance of processes and service delivery at Company X.

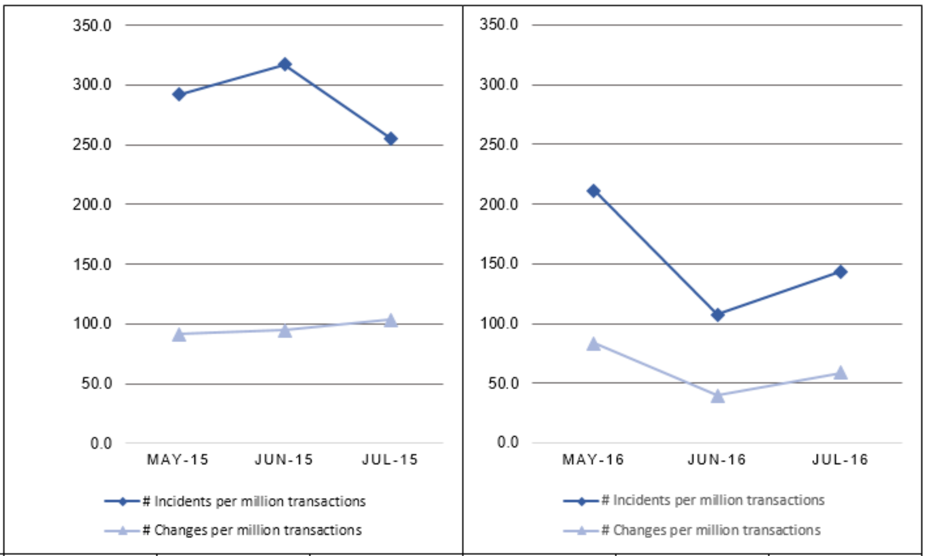
This reflection on market events in *section 5.8.3* prompted the need for a final reflection on macro environmental factors based on the PESTEL framework. The final reflection was not a construct of the research design and hence did not feature in Chapter 3 Research Methodology. It was through cycle 1 (Chapter 5) of the action research that it was realized that a deeper analysis of external factors was required for further insight into the anomalies uncovered with process performance. The final reflection also provides a holistic view of factors that may affect process performance data.

6.8.1 Political Conditions

This section discusses the 2 major political events that occurred during the research period, and how these events affected process performance at Company X.

Brexit

A historical trend analysis of trading volume at Company X showed that global events cause higher trading volumes that are directly associated with higher numbers of incidents, problems, and changes. *Brexit* refers to the decision of the Government of the United Kingdom (UK) to leave the European Union (EU) as a result of a referendum held on 23 June 2016 (Goodwin & Heath 2016). In the early hours of Friday, June 24, 2016, the United Kingdom released the results of its European Union (EU) membership referendum (Brexit). The vote was in favor of leaving the EU, sparking waves of uncertainty in global capital markets. The result was the single most significant market event in more than two years, with U.S. equity market unpredictable volatility spiking more than 40 percent that translated into exceptionally high foreign exchange trading volumes. In fact, Company X's highest daily trading volume to date coincided with Brexit. The British Pound (GBP) started to weaken as poll numbers were released from individual areas throughout the day. This marked the lowest the pound had traded at since 1985. Globally foreign exchange trading volumes jumped to record highs in June 2016. Although this event caused peak trading volumes, Company X suffered minimal service disruptions, and the executive staff attributed this positive situation to the actions taken to address some of the recommendations provided by the SMPA method. Figure 6-20 charts the number of incidents and changes per million transactions for the 3-month period May through July of 2015 and 2016.



	May-15	Jun-15	Jul-15	May-16	Jun-16	Jul-16
# Incidents	1,899	2,495	1,831	1,351	968	1,185
# Changes	595	745	743	534	358	486
# Transactions	6,500,226	7,862,355	7,170,050	6,399,613	9,005,845	8,262,355

Figure 6-20 Incidents and Changes per million transactions for 3-month period in 2015 and 2016 at Company X

Figure 6-20 highlights the significant process performance improvements during the period of May – July 2016 in comparison with the same period in 2015 despite the peak in the number of transactions in 2016. While the transactions peaked in June 2016 (14% increase in comparison to June 2015), there was a *decrease* in the number of incidents (by 60%) and the number of changes (by 50%) in comparison to June 2015. The executives at Company X confirmed that the process improvements undertaken based on the SMPA assessment report were the only significant changes made to their ITSM practices. Therefore it can be asserted that a significant contribution of the application of the Behari ITSM Measurement Framework for improved process performance.

<u>US presidential elections</u>

The second major political event that triggered market volatility was the US presidential elections in November 2016.

On the evening of the November 8, 2016, US presidential election, the markets responded to the developing events when it became progressively more apparent that

Republican candidate Donald Trump's lead over Democratic nominee Hillary Clinton was growing. The unexpected turn of events was immediately reflected in global markets as the news developed and was processed by people around the world. Overnight, Dow futures tumbled close to 800 points, and the S&P 500 dropped 5 percent (NYSE 2016). Foreign markets also dropped as uncertainty over the future of global trade policies took root. Figure 6-21 charts the volatility of the stock market the night of the US 2016 presidential elections.

Figure 6-21 Stock Market Volatility on the US Election night from CNN (2016)

However, by the end of the next trading day, the Dow hit new record highs, demonstrating the resiliency of the markets in processing information in an orderly manner. The end of this eventful week pushed the Dow industrials to their best week since 2011. Figure 6-22 illustrates the performance of the US stock market for the week of the US 2016 presidential elections.

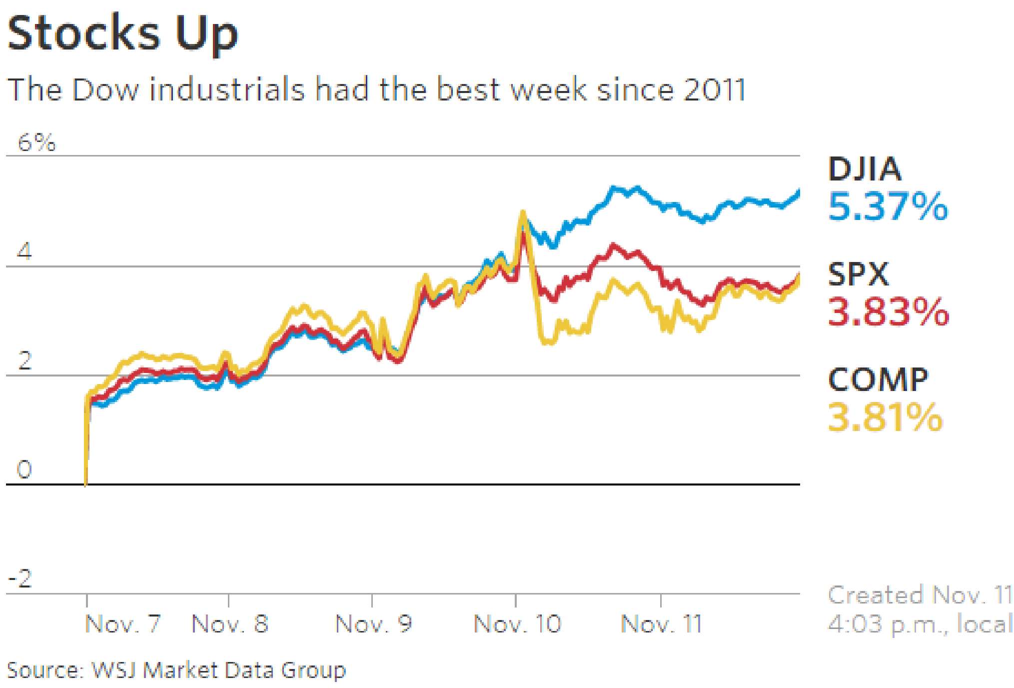


Figure 6-22 The US Stock Market Performance the week of the 2016 US Elections (CNN 2016)

A number of news agencies (BBC 2016; CNN 2016; WSJ 2016) have reported on the sectors that comprised the most prominent market movers, possible reasons for their increase or decrease in performance and the market impact as shown in Table 6-62.

Table 6-62 Most prominent market movers with possible reasons and market impact

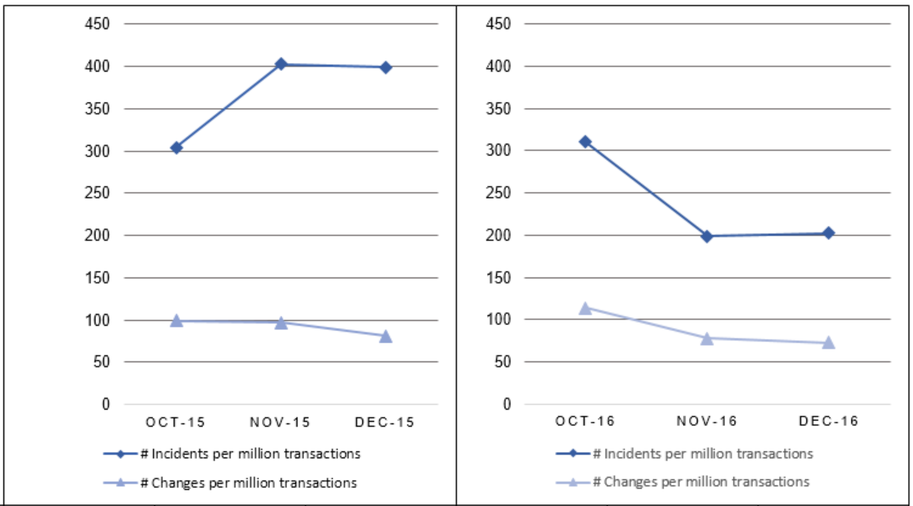
Sector	Reason for market movement	Market Impact
US drug companies	Hillary Clinton had pledged to bring in controls to prevent pharmaceutical companies from hiking the price of drugs following recent scandals.	Shares in Pfizer, the world's largest drug company, were up 7%.

Sector	Reason for market movement	Market Impact
Private Prison Operators	Traders predicted that Trump might row back the US government's decision to phase out the private sector after finding it is failing prisoners.	Shares in Corrections Corp Of America (CCA) were up 41%, and rival Geo Group shares were up 18%.
Construction	Traders expected more work from Trump's pledge to build a wall along the southern border with Mexico and embark on a massive program to repair and improve America's aging infrastructure.	Shares in construction equipment company Caterpillar were up 7%.
Banking stocks	Traders speculated that Trump would follow through with his pledge to tear up red tape and relax regulations.	Bank of America and SVB Financial gained 17% and 20%, respectively.
Gun companies	The election of Trump removed fears that Clinton may have done more to bring in gun controls. A Democratic victory would probably have sent gun enthusiasts out to buy more weapons out of fear they might not have been able to in the future.	Shares in the two biggest listed gun companies, Smith & Wesson and Sturm Ruger, were both down 12%.

If the information provided by the above reports is not *fake news* (Allcott & Gentzkow 2017), the possible reasons for the market movement may be attributed to trader's emotions, sentiment, and beliefs (see section on Social Environment factors).

The 2016 US presidential elections triggered erratic market volatility that transformed into exceptionally high foreign exchange trading activity. The dollar recovered after falling overnight, as traders said immediate fears of Trump's impact on the economy could have been overplayed. By 10am the dollar was down 1.4 percent against the yen. It was little changed at $1.1033 per euro, having earlier tumbled by 2.4 percent. The Sterling which fell to 30-year lows in the wake of the Brexit vote was up 0.5 percent the next day.

Although this event caused peak trading activity, Company X's processes performed better when compared to the performance for the same 3 month period the previous year. Figure 6-23 charts the number of incidents and changes per million transactions for the 3-month period October through December of 2015 and 2016.



	Oct-15	Nov-15	Dec-15	Oct-16	Nov-16	Dec-16
# Incidents	1,911	2,158	2,011	1,547	1280	1,074
# Changes	625	519	410	567	504	386
# Transactions	6,284,757	5,353,883	5,038,918	4,986,832	6,436,913	5,299,571

Figure 6-23 Incidents and Changes per million transactions for 3-month period in 2015 and 2016 at Company X

Figure 6-23 highlights the significant process performance improvements during the period of October – December 2016 in comparison with the same period in 2015 despite the increase in the number of transactions in November and December 2016. While the number of transactions increased in November 2016 (20% increase in comparison to November 2015), there was a *decrease* in the number of incidents (by 40%) and the number of changes (by 3%) in comparison to November 2015. The business and IT staff at Company X confirmed that both the process improvements undertaken based on the SMPA assessment report and the implementation of *circuit breakers* (see Appendix A.1 for definition) to mitigate risk help with the improvement of processes during these volatile times. Therefore we can assert a contribution of the application of the Behari ITSM Measurement Framework for improved process performance.

6.8.2 Economic Factors

§5.8.3 discussed one economic event and its impact on the financial market. Another economic event that influenced the process performance results at Company X was Non-Farm Payroll (NFP).

Traders are continually monitoring various economic indicators to identify trends in economic growth. Some of the most watched economic indicators include the Consumer Price Index, housing starts, gross domestic product and the employment report (Layton, Robinson & Tucker 2009). Out of these indicators, the employment report contains a variety of data and statistics regarding the employment information of the market.

The NFP report is a crucial economic indicator for the United States. The employment report is released on the first Friday of every month by the Bureau of Labor Statistics, providing data covering the previous month. The report contains information on unemployment, job growth, and payroll data, among other stats.

Out of the payroll data that is provided, the most important statistic that is analyzed is the non-farm payroll data, which represents the total number of paid U.S. workers of any business, excluding general government employees, private household employees, employees of non-profit organizations that provide assistance to individuals, and farm employees. This data is analyzed carefully because of its importance in identifying the rate of economic growth and inflation (Layton, Robinson & Tucker 2009). The NFP report causes one of the consistently largest rate movements of any news announcement in the forex market.

NFP announcements cause an increase in trading activity, applying stress to the trading infrastructure, thus making the system more vulnerable to an increase in incidents and problems. To mitigate the impact of NFP announcements, one can proactively execute measures to control trading activity and thus eliminate spikes in the number of incidents and problems during these times, by widening prices, applying rate filters, throttling price discovery or disabling erratic price streams.

6.8.3 Social Environment

There are numerous cognitive processes that influence how forex traders make decisions. Being aware of those processes can help traders in how they approach the forex market. It can help with their trading strategy and trading psychology as a whole (Kahneman, Daniel 2011; Oberlechner & Hocking 2004).

6.8.4 Technological Factors

Technology is at the core of how organizations operate and maintain their competitive edge in this highly competitive environment. Technological advances have made forex trading more accessible to the masses. The ease of access and increased transparency provided by electronic trading platforms appeal to a broader customer base, including retail traders (Rime 2003).

Forex traders demand ultra-low latency networks, resilient trading infrastructure, and robust risk management systems. In order to meet these stringent demands, forex service providers need to be at the cutting-edge of technology in order to remain relevant and be competitive.

Looking back at 2015 the outage and major incidents at Company X in cycle 1 of the action research (as detailed in §5.3.2) were all technology-related. The outage was due to a connectivity issue with one of Company X's ISP. Company X has since implemented a failover plan for all of its third-party dependencies. The major incidents were caused by software-related issues that have been addressed by more stringent software release criteria and application monitoring through the DevOps program. In 2016 one of the outages was caused by a hardware failure, the other by a connectivity drop by an ISP, and the major incident was caused by a hardware failure.

6.8.5 Environmental Factors

The environmental factors that potentially affected process performance at Company X over the research period are discussed next.

Natural Disasters

The recent devastation by hurricanes Harvey and Irma has a widespread impact on global financial markets. The human calamity of lost lives and the millions who were dislocated by the floods is only one consequence of the natural disasters. The financial press (Liesman 2017) has also noted the likely dip in U.S. economic growth in the third quarter of 2017 due to lost productivity, offset by a pickup in jobs and production in the final quarter of 2017.

Hurricane Harvey has already been a significant factor in President Donald Trump's ability to reach an agreement with Democratic congressional leaders to fund the government through mid-December (The New York Times 2017b). The storms could also affect decision-making in three major central banks, influencing the future direction of currency exchange rates, as well as global equity and bond markets (The New York Times 2017b).

U.S. employment fell in September for the first time in seven years as Hurricanes Harvey, and Irma left displaced workers temporarily unemployed and delayed hiring, the latest indication that the storms undercut economic activity in the third quarter. NFP decreased by 33,000 jobs in September 2017 amid a record drop in employment in the leisure and hospitality sector (Journal 2017). The decline in payrolls was the first since September 2010 (Journal 2017).

Man-made Disasters

The biggest driver of currency fluctuation and market volatility in 2017 had nothing to do with monetary policy or economic data, but instead, the geopolitical tensions between the U.S. and North Korea were the primary contributor to market swings in 2017.

On 22 September 2017, the war of words between President Trump and Kim Jong-un, North Korea’s leader, raised concerns that it could escalate into a new and more volatile phase as the White House contemplated its next steps in response to a threat by Pyongyang to conduct the world's first atmospheric nuclear test in 37 years (The New York Times 2017a). North Korea's warning that it might test a nuclear bomb over the Pacific Ocean added urgency to an administration debate over options for a pre-emptive strike if preparations for a launch are detected (The New York Times 2017a).

On 25 September 2017, North Korea's Foreign Minister Ri Yong Ho accused US President Donald Trump of declaring war on his country by tweeting over the weekend that North Korea "won't be around much longer." (Cohen, Z 2017). Stocks extended losses, gold jumped, and Treasury yields fell in intra-day trading. The Dow Jones industrial average closed 53.50 points lower, or 0.24 percent, at 22,296.09 (Cheng 2017).

This led to volatility in the forex market with the USD/JPY severely declining as traders worry that this heated exchange could result in military action. Although the US dollar is down sharply versus the Yen, it strengthened against other major currencies such as sterling, the Australian and New Zealand dollars. So while there's no question that war is negative for USD/JPY it can initially drive the dollar higher against other currencies such as AUD and NZD. The Japanese Yen and Swiss Franc perform best during times of war, which means all of the Yen crosses including USD/JPY will weaken. The yen is often sought in times of geopolitical tension or market turbulence because Japan has a large current account surplus and traders tend to assume Japanese investors would repatriate funds at times of crisis.

Information technology had its worst day since August 17, falling 1.4 percent as the greatest decliner in the S&P 500, which declined 5.56 points to 2,496.66. Apple shares fell for a fourth straight day, down 0.88 percent. Facebook shares closed 4.5 percent lower on their worst day of the year. Amazon.com fell 1.6 percent, while Netflix dropped 4.7 percent.

The analysis of natural disasters that influence the stock and forex markets confirms the previous studies that have reported that natural disasters have a detrimental impact on the value of stock and currencies (Benson & Clay 2004; Cavallo et al. 2013; Fengler, Ihsan & Kaiser 2008). The analysis of man-made disasters, such as the US-

North Korea tensions, and the threat of war, confirms the assertions made by previous studies (Barro 2009).

Terrorist Attacks

Unexpected terror attacks became more prevalent in 2016 and 2017 than in previous years. The impact that an act of terror has on the marketplace varies depending on the type of attack, locale and time in which it was committed. Some acts of terror cause only a regional disturbance spiking volatility in domestic markets, while others send shockwaves through the entire global financial system. No matter the size and scope of the act, it brings uncertainty to the marketplace and ensures enhanced volatility facing a wide variety of asset classes.

6.8.6 Legal Environment

The Retail Forex market experienced a major shock in January 2015 when the Swiss National Bank ended its policy of capping the Swiss franc at 1.20 francs per Euro. The change in policy caused the price of the Swiss franc to increase almost 30 percent in value against the Euro (Graham 2015) and resulted in significant losses to market participants (Iosebashvili, Ackerman & Wexler 2015). These events caused NFA to tighten margin requirements for Retail Forex transactions involving specified foreign currencies (National Futures Association 2016) and prompted calls for the CFTC to consider increased requirements for Retail Forex (Ackerman 2015).

In February 2017, the CFTC brought an enforcement action against Forex Capital Markets, LLC (FXCM), a registered FCM and RFED that was previously the largest Retail Forex broker in the United States (Nguyen 2017), and two of its principals for alleged fraudulent conduct in connection with FXCM's Retail Forex platform (CFTC 2017). The CFTC's settlement order alleged that FXCM had represented to customers that it executed customer trades through its *No Dealing Desk* on strictly an agency or riskless principal basis through external market makers, thus eliminating the conflict of interest resulting from FXCM taking a principal position opposite its customers. The CFTC, other regulators, and prosecutors continue to bring actions against participants in both the retail and institutional markets.

The Bank for International Settlement (BIS), an organization of 60 central banks, is in the process of finalizing a Global Code of Conduct for the foreign exchange market that is intended to promote integrity and effective functioning of the foreign exchange market. BIS published an initial draft of the Global Code of Conduct in 2016 that set forth standards regarding ethics, governance, information sharing, execution, risk management and compliance and confirmation and settlement processes. The Global Code of Conduct will be a voluntary code and will not have the force of regulation, but BIS and the working group responsible for the Code are working to promote widespread adoption of the Code, including among buy-side firms, sell-side firms and other foreign exchange market participants (BIS 2016).

In the wake of the recent enforcement of regulation in the forex industry, financial services businesses need to embrace the stringent laws and adapt their businesses to comply in order to gain competitive advantage.

6.9 Chapter Summary

Chapter 6 described the events of each step of the KISMET model within each phase of the second cycle of the action research. The KISMET model was used as a process improvement guide to the action research phases.

The Diagnose phase detailed the activities involved in setting up of the process improvement infrastructure at Company X. The process capability assessment survey, the performance assessment, and the financial measurement were conducted in this phase. A focus group workshop was conducted to assess the SMPA tool, discuss the findings of the process capability assessment report, and to triangulate the data reported. This phase also operationalized the Behari ITSM measurement model described in chapter 3.

The Plan phase used the output of the Diagnose phase to detail the process improvement activities. Meetings were conducted with key stakeholders to formulate and document action plans for each ITSM process.

The Take Action phase served to deploy the documented plan from the Plan phase. This phase involved active intervention by the researcher, to ensure that the process improvement plans were being followed, and to make adjustments as deemed necessary.

The Evaluate Action phase served to review and reflect on the improvement program implemented in the previous phase and to evaluate the outcomes of the process improvement program.

"Using the results of the process capability, process performance, and financial performance from cycle 1 (as described in Chapter 5) as the benchmark data for cycle 2 to measure against, Chapter 6 provides the answer to RQ1. "*How can the association of ITSM process capability and process performance with financial performance of an organization be determined?*"

Learning from the experience in cycle 1, that Reflection was a continual process, the Action Research cycle and KISMET were adjusted in cycle 2, to incorporate Reflection into every phase of KISMET. This new approach in cycle 2 further demonstrated how the ITSM measurement framework can be effectively applied for CSI, thus contributing to RQ2. *How can the ITSM measurement framework be demonstrated for CSI?*"

CHAPTER 7 DISCUSSION

7.1 Introduction

This chapter presents a discussion of the research findings. Chapter 4 presented the design of the measurement model. Chapters 5 and 6 detailed the application of the measurement model, the activities of the KISMET framework, and presented the details and findings of the two cycles. The aim of this chapter is to provide a critical examination of the research results with discussions based on the context of the research method and reviewed literature. Discussions are structured to answer the two research questions with a consideration of research work conducted and the presentation of key themes emerging from this research.

As articulated in Chapter 1, this study addresses the research problem of the lack of a pragmatic model and method that associates ITSM process capability and performance with business performance.

Chapter 7 comprises six main sections. *Section 7.1* introduces the chapter. *Section 7.2* explains the discussion approach. *Section 7.3* provides the discussion on research question one. *Section 7.4* discusses the findings related to research question two, followed by *Section 7.5* that extends the discussion to consider the researcher-practitioner gap, by providing evidence of how the scholar-practitioner approach can provide tangible benefits to organizations that participate in academic research, as well as how academic research can advance by applying theory to solve real-world problems. Finally, *section 7.6* summarizes this chapter. Figure 7-1 shows the overview of Chapter 7.

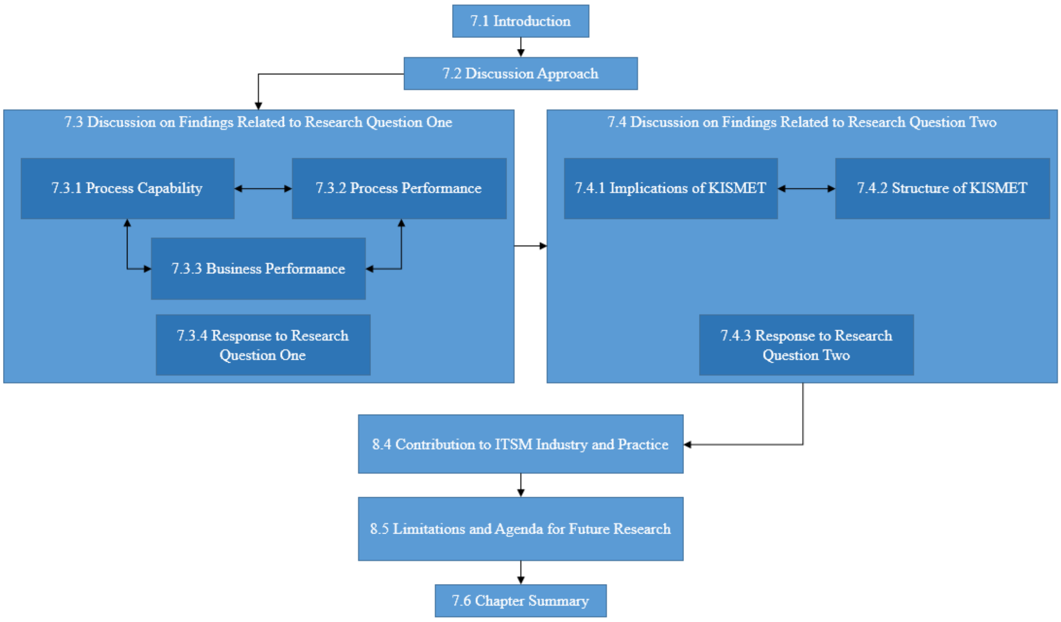


Figure 7-1 Overview of Chapter 7

7.2 Discussion Approach

The reflection sections in the previous two chapters contain a discussion of the analysis of the data collected and the techniques applied. Discussions emergent from the research methods and outcomes reported in the reflection sections of the previous two chapters provide a context to communicate the contributions and impacts that this research can make. The most significant reflections and outcomes are highlighted and discussed. These reflections inform the remainder of this discussion chapter. Table 7-1 presents the most significant reflections, the sections where they were discussed, and the resultant outcomes and actions.

Table 7-1 Summary of significant reflections and their outcomes extracted from chapters 5 and 6

Research Cycle	Significant Reflection	Chapter Section	Outcome
ARC1	Validity of the process assessment results	§5.6.1	Discussed Change Management process capability anomaly at focus group workshop
	Validity of the process performance metrics	§5.6.2	Historical analysis of operational metrics around major software release dates at Company X.
	Effects of market events on process performance	§5.6.3	Senior management established a renewed focus on customer service and process performance. There was a sense of urgency to scrutinize key processes and evaluate whether changes were required.

Research Cycle	Significant Reflection	Chapter Section	Outcome
ARC2	Validity of the process assessment results	§6.2.2.2	A comparative analysis of the number of recommendations/observations was conducted to determine if the process capability improved year-over-year.
	Validity and reliability of the financial measurement	§6.2.2.3	Employee salaries increased between cycle 1 and cycle 2. To enable an accurate comparison of salaries, the Consumer Price Index (CPI) was used to normalize the salaries in cycle 2.
	Validity of the process performance metrics	§6.2.2.6	Further investigation into the underlying calculations of the ITSM[3]. Steinberg's approach was modified to weight the KPIs associated with each CSF to better align with the organization's strategic goal.
	Effects of external factors on process performance	§6.8	The PESTEL framework was used in the final reflection of cycle 2 to analyze the impact of the macro-environmental factors on process performance.

In chapter 5 and chapter 6 the measurement of the Incident Management, Problem Management, and Change Management processes was discussed individually. For each construct, the next sections combine and summarize outcomes of all processes, and demonstrate the linkage to the underpinning theories and bodies of knowledge, to answer each research question. This study addresses the research problem of the lack of a pragmatic model and method that associates ITSM process maturity (process capability and performance) with business performance.

The next section discusses the findings related to RQ1: H*ow can the association of ITSM process capability and process performance with financial performance of an organization be determined?*

7.3 Discussion on findings related to research question one

7.3.1 Process Capability

Process capability improved for all three processes as measured by the comparison of the number of recommendations/observations in the process capability assessment reports in cycle 1 and 2. In particular, of the 62 potential recommendations for the Incident Management process, no recommendations were presented by the SMPA report in cycle 2 compared to nine recommendations in cycle 1. The Problem Management process was presented with 34 of the 65 potential recommendations in cycle 1, while only seven recommendations were presented in cycle 2. The Change Management process decreased from 14 recommendations in cycle 1 to four in cycle 2 out of a potential of 68 recommendations.

Combining the recommendations for improvement across the three processes showed an improvement in the total recommendations for improvement from 57 in cycle 1 to 11 in cycle 2.

Therefore, consistent with previous studies (Cater-Steel, Toleman & Rout 2006; Jäntti et al. 2013), this study found that improving processes results in higher process capability attainment, as evident by a reduction in the number of recommendations for improvement.

7.3.1.1 Organizational Change

The focus group workshop discussion on the process capability results in cycle 1 prompted the decision to restructure the organization by transferring the Trading Solutions business unit from the Sales to the Engineering department. The focus group felt that the Trading Solutions business unit was detached from all the other Engineering business units involved with process improvement, and by incorporating this unit into Engineering, the restructure of the organization would facilitate the adoption of the Engineering department's culture and policies by the Trading Solutions business unit. The organizational change of restructuring strengthened the actor-network by making it easier to enroll members in the process improvement initiative since policies and inscriptions became more uniform.

Roles and responsibilities were organically developed and bestowed upon those who best fit the position. For example, in cycle 2 one of the change managers from cycle 1 was given the role of problem manager, as this manager underwent ITSM training and was most familiar with all processes. This empowered staff and made them champions of ITSM in the actor-network that facilitated a broader reach for enrolling other actors in the improvement initiatives.

This finding of organizational structure change is consistent with those of other researchers who noted that ITSM improvement is typically accompanied by changes to organizational structures (Hochstein, Tamm & Brenner 2005), staff position descriptions (Iden 2009; Iden & Eikebrokk 2015) and training of staff on the ITIL framework, ITSM processes and tools (Cater-Steel & Tan 2005; Hochstein, Tamm & Brenner 2005; Iden & Langeland 2010; Pollard & Cater-Steel 2009).

Furthermore, it was apparent that a level of self-interest was evident in the SMPA survey responses of members of the Trading Solutions business unit. The transfer of the Trading Solutions unit to the Engineering group bridged the information asymmetry gap and strengthened the actor-network. The outcome of the organizational change is consistent with previous studies on agency theory (Amagoh 2009; Eisenhardt 1989a; Lee, D & Setiawan 2013), and actor-network theory (Callon 1999; Latour 1999).

Relocating the Trading Solutions unit to the Engineering group afforded the transfer of ITSM knowledge that demonstrated the effects of the attributes of a firm's IT capability on its relationship with organizational performance. Knowledge transfer was achieved by enforcing prescriptive policies, procedures, and tools of ITSM. This confirms the views of previous studies on Resource Base Theory (Eisenhardt & Martin 2000; Grant 2016; Mills, Platts & Bourne 2003; Wade & Hulland 2004).

7.3.1.2 Process Capability Scoring

As described in §6.2.2.2, the process attribute ratings generated by the SMPA tool based on the four-point NPLF scale, without the actual raw scores for each process attribute, were not informative and representative of the process improvement perceived by the Process Managers. When the comparative SMPA results were presented at the focus group workshop in cycle 2, one Process Manager stated the following:

"That doesn't look right, as I know on a day-to-day basis that we addressed those recommendations you gave us and I believe that we improved the way we work with all three processes" (IMPM1).

The decrease in the number of recommendations as a measure of process improvement was more meaningful, and representative of the improvement achieved at a more granular level. It is interesting to note that the revised version of the process assessment standard (ISO/IEC 33020) provides finer granularity (than ISO/IEC 15504) with an option to report process attribute achievement on a six-point scale: N, P-, P+, L-, L+, F (ISO/IEC, 2015). A unique contribution of this research is the use of the number of recommendations as an alternate measure of process capability rather than capability level or attribute achievement.

7.3.2 Process Performance

Process performance improved as demonstrated by the operational metrics reported in §6.2.2.6. From a total of 25 process performance KPI items for all three processes, 10 KPIs showed improvement, 11 remained the same, and 4 declined in cycle 2 when compared to the results of cycle 1. The next sections highlight the factors that contributed to the improvement in process performance and considers the macro-environmental factors that affected the performance of processes.

7.3.2.1 Performance Metrics

The reflection on the process capability assessment results in §6.3.2 unveiled that by using the proportion of SMPA recommendations as a proxy measure for process capability, it was clear that the processes did improve yielding fewer recommendations in cycle 2 when compared to cycle 1. In the reflection on financial measurement, in §6.3.3.1, the costs associated with performing the processes decreased year over year. Despite these two positive indicators of improvement, the radar charts (Figures 6.8 – 6.10) generated for the CSF risk levels did not indicate improvements in CSFs.

A further investigation into the underlying calculations of the $ITSM^3$ was conducted. In collaboration with senior management (business) and ITSM process managers (IT), it became evident that some KPIs are more important than others to achieve a CSF. In response, Steinberg's approach was modified to apply weightings to the KPIs associated with each CSF to better align with the organization's strategic goal. Furthermore, the direction of Steinberg's KPI attainment score scale was reversed to score 3 for KPIs meeting their targets, 2 for KPIs between target and warning thresholds, and 1 for KPIs not meeting their target. The revised scale aligns with the direction of the CSF NPLF scoring method.

The exercise of adapting Steinberg's measurement model in collaboration with the business (senior management) and IT (ITSM process managers) facilitated a dialogue between business and IT, that strengthened the alignment between these two groups, thus confirming the assertions made in previous studies on ITSM and Business-IT alignment (Chen 2008; Luftman 2000; Luftman & Ben-Zvi 2011; Luftman, Papp & Brier 1999; Rahbar, Zeinolabedin & Afiati 2013; Silvius 2008; Tapia 2007). This partnership between these two groups is in line with previous studies on strategic alignment (Coleman & Papp 2006; Henderson & Venkatraman 1993; Reich & Benbasat 1996; Ward & Peppard 2002).

7.3.2.2 Quality of Data

As stated in §5.6.1 the study prompted in-depth analysis and subsequent classification of incidents and problems, thus improving the accuracy of the data, for example by eliminating false positive alerts. In order to meet the quality requirements of data used to populate the $ITSM^3$, §6.3.5 discussed *how* the derivation of operational metrics from Zendesk was reviewed. This is in alignment with the literature on the data accuracy in performance measurement (Sheng & Mykytyn Jr 2002; Watson & Haley 1997).

Steinberg's ITSM Metrics Modeling Tool was adapted in §6.2.2.6 to derive CSFs from the weighted average of the KPIs that were associated with the CSFs, rather than solely using the lowest associated KPI for the CSF score. Furthermore, Steinberg's Model was modified to use the NPLF ordinal scale to score KPIs, in order to be consistent with the outcomes. Steinberg's model was further enhanced to weight the Business Risks that were associated with CSFs to generate the CSF scorecards. These enhancements to Steinberg's model are in line with the literature on quality of data that asserts that apart from data accuracy, data need to be fit for use in order to be meaningful in the context of use (Sheng & Mykytyn Jr 2002; Watson & Haley 1997).

Employee salaries increased between cycle 1 and cycle 2. To enable an accurate comparison of salaries, it was decided to apply the Consumer Price Index (CPI) to normalize the salaries in cycle 2. This addressed the data accuracy requirement of the financial measurement.

7.3.2.3 Use of Technology

The use of appropriate technology to derive metrics to measure process performance is paramount for process improvement. As described in Chapter 5, SugarCRM was used at Company X for sales-force automation, marketing initiatives, customer support, and collaboration. However, SugarCRM did not provide the performance metrics that mattered for process improvement at Company X. SugarCRM was replaced by Zendesk for customer support to provide the required metrics to measure process performance. The Zendesk software-as-a-service allowed the researcher to create custom metrics that were relevant to the study and Company X that was otherwise not easily possible. Bugzilla was used by Company X to track problems and incidents but was not integrated with Zendesk. Bugzilla was replaced with Jira for its tight integration with Zendesk to track problems that caused incidents. CSFs were also weighted to determine the business risk scores and the CSF attainment level scores were also calculated by applying the ordinal NPLF scale.

These activities confirm previous research that highlighted the critical importance of appropriate ITSM tools (Pollard & Cater-Steel 2009).

7.3.2.4 External Factors

This section discusses the most significant external factors that impacted the financial markets and process performance at Company X through the duration of the research project.

Political Factors

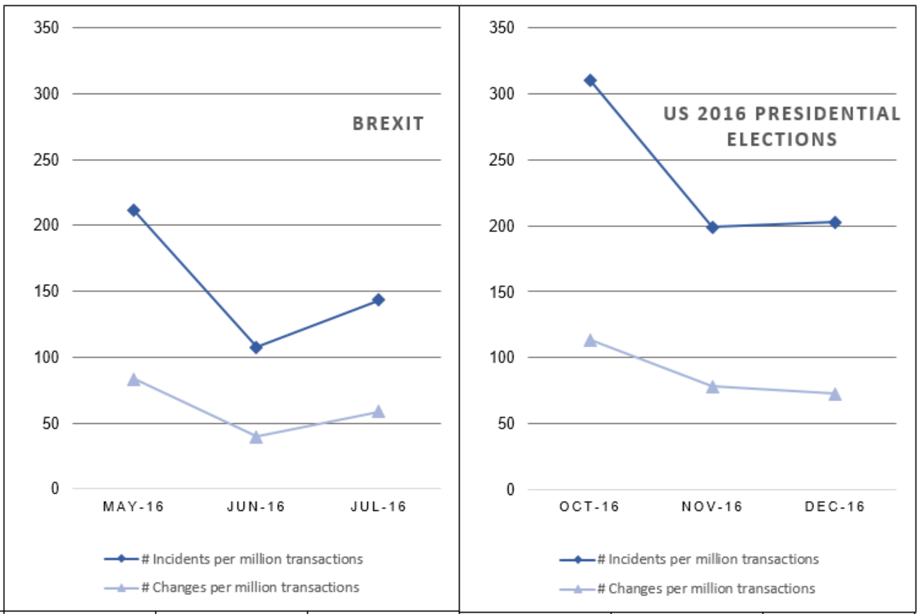
§6.8 discussed Brexit and the 2016 US Presidential Elections as the two most significant political events that caused chaos in the financial markets. Market volatility was at its peak during these events, due to trading speculation around the uncertainty of outcomes.

As highlighted in §6.8 Figure 6-20, the analysis of the effect of the Brexit event on Company X revealed significant process performance improvements during the period of May – July 2016 in comparison with the same period in 2015 despite the peak in the number of transactions in 2016.

Similarly, the analysis of the effect of the 2016 US Presidential Elections on Company X showed process performance improvements during the period of October – December 2016 in comparison with the same period in 2015 despite the increase in the number of transactions in November and December 2016.

The improvement in process performance during Brexit and the US elections was attributed to the execution of the process improvement plans this study prescribed and enforced.

The number of transactions increased during Brexit accompanied by a decrease in the number of incidents and changes. During the US 2016 presidential elections, although the number of transactions was lower than at the time of Brexit, there was an increase in the number of incidents and changes. Figure 7-2 illustrates that the US 2016 presidential elections resulted in more incidents and changes at Company X than Brexit, although the number of transactions was lower. This finding concurs with the views of previous studies (Persson & Tabellini 1990; Rogoff 1996) on the varying impact of political events and their outcomes on financial markets.



	May-16	Jun-16	Jul-16	Oct-16	Nov-16	Dec-16
# Incidents	1,351	968	1,185	1,547	1,280	1,074
# Changes	534	358	486	567	504	386
# Transactions	6,399,613	9,005,845	8,262,355	4,986,832	6,436,913	5,299,571

Figure 7-2 Incidents and Changes per million transactions for 3-month period around Brexit and the US 2016 Presidential Elections

Environmental Factors

The most significant environmental factor that caused market volatility and affected process performance at Company X is discussed next.

The geopolitical tensions between the leadership of U.S. (Donald Trump) and North Korea (Kim Jong-un) were the major driver of market volatility in 2017. On 10 August 2017, the US stock market underwent its sharpest decline in three months, and the Chicago Board Options Exchange Market Volatility Index (VIX) jumped to its highest level since the 2016 US election after President Trump exchanged a *war of words* with North Korea (Wigglesworth, Platt & Bullock 2017). VIX is the most widely used measure of market risk, often referred to as the "investor fear gauge" (Whaley 1993).

Figure 7-3 shows the spike in the VIX chart after President Trump's retaliation to North Korea's threat.

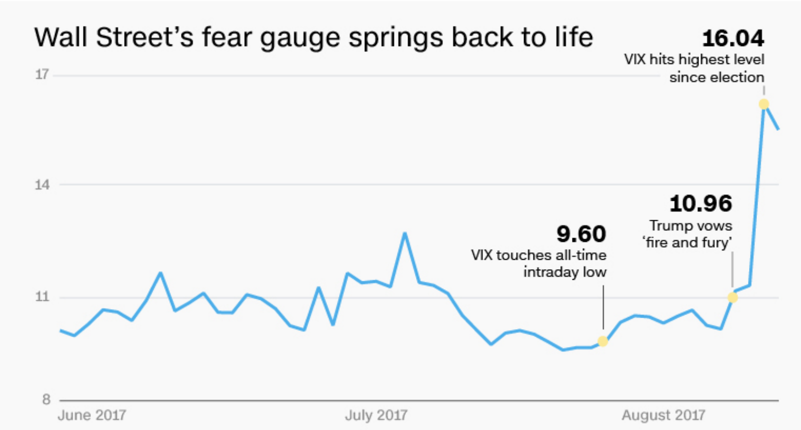


Figure 7-3 The VIX chart for June-August 2017 (MarketWatch 2017)

Figure 7-4 clearly shows the VIX jump on 10 August 2017 relative to the index on 3 November 2016 (the day of the 2016 US elections).

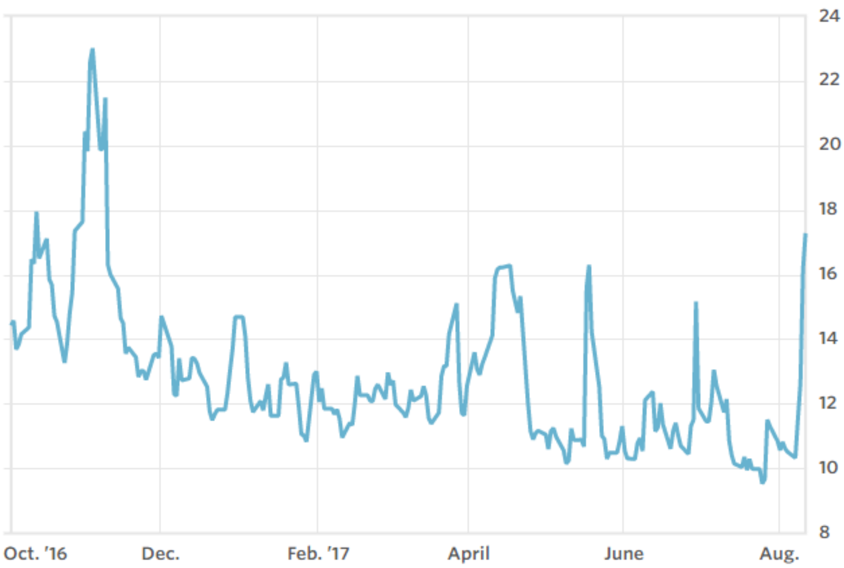
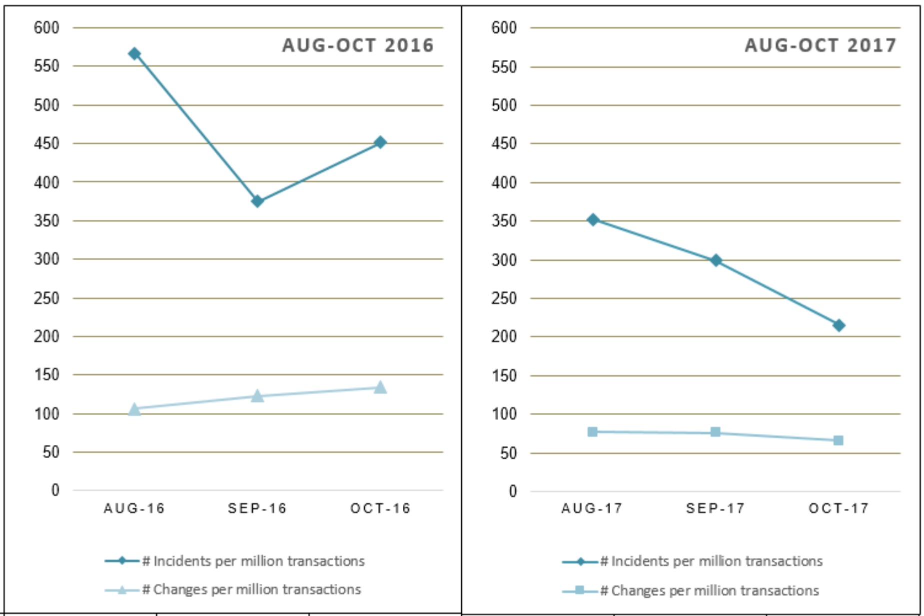


Figure 7-4 VIX chart showing biggest jump since the 2016 US Election (MarketWatch 2017)

Less-risky assets benefit from the geopolitical tensions, as investors move their money into what they apparently deem safer assets. At this time, the Japanese yen and Swiss franc were both stronger, and the price of gold rose as much as 1 percent, trading at the highest levels since September 2016, while the yen also climbed as much as 0.9 percent (CNBC 2017). Figure 7-5 illustrates the strengthening gold index and the weakening US dollar against the Japanese Yen.

Figure 7-5 A comparative chart of Gold and the Japanese Yen (The Economic Times 2017)

The effects of the market volatility described above on process performance at Company X is illustrated in Figure 7-6 that charts and compares the number of incidents and changes per million transactions for the 3-month period August through October of 2016 and 2017.



	Aug-16	Sep-16	Oct-16	Aug-17	Sep-17	Oct-17
# Incidents	2,750	1,752	1,911	2,019	1,664	1,176
# Changes	514	574	568	442	424	358
# Transactions	4,849,982	4,675,149	4,231,594	5,725,205	5,567,131	5,462,920

Figure 7-6 Incidents and Changes per million transactions for 3-month period Aug-Oct 2016 and 2017

Figure 7-6 highlights the significant process performance improvements achieved by the project during the period of August – October 2016 in comparison with the same period in 2017 despite the peak in the number of transactions in 2017. While the number of transactions peaked in August 2017 (19% increase in comparison to August 2016), there was a *decrease* in the number of incidents (by 5%) and the number of changes (by 26%) in comparison to August 2016.

The market analysis conducted around the US-North Korea tensions, and the threat of war, is consistent with previous studies on the effects of man-made disasters on the financial markets (Barro 2009).

7.3.3 Business Performance

Prior to the commencement of the project, success factors at Company X were informally defined and loosely implemented and monitored. This project introduced the concept of CSFs, its definition, and scope. As described in KISMET Phase 1 in chapter 5, meetings with senior management were convened by the researcher to discuss proposed CSFs. A list of Business Risks was compiled and distributed to senior staff for approval, as described in §5.2.

7.3.3.1 CSF Attainment

In terms of business performance outcomes, five CSFs were derived from the associated weighted KPIs for each process. Overall, three out of the seven operational CSFs improved, three remained the same, and one declined. Three of the four quality CSFs remained the same while one improved. All of the four financial CSFs improved.

7.3.3.2 Risk Assessment

The ITSMP^2 was used to conduct a risk assessment for each ITSM process at Company X. Risk mitigation levels were derived by weighting the association of business risks with CSFs as detailed in §6.3.5.

Out of the 45 business risks, 22 improved mitigation levels from *Largely* in cycle 1 to *Fully* in cycle 2, while 21 remained the same at *Largely* and one at *Fully* in both cycles, with one declining from *Fully* to *Largely* cycle over cycle.

The risk assessment method applied by operationalizing the BITSMMF provided an integrated, holistic approach to governance, risk, and compliance (GRC) through the alignment of strategy, processes, technology, and people, thereby improving efficiency and effectiveness. This outcome is in alignment with the definition of GRC provided by Racz, Weippl and Seufert (2010).

7.3.3.3 ITSMP^2 Scorecard

An ITSMP^2 Scorecard was generated for each process by calculating the weighted average of business risk scores for the risks associated with each dimension of the ITSMP^2. All performance dimensions of the ITSMP^2 improved from cycle 1 to cycle 2.

7.3.3.4 Financial Performance

The financial performance of Company X was measured in terms of costs associated with performing the processes and the cost of IT failures.

In summary, the labor cost of performing the three improved processes decreased from cycle 1 to cycle 2. Figure 7-7 illustrates the total labor cost savings when comparing the labor cost of performing processes in cycle 1 with cycle 2. The total labor cost of the three processes decreased by 27.64% providing a saving to Company X of $895,210.

Figure 7-7 Total cost savings when comparing the labor cost of performing processes in cycle 1 with cycle 2

The costs incurred from major incidents and outages were then included in calculating the total cost savings year-over-year. Table 7-2 shows the total cost savings by Company X year over year.

Table 7-2 Total cost savings year-over-year

ITSM Process	2015	2016
Incident Management	$1,303,416	$1,037,062
Problem Management	$1,141,073	$747,005
Change Management	$820,061	$585,274
Cost of Major Incidents and Outages	$17,370	$5,443
Total Costs	$3,283,935.00	$2,376,800.00
Total Cost Savings	**$907,137**	

To illustrate of the association of Process Capability, Process Performance with Financial Performance, a similar technique to Process Capability determination was used to measure process performance at a high level.

Table 7-3 shows that out of the 25 total process performance KPIs across all three processes, while 13 KPIs did not meet their targets in cycle 1, only nine failed to meet their targets in cycle 2.

Table 7-3 Comparison of Performance KPI Achievement: Cycle 1 & 2

	Process Performance KPI	Cycle 1 Result	Cycle2 Result
Incident Management	Number of Incident Occurrences	10,171	5,881
	Number of High Severity/Major Incidents	6,672	912
	Incident Resolution Rate	0.33	41.7%
	Customer Incident Impact Rate	0.33	12.1%
	Incident Reopen Rate	0.11	6.8%
	Average Time to Resolve Severity 1 and Severity 2 (hours) Incidents (Hours)	52.20	63.40
	Average Incident Response Time (hours)	7.2	2.5
	Percentage of Incidents completed without escalation	0.83	21.7%
	Incident Labor Utilization Rate	0.36	36.2%
Problem Management	Incident Repeat Rate	28.57%	0.00%
	Number of Major Problems	8	7
	Problem Resolution Rate	19.3%	87.5%
	Problem Workaround Rate	6.0%	31.3%
	Problem Reopen Rate	3.6%	0.0%
	Customer Impact Rate	0.0	0.0
	Average Problem Resolution Time - Severity 1 and 2 Problems (Hours)	664.5	473.2
	Problem Labor Utilization Rate	20.0%	20.0%
Change Management	Change Efficiency Rate	3.3%	2.6%
	Change Success Rate	86%	48%
	Emergency Change Rate	57.7%	191.7%
	Change Reschedule Rate	65.5%	3.2%
	Average Process Time per Change (Hours)	401.6	57.4
	Unauthorized Change Rate	0.6%	1.9%
	Change Incident Rate	0.2	0.8
	Change Labor Workforce Utilization	81%	81%
Total number of KPIs not meeting their targets (Red and Yellow cells)		13	9

Using the ratio of improvement recommendations, the ratio of process performance KPIs that did not meet their targets, and the total costs year-over-year, Figure 7-8 compares cycle 1 and cycle 2 outcomes to illustrate the association of process capability, process performance and financial performance at Company X.

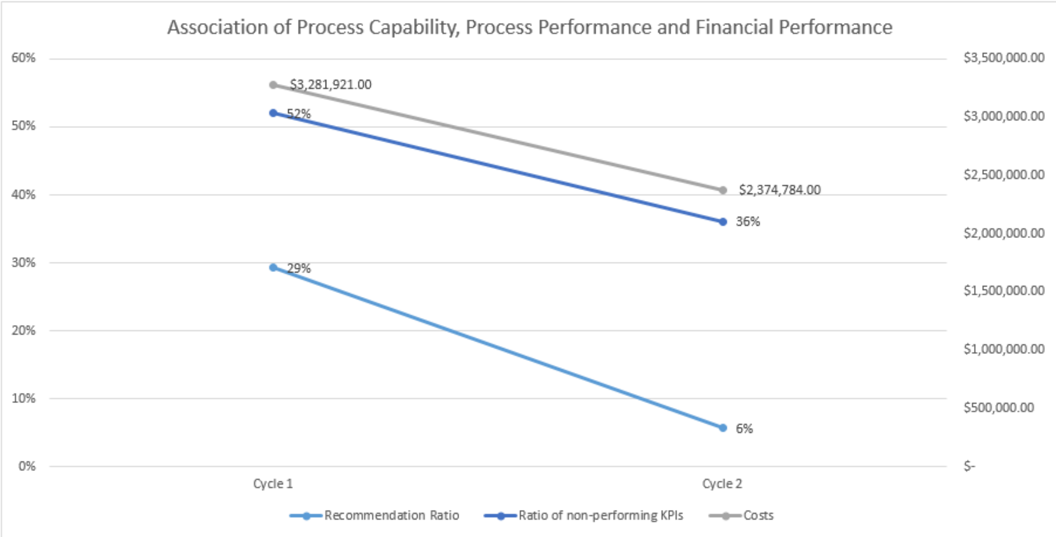


Figure 7-8 Association of Process Capability, Process Performance and Financial Performance

Using the *recommendation ratio* as a proxy for **Process Capability,** the *ratio of non-performing process performance KPIs* as a proxy for **Process Performance**, and the *percentage change in costs*, as a proxy for **Financial Performance**, comparing the results of cycle 1 with cycle 2, Process Capability improved by 24 percent, Process Performance improved by 16 percent and Financial Performance showed an improvement of 30 percent between cycle 1 and cycle 2.

Corporate governance improved at Company X by minimizing costs and risks associated with the isolation of the business from IT and with maximizing returns to the business using the skills of IT staff. This concurs with the literature on corporate governance and confirms the study by Licker (2007).

7.3.4 Response to Research Question One

The first research question asked *How can the association of ITSM process capability and process performance with financial performance of an organization be determined?*

The review of previous academic research and empirical studies confirmed the lack of a model and method to determine an association of process capability and process performance with business performance. The ITSM Metrics Modelling Tool (Steinberg 2013) was identified in the literature as a practical tool to use as a starting point to answer research question one. The measurement model proposed by Steinberg (2013) was adapted to include costs and other financial performance metrics and extended to identify business risks associated with the established CSFs to present a CSF Risk Mitigation Level Scorecard instead of using the balanced scorecard approach Steinberg proposed.

The framework was developed as described in Chapter 4. The framework was first applied in cycle 1 as described in Chapter 5. The metrics were reviewed, and minor enhancements to the framework were applied in cycle 2 (Chapter 6).

At Company X, the improvement in process capability and process performance was accompanied by an improvement in business performance, in terms of lower business risks, cost savings and high CSF attainment levels. The results provide evidence that process capability and process performance are associated with business performance.

To illustrate the association, the Incident Management process may be used as an example. Six of the seven KPIs associated with the CSF of *Improve IT and Business Productivity* showed improvement, while one did not improve. Table 7-4 shows the comparison of KPI performance of cycle 1 and cycle 2.

Table 7-4 Comparison of KPI Performance for Incident Management: Cycle 1 & Cycle 2

Key Performance Indicator	Cycle 1 KPI	Cycle 2 KPI
Number Of Incident Occurrences	10,171	5,881
Incident Resolution Rate	33%	41.7%
Incident Reopen Rate	11%	6.8%
Average Incident Response Time (hours)	7.2	2.5
Percentage of Incidents completed without escalation	83%	21.7%
Incident Management Cost	$1,303,416	1,307,062
Incident Management Process Capability	14.5%	0%

The CSF attainment improved from cycle 1 to cycle 2 as shown in Table 7-5.

Table 7-5 Incident Management CSF Attainment Levels: Cycle 1 & Cycle 2

Action Research Cycle	CSF Attainment	CSF Attainment Score
Cycle 1	L	0.58
Cycle 2	F	0.88

All of the ten Business Risk Mitigation Levels remained the same at *Largely* as shown in Table 7-6.

Table 7-6 Business Risk Mitigation Levels for the ITSMP^2 Productivity Dimension: Cycle 1 & Cycle 2

Outcome Risks	Cycle 1 Risk Level	Cycle 2 Risk Level
Rework	L	L
Waste	L	L
Delayed Solutions	L	L
Slow Operational Processes	L	L
Unexpected Costs	L	L
Higher or escalating costs	L	L
Slow Response To Business Needs And Changes	L	L
Inability to scale	L	L
High Levels Of Non-Value Labor	L	L
Loss of Market Share	L	L

The Productivity dimension of the ITSMP^2 remained the same as shown in Table 7-7.

Table 7-7 ITSMP^2 Productivity Attainment Levels

Action Research Cycle	CSF Attainment	CSF Attainment Score
Cycle 1	L	0.58
Cycle 2	L	0.84

The *Productivity* dimension of ITSMP^2 scored *Largely* in both cycle 1 and cycle 2 after associating business risks with the CSF, but in cycle 2 the score of 0.84 is on the brink of being *Fully* attained.

7.3.4.1 Revised Behari ITSM Measurement Framework

The Behari ITSM Measurement Framework (BITSMMF) was developed by the adaption of the Performance Pyramid proposed by Lynch and Cross (1991) and the extension and enhancement of the ITSM Metrics Model proposed by Steinberg (2013). The two components that comprise BITSMMF are the ITSM Performance Pyramid (ITSMP^2) and the ITSM Measurement Model (ITSM^3).

ITSMP^2

As detailed in §4.2.1, the ITSMP^2 was based on Performance Pyramid developed by Lynch and Cross (1991) and adapted to fit the study by merging the two levels between the apex and base of the pyramid. This created a holistic, integrated performance measurement system that was required to address the gap between the business and IT at the case study organization.

ITSM^3

Table 7-8 lists the changes made to each component of the Steinberg ITSM Metrics Model Tool to develop the ITSM^3.

Table 7-8 Changes made to Steinberg's Tool to develop the ITSM³

Component	Steinberg's ITSM Metrics Model Tool	Behari ITSM Measurement Framework
Financial Dimension	Not included	The ITSM³ includes the cost of performing a process and the costs of IT failures.
KPI Scoring	Steinberg used a 3 point scale: 1 KPI result meeting the target; 2 KPI results within the warning zone; 3 KPI results outside the warning zone.	The KPI scoring method was modified to score 3 for KPIs meeting their targets, 2 for KPIs between target and warning thresholds, and 1 for KPIs not meeting their target.
CSF Scoring	First, identify the KPIs that relate to the CSF and then rate the CSF based on the highest (worst) value observed in any one of those KPIs. Steinberg used a 3 point scale for the CSF attainment level: 1 high attainment; 2 medium attainment; 3 low attainment.	The scoring method was modified to align with the CSF NPLF scoring method of the ITSM³
	Assumes that all KPIs are equally valuable in achieving their associated CSF.	Applies weightings to recognize that some KPIs are more important than others to achieve a CSF. Attainment levels of CSFs are then determined by dividing the weighted average of the KPIs associated with them by the maximum possible score of 3.

Component	Steinberg's ITSM Metrics Model Tool	Behari ITSM Measurement Framework
Outcome Risk Level/Business Risk Mitigation Level	Derived from using the highest scoring CSF that the outcome risks were associated with.	Derived from using the weighted average of CSF scores for the CSFs associated with the business risk.
	Scored 3 for high risk; 2 for moderate risk; and 1 for low risk.	Used the NPLF ordinal scale to score the mitigation level of business risk.
BSC Risk Levels/ITSMP^2 Attainment Levels	The BSC Risk Levels were derived using the average of the CSF scores for the CSFs that were associated with the BSC dimension.	The ITSMP^2 attainment levels were scored by using the weighted average of business risks scores associated with the ITSMP^2 dimension.
Final Output	The BSC Risk Level Scorecards were represented as radar charts showing the BSC Risk Levels.	ITSMP^2 Scorecards were represented as radar charts showing the attainment of the ITSMP^2 dimensions using the NPLF ordinal scale.

Figure 7-9 illustrates the changes made to the components of the Steinberg ITSM Measurement Modelling Tool to develop the ITSM^3. The changes are highlighted by the grey background.

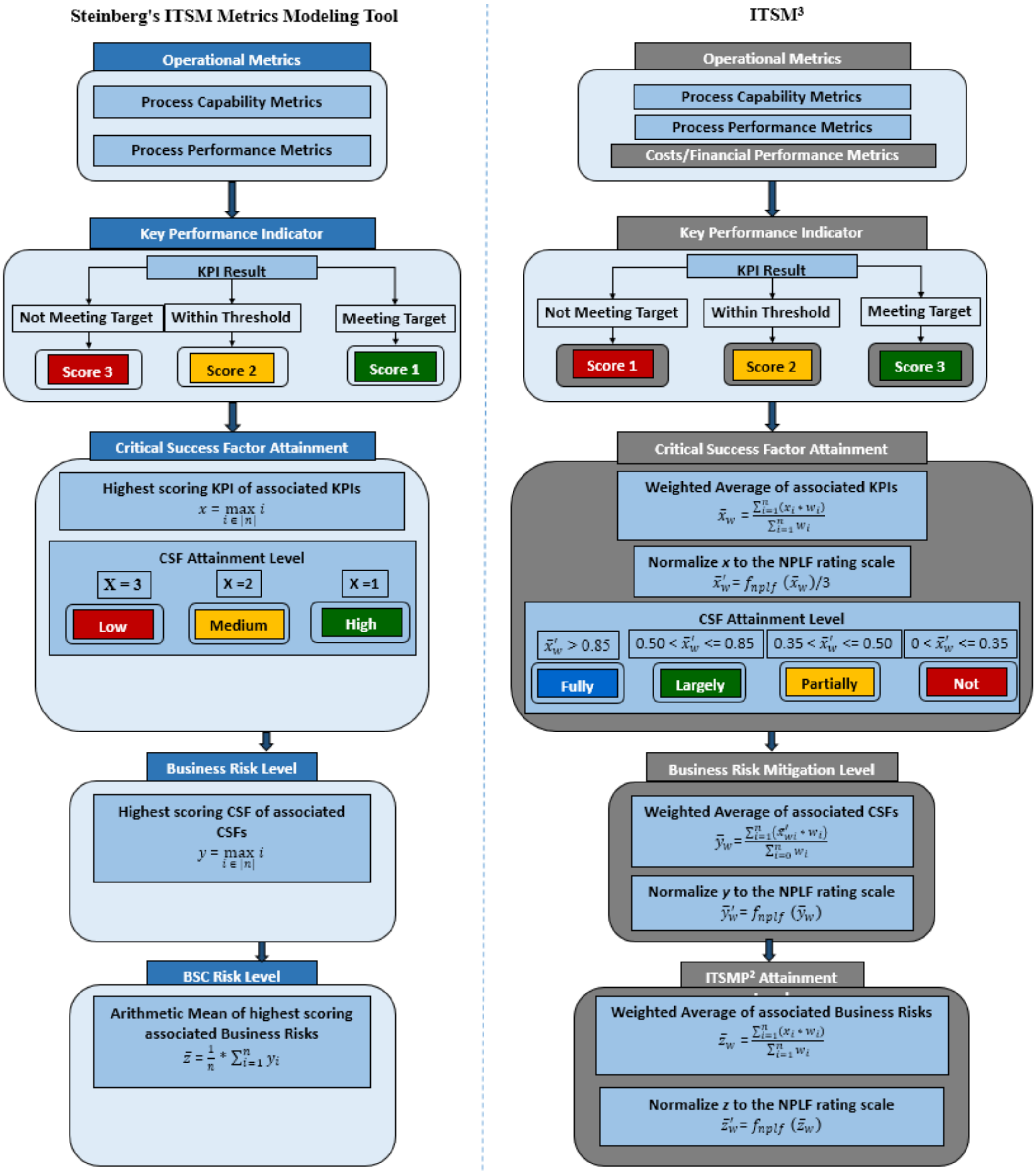


Figure 7-9 Changes made to each component of the Steinberg ITSM Metrics Modelling Tool to develop the ITSM³

Screenshots of the ITSM³ spreadsheet model for the Incident Management process are shown in Appendix F. The next section discusses the findings related to RQ2: *How can the ITSM measurement framework be demonstrated for CSI?*

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7.4 Discussion on findings related to research question two

7.4.1 Implementation of a method to demonstrate the ITSM Measurement Framework for CSI

As detailed in Chapter 3 §3.5.2, KISMET was selected to guide the process improvement initiative essential to demonstrate the Behari ITSM Measurement Framework. Previous studies have applied KISMET as both a model and tool to guide process improvement, but to the author's knowledge, none of the previous studies explicitly linked KISMET and/or the application thereof to theory (Heikkinen et al. 2013; Jäntti, Cater-Steel & Shrestha 2012; Jäntti, Lahtela & Kaukola 2010; Jäntti & Niskala 2014; Suhonen et al. 2013). The next section discusses how the implementation of KISMET provided opportunities to contribute to the study's underlying theories.

7.4.1.1 Agency Theory

Agency Theory was introduced in Chapter 2 §2.4.1 as the backdrop to the literature review and this research. Information asymmetry is an agency problem that occurs when the agent has relevant information that the principal does not have. This agency problem of information asymmetry was addressed at Company X by using the KISMET framework for process and continual service improvements. The KISMET framework called for the sharing of information at different levels of the organization, thus affording the alignment of interests of the principal and agent.

The KISMET framework provided the practical approach required to align the interests of the business and IT, by providing requirements at different phases of the framework in a language familiar to both the business and IT. Each phase of the KISMET framework required some level of collaboration between the principal (business) and the agent (IT), thus making the information transparent to both the business and IT. This led to IT staff understanding the core business and the business to understand IT's role and contribution.

7.4.1.2 Business-IT Alignment

The KISMET framework in conjunction with ANT principles afforded the engagement of management (principal) and staff (agent) to better align the business with IT. The first phase of KISMET *create a process improvement infrastructure* effectively enforced the code of collaboration between business and IT, by prescribing the joint effort of the principal (business) and agent (IT) to discuss the interests of the business needs and IT openly.

The concepts and prescriptions of KISMET were consistent with the culture of Company X, while simultaneously underpinned by action research principles. Using KISMET as a structured approach for the process improvement program offered the predictability required by both business managers and IT staff at Company X. Both groups were always aware of the next phase of KISMET and worked together on meeting the requirements of a phase before moving on to the next phase.

KISMET offered a common industry-familiar language that makes it easy for both business managers and IT personnel to understand without any issues of translation and misinterpretation. The description of each phase of KISMET was practical, and that made it ideal for business buy-in and process improvement execution.

Previous studies on ITSM and Business-IT alignment have focused on the effects of the best practices of ITIL on Business-IT alignment (Luftman & Ben-Zvi 2011; Luftman, Papp & Brier 1999), while this research extends the body of knowledge by demonstrating how the application of the KISMET framework bridges the Business-IT alignment gap.

The use of the KISMET framework in this research drove business value for Company X, by continually assessing and aligning IT capabilities. KISMET facilitated the alignment of IT activities with business strategy and performance goals.

7.4.2 Structure of the method to achieve CSI

This research used KISMET as a framework within action research cycles to structure ITSM process improvement as it supported action research methods which focus on improving ITSM practices (Suhonen et al. 2013) and CSI. As discussed in Chapter 3, the phases of KISMET harmonize with the phases of action research.

7.4.2.1 Enhancement of Action Research

As described in Chapter 3, prior to cycle 1, the KISMET phases were modified to take into account enhancement of existing processes at Company X and process performance. A major enhancement to KISMET was identified in the Continual Process Improvement phase of Cycle 1 when it was realized that reflection should not be done at the end of the cycle, but should be done in every phase. This is a significant innovation and can be applied to Action Research principles to challenge the practice of curtailing reflection to a final stage. The practice of continual reflection allowed for timely intervention and corrective actions. This concept of continual reflection concurs with Baskerville's view (1999). Figure 7-10 shows the action research approach used in this research.

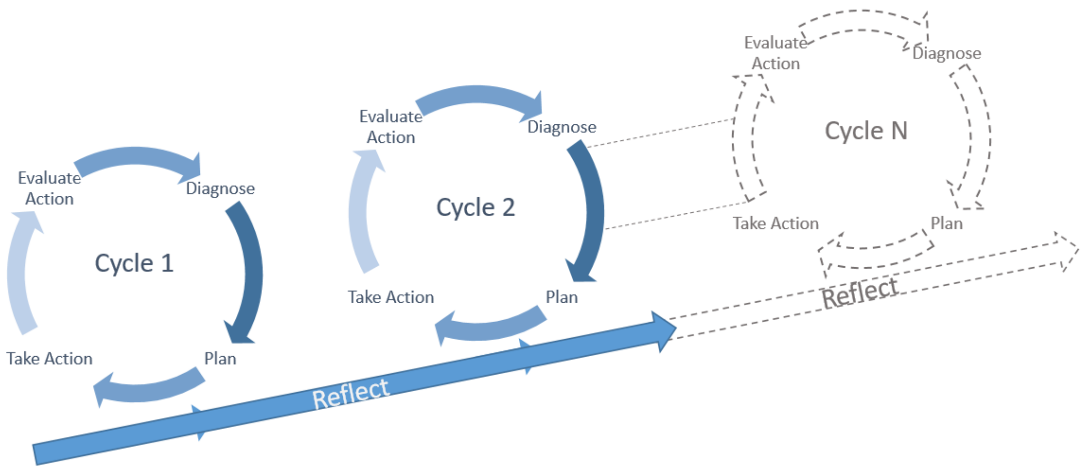

Figure 7-10 Action research approach used in this research

7.4.2.2 Influence of the KISMET Framework

KISMET stresses the importance of the initial establishment of a process improvement infrastructure. At Company X, ITSM tools including Zendesk and Jira played a critical role in providing metrics to support the processes. As detailed in Chapter 5, SugarCRM was replaced with Zendesk to provide the required metrics to measure process performance, and Bugzilla was replaced with Jira for its tight integration with Zendesk to track problems that caused incidents. The KISMET framework influenced the decision to use the fit for purpose software tools.

7.4.3 Response to Research Question Two

The second research question asked *How can the ITSM measurement framework be demonstrated for CSI?*

To demonstrate the BITSMF, a process improvement initiative was undertaken as detailed in Chapters 5 and 6. The BITSMF was applied to measure and compare process capability, process performance and costs before and after three processes were improved. The BITSMF was demonstrated for CSI based on the assessment and improvement of three ITSM processes at Company X. KISMET as a framework facilitated the formulation of a process improvement program and CSI that was successfully followed by Company X to improve all three ITSM processes.

The enhanced KISMET framework is shown in Figure 6.1 and was applied in cycle 2.

The next section discusses the scholar-practitioner approach to this study.

7.5 Discussion on Scholar-Practitioner Approach

In addition to contributing to academic work in various bodies of knowledge, this study provides an example of how the scholar-practitioner approach can provide tangible benefits to organizations that participate in academic research, as well as how academic research can advance by applying theory to solve real-world problems. The benefits to Company X are knowledge, organizational culture change, process efficiency, the mitigation of business risk, the alignment of business and IT, and cost savings.

As the Director of Engineering at the case study organization, the researcher is an integral contributor to the case organization's ITSM program. The goal of using a scholar-practitioner approach to solve a business problem was to bridge research, theory, and practice. Furthermore, the use of this approach with action research afforded the introduction of critical thinking and reflection to the practice.

In line with the suggestions from Shrivastava and Mitroff (1984) and Cronholm (2016), to make research more meaningful for practitioners, the BITSMMF design uses self-explanatory variables (day-to-day operational metrics terminology) with direct and actionable implications. The main objective of Company X's process improvement was to save costs, but the other CSFs were just as important. The CSFs are the dependent variables in academic research parlance. Company X was interested in knowing the organizational factors that were under its control, which in academic terms are independent variables. The construction of these research variables supports the *goal relevance* and *operational validity* expectations identified by Thomas, KW and Tymon (1982). The research has a high degree of operational validity, and goal congruence as the variables identified by the researcher are relevant to organizational issues and can be manipulated by the practitioner (Thomas, KW & Tymon 1982).

This research balances the requirements of practice (relevance) by solving a real-world business problem through collaboration with organizational staff to understand the research findings with the incorporation of research rigor into the inquiry process (Cronholm & Göbel 2016). This research outcome concurs with the findings of Mohrman, Gibson and Mohrman (2001), that claim that research is more likely to be seen as relevant and useful if there are opportunities for researchers and practitioners incorporate each other's perspectives to jointly participate in interpreting the results of the research.

The value of the research outcomes to the business is evidenced by comments from two executives at Company X:

> *"This information presented by the research is insightful and knowing that the results are backed by academic theory makes it sound and reliable." (*CFO at Company X, *30 October 2017)*

> *"The relevance of the research to our day-to-day activities adds value as it provides information that we can understand and therefore act on." (*VP of Operations at Company X, *30 October 2017).*

7.6 Chapter Summary

This chapter discussed the improvement in process capability and process performance with the associated improvement in business performance, in terms of lower business risks, cost savings and high attainment of CSFs. The results provide evidence that process capability and process performance are associated with business performance. Chapter 7 also discussed the implementation of the KISMET framework as an effective guide to process improvement. Finally, the benefits of the scholar-practitioner research approach were highlighted. The next chapter concludes the thesis.

CHAPTER 8 CONCLUSION

8.1 Introduction

This chapter provides a conclusion to this thesis with a summary of the key research findings to demonstrate how this research has met its objectives. This is followed by an account of the contributions of the research to theory and practice. Finally, the chapter also states the limitations of this research and directions for future research.

This chapter is organized into six sections. This section is an introduction to the final chapter. A summary of the research findings is provided in *section 8.2*. The contributions this research makes to theory and literature are presented in *section 8.3*. *Section 8.4* presents the contribution this research makes to industry and practice. Limitations of the research and suggested directions for future research are provided in *section 8.5*. The final chapter summary is provided in *section 8.6*.

An overview of the chapter is shown in Figure 8-1.

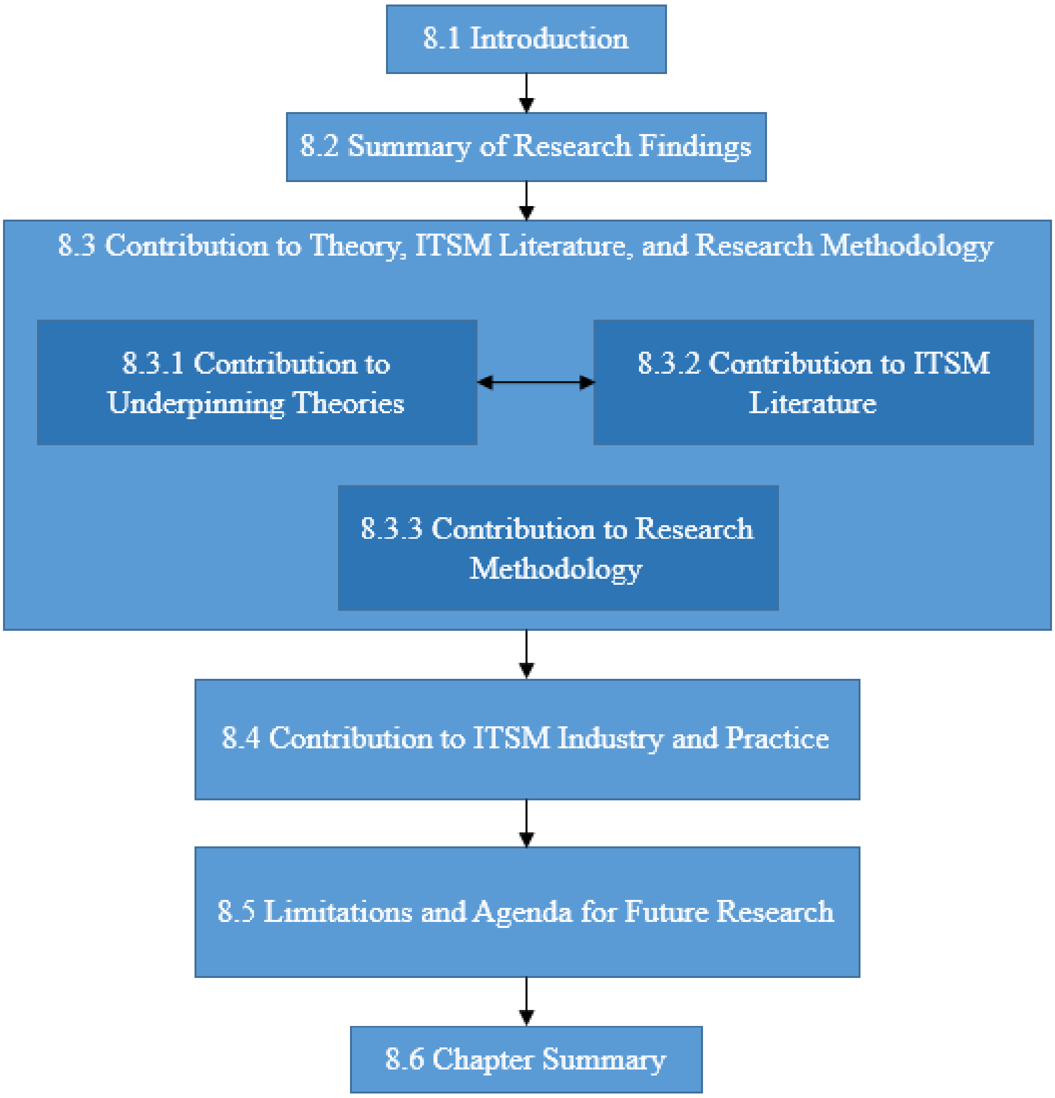

Figure 8-1 Overview of Chapter 8

8.2 Summary of Thesis

The aim of this research was to explore the association of ITSM process capability and ITSM process performance with business performance. This research study is presented in eight chapters. Chapter 1 provided the background to the research, identified the research problem, presented the research questions and justification of the research as well as the expected research contributions. Chapter 1 also presented an introduction to the methodology, definition of key terms, scope delimitations and key assumptions of this research.

In Chapter 2, by dichotomizing the research topic into the streams of IT and business, the literature review followed a structured method, using a top-down approach to examine the academic, industry, theoretical and empirical studies related to ITSM capability, ITSM performance, and business benefits, specifically financial benefits. The literature review strategy used a top-down approach to logically synthesize studies around the parent theories Strategic Alignment, Resource-Based View using Agency Theory as the backdrop. Relationships across the lower level focus areas were identified and confirmed. The literature review revealed that there is a lack of theoretical and practical knowledge around the development and use of a method and model to examine the association of ITSM process capability and process performance with business performance. Furthermore, to date, there is no empirical evidence of applying a pragmatic academic method and model as an ITSM process improvement tool. Chapter 2 identified two research opportunities based on the literature review findings.

Chapter 3 presented the blueprint for the research study. The underlying research philosophy, epistemology, and ontology, driven by the research questions, formed the basis for the overall research design and approach. The research design and approach were underpinned by the research philosophy of pragmatism. The study used applied research integrating mixed methods within a case study, following the action research approach, to provide academic rigor and industry relevance. The planned research design and activities to answer the two research questions were also presented in Chapter 3. Finally, the ethical considerations made in this research were provided.

In Chapter 4, the design of the measurement model was presented. Steinberg's model was extended to include financial measurements and incorporate business risks to chart the risk levels of CSFs. A *top-down* conceptual model of measurement and control linking process capability, process performance, and financial profitability to KPIs, CSFs, and business risks was presented. The $ITSM^3$ provided a method to derive KPIs from operational metrics, link KPIs that operationalize CSFs to applicable CSFs to achieve organizational goals, and associated business risks to these CSFs to ultimately determine the risks of these CSFs or business objectives.

Chapter 5 described the events of the first cycle of the action research. Using the action research approach, the researcher, through direct participation, followed the cyclic process of the approach to systematically enable process improvements and measure financial benefit in the case study organization. The activities of the KISMET framework were mapped to the phases of action research in Chapter 3 and used in the first cycle as a process improvement guide in order to achieve the goals of this action research study.

Chapter 6 described the events of each step of the KISMET framework within the second cycle of the action research. Reflection was an ongoing activity throughout this cycle. Further modifications to the measurement model were made and applied to the results of cycle 2. The model was re-applied to the results of Chapter 5, and a comparison of cycle 1 and cycle2 was presented.

In Chapter 7, a critical examination of the research results with discussions based on the context of the research method and reviewed literature was provided. Discussions were structured to answer the two research questions with a consideration of research work conducted and the presentation of key themes emerging from this research.

The study answers the two research questions as stated below.

RQ1. How can the association of ITSM process capability and process performance with financial performance of an organization be determined?

Through a literature review, the research confirmed the lack of a practical, cost-effective measurement model and method to associate ITSM process capability and performance with business performance. The ITSM Metrics Modelling Tool, proposed by Steinberg (2013), was used as a starting point to the development of the ITSM^3 (Chapter 4). In order to answer research question one, Steinberg's model was adapted and extended to include a financial dimension and was applied in two action research cycles by operationalizing Key Performance Indicators (KPIs) to support Critical Success Factors (CSFs) and associating CSFs with business risks to determine the attainment levels of the ITSM Performance Pyramid dimensions. The SMPA tool was used to determine a holistic measure of process capability. The SMPA tool was chosen for its transparency, convenience, effectiveness, low costs, and for its ability to report recommendations and observations. Rather than using the process capability score generated by the SMPA tool, the proportion of the number of recommendations generated of the total number of recommendations was used as a measure in the ITSM[3]. Business performance was measured across business risks, to provide a CSF risk assessment.

The Behari ITSM Measurement Framework was developed and applied in two cycles of the action research. Improvement in process capability was accompanied by improved process performance, financial performance, and overall business performance.

RQ2. How can the ITSM measurement framework be demonstrated for CSI?

As described in Chapter 3, the activities of the KISMET framework were mapped to the phases of the action research cycle. This mapping afforded the use of a scholar-practitioner approach to process improvement and CSI. The concepts and prescriptions of KISMET as an adaption of action research were consistent with the culture of ITSM practice. Moreover, KISMET enforced collaboration between the business and IT, by providing a common language, thus improving the alignment of the principal (business) and agent (IT).

The KISMET framework was adapted and applied to answer research question two. The adapted KISMET model was found to be effective in guiding improvements in Incident, Problem and Change Management processes, and in demonstrating CSI.

8.3 Contribution to Theory, ITSM Literature, and Research Methodology

The research provides a structure to, and synthesis of the academic literature in the field of ITSM. A comprehensive and empirically validated conceptualization of the factors (within the scope of this research) pertaining to the association of process capability, performance and business performance is presented.

8.3.1 Contribution to Underpinning Theories

<u>Agency Theory</u>

The research contributes to the underpinning parent theory, Agency Theory, by presenting an example of bridging the information asymmetry gap that is often held as a cause of many agency problems. The operationalization of the BITSMMF called for the collaboration of the business and IT. Both the business and IT were involved with the ITSM function to derive KPIs that support the organization's CSFs. This resulted in the business understanding the goals of IT at the KPI level and IT understanding the business's strategic goals at the CSF level. Business management at Company X had access to accurate information on IT activities to make better business decisions, while IT had insight into how their work affected the CSFs of the company. This transparency of information helped bridge the information asymmetry gap.

Business-IT Alignment

This research contributes to the literature on ITSM and Business-IT alignment by using KISMET as a process improvement framework to facilitate the alignment of business and IT. The use of a practical framework, that was previously empirically tested (Heikkinen et al. 2013; Jäntti, Cater-Steel & Shrestha 2012; Suhonen et al. 2013), provided the appropriate business-IT language to allow for the alignment of the interests of the business and IT.

Resource-Based View

Although this study was expected to exhibit the attributes of a firm's IT capability and its relationship to organizational performance, the text of this thesis does not prominently demonstrate a contribution to the resource-based view theory.

However, a contribution to RBV can be inferred by the information uncovered by this research on how ITSM frameworks, such as ITIL, are able to provide a positive influence on knowledge transfer by prescribing policies, procedures and tools that serve as valuable enablers of knowledge generation and application These frameworks influence the IT organization's resources and capabilities, and ultimately can lead to improvement of a firm's competitive advantage.

8.3.2 Contribution to ITSM Literature

ITSM Adoption, Implementation, and Benefits

The literature on the adoption, implementation and benefits of ITSM reports business benefits such as improved resource utilization, more timely deliverables, improved communication with IT departments within the organization, a reduction of server errors, elimination of redundant work and a decrease of rework, and the justification of the cost of quality (Cater-Steel, Toleman & Tan 2006). Previous empirical studies focused on process-specific benefits, and not financial returns (Gacenga, Cater-Steel & Toleman 2010). This research contributes to this body of knowledge by providing empirical evidence of the benefits of cost savings and risk mitigation by a business through improving ITSM process capability and performance.

ITSM Capability

The research contributes to the body of knowledge on ITSM process capability, by using a standards-based maturity model, ISO/IEC 15504 for the measurement of process capability, and adapting it to provide a fit-for-purpose measurement model. The adaption was to use the variation in the number of recommendations (generated by the SMPA report) based on process attributes to determine improvement in process capability rather than the process capability level. The account of the use of a transparent, efficient tool (SMPA) for process assessment contributes to the literature on process assessments.

ITSM Performance

The novel approach to combine CSFs and KPIs in the ITSM^3 contributes to the literature on using CSFs and KPIs in IT performance measurement systems.

By using a scholar-practitioner approach to this research, the overarching contribution of this research is the demonstration that academia can benefit by partnering with practice to bridge the research-practice gap. Academic scholars can significantly increase the prospect of evolving knowledge for theory and practice when they interact, collaborate, and forge a partnership with practitioners.

8.3.3 Contribution to Research Methodology

Actor-Network Theory

ANT has not been prominent in the thesis text, however, the principles and inscriptions of ANT were indeed intentionally followed by the researcher throughout the research project. This research did not contribute to ANT as expected.

Action Research

Previous action research studies in IT (Jäntti & Niskala 2014; Kang 2008; Phaal, Farrukh & Probert 2001; Suhonen et al. 2013) have used various models of action research (Baskerville & Pries-Heje 1999; Costello 2003; Kemmis, McTaggart & Nixon 2013; Maslen & Lewis 1994; McNiff 2013; McTaggart & Kemmis 1988; Susman & Evered 1978) but most followed the prescribed sequence of phases. Following the stages or cycles of a particular model too rigidly, could adversely affect the unique opportunity offered by the emerging nature and flexibility that are the hallmarks of action research.

By engaging in reflective practice throughout the entire action research project, the research-practitioner was able to reflect on activities during each phase of the action research cycles and the KISMET model to respond with prompt and apt revisions and interventions. This continual reflection allowed for real monitoring of the progress of change. By adopting this continual reflective approach, the researcher-practitioner is equipped to make decisions and revisions to the process throughout the implementation. Reflection is integrated throughout the action research cycle and should not be seen as a final phase of the cycle. This is a significant revelation and can be applied to Action Research principles to challenge the practice of curtailing reflection to a final stage. The practice of continual reflection allowed for timely intervention and corrective actions and concurs with the suggestions made by Baskerville and Wood-Harper (1996).

The KISMET model may be seen as a limitation if used as-is with action research. As described in *section 3.5.2* Table 3-1, the phases of the KISMET model did not automatically map to the phases of action research, so following a pragmatist approach, the researcher mapped the KISMET phases to the action research phases to fit this study. Furthermore, some of the phases of the KISMET model were renamed to offer familiarity to the case study organization. Future action researchers, especially those outside the ITSM domain, may choose to further adapt and/or remap KISMET to action research to fit their study.

8.4 Contribution to ITSM Industry and Practice

The study contributes to the ITSM industry and practice by providing a measurement model and method to identify opportunities to reduce costs and increase efficiency in ITSM processes that can ultimately lead to increased competitiveness. The research aimed to meet the challenges and opportunities that arise in businesses. The challenges are to increase revenue or decrease cost through the design of effective business processes.

The results suggest that it is possible to use the ITSM[3] as a starting point for self-improvement for businesses, identifying gaps in processes, benchmarking within an organization as well as guiding an organization's improvement efforts.

Some of the key features of this measurement model include:

- support for continual improvement;
- offers a process- and service-based IT service management approach;
- presents a scalable and flexible fit-for-purpose model;
- aggregates metrics to formulate key performance indicators;
- derives a method for filtering improvement initiatives and tracking performance status; and
- provides the ability to report on CSF attainment levels to develop performance improvements.

A practical measurement model was developed to determine the association of ITSM process capability, process performance and business performance. The model can be used to conduct *What-If* analyses to model the impacts of future business decisions on KPIs and CSFs. This can be achieved by increasing or decreasing the values of the Operational indicators that may be related. The model may also be used for analytics, for example, drilling down to more specific operational metrics. The measurement model presented in this study can be quickly implemented, adapted and evolved to meet the organization's needs. The Behari ITSM Measurement Framework is an exemplar that other organizations can benefit from. In response to the unpredictable market volatility, Company X has started to implement other ITSM processes such as Release and Deployment Management, Availability Management, and Service Level Management, and has extended the ITSM^3 to incorporate these new processes.

The rhythm of the KISMET cycles and the operationalization of the Behari ITSM Measurement Framework have been institutionalized at Company X. The lasting benefits to Company X are the implementation of new software tools (Zendesk, Jira, and the ITSM^3), the alignment of business and IT through organizational change, staff development through ITIL training, and the continual service improvement offered by the BITSMMF.

The practical contribution of the research is that it offers an example from which other organizations can learn to measure their business performance and financial return on investment in ITSM improvement. It seeks to provide an understanding of how to derive KPIs from operational metrics, link KPIs that operationalize CSFs to applicable CSFs to achieve organizational goals and associate business/outcome risks to these CSFs to ultimately determine the risks of these CSFs or business objectives. It aims to provide an understanding of the potential degree of financial benefits realizable due to process improvements. The application of the model establishes the link between IT capability and performance and financial measures.

The operationalization of the BITSMMF will be shared with practice through presentations at the San Francisco Bay Area itSMF Local Interest Group, and through articles in itSMF Bulletins. LinkedIn will be used as a social media tool to share the research findings with practice. The researcher plans to take the spreadsheet-based measurement model to the next level, to develop Software-as-a-Service to expose the BITSMMF by initially integrating with the Zendesk API to automate the population of the ITSM^3.

Some of the major ITSM software tool vendors, such as ServiceNow, BMC, Cherwell Software, and Ivanti (Matchett, Doheny & Gonzalez 2017) will be approached to foster a business partnership to provide the ITSM[3] as a plugin or add-on to these vendors' offerings.

Although not core to this research, the PESTEL analysis and the reflection thereof contributes to the increasing literature on market volatility studies (Bjønnes & Rime 2005; Brada, Kutan & Yigit 2006; Dolan 2011).

An overarching contribution of this research is the presentation of an exemplar that demonstrates how academic studies can be effectively used to solve business problems and contribute to the success of the business.

8.5 Limitations and Agenda for Future Research

This section discusses the limitations of the research and recommends future research topics. This research explores the association of ITSM Process Capability, Process Performance and Business Performance. The limitations of the research are categorized into Literature Review, Methodology, and the Behari ITSM Measurement Framework.

8.5.1 Literature Review

The limits defined in the literature review protocol (Chapter 2, Table 2.1) resulted in the exclusion of literature that did not meet the predefined criteria. It is possible that relevant research is available in literature from non-English academic and industry literature excluded in this study, that can be explored in future research. Future research can explore academic and industry literature that did not meet the criteria for review in this study, to complement and/or further contribute to the research problem.

8.5.2 Methodology

The scope of this research is delimited by the philosophical worldview, theoretical underpinnings, research design and the selected research methods as discussed in Chapter 1, §1.7. Future research may be conducted using a different worldview, underpinning theories, research design and research methods to extend and/or enhance this study.

8.5.2.1 Single Case Study

This research was based on a single case study focused on three ITSM processes. Using a single case study often generates a question around replication logic and generalization. The use of multiple case studies would have strengthened the data, information and context used to develop the design of the artefact (BITSMMF). This limitation was mitigated by the iterative improvement and enhancement of BITSMMF facilitated by the Action Research cycles. However, using the framework developed in this research, the approach can be easily extended to other organizations and all ITSM processes. It can also be extended to work beyond ITSM.

Beyond the software engineering discipline, the ISO/IEC 15504 standard, originally referred to as Software Process Improvement and Capability DEtermination (SPICE), has now been established as a general process assessment standard and is being transformed into a new standard family of ISO/IEC 330xx series (Rout 2014). The fundamental evolution of the ISO/IEC 15504 standard architecture has opened up the way to other sectors of the industry and new horizons for process assessment (Cortina et al. 2014). In recent years the standard has been broadened to address non-software domains such as management systems, banking, automotive, medical devices and aerospace (Cortina et al. 2014; Di Renzo et al. 2007; McCaffery, Dorling & Casey 2010; Rout et al. 2007; Van Loon 2007). Beyond the discipline of ITSM, the SMPA approach (used in this research project to assess process capability) can potentially be applied to other models or domains where a compliant assessment model is available.

The operationalization of BITSMMF by deriving KPIs from operational metrics, linking KPIs to applicable CSFs to achieve organizational goals and associating business risks to these CSFs to ultimately determine the attainment of business performance dimensions, is a generic approach to exploring the association of process capability, process performance and financial performance.

Using the automotive industry as an example, two operational metrics could be the Number of Vehicles Manufactured and the Number of Defective/Recalled Vehicles. An example of a KPI that can be derived from these operational metrics is Defective Units/Recall Rate, which would be calculated by taking the total number of vehicles that have been recalled due to a defect in the vehicle produced within a specified time period and dividing by the total number of vehicles produced within the same time period. An examples of an associated CSF is cost savings. A business risk for the automotive industry that is associated with the Financial performance dimension of ITSMP2 could be Fines and Penalties. Examples of process financial costs could include manufacturing equipment outages and worker injuries. Further research can be undertaken to apply the framework in different industry sectors, using different tools for data collection and methods to calculate financial measures and business performance.

The validity threats around single case study research are concerned with the ability to generalize the results. Positivist studies aim at finding objective truths, which implies that they are valid for the respective sample, and hence positivists are after being able to generalize from a sample to a population (Petersen & Gencel, 2013). In interpretivist and action research studies generalizability has to be viewed differently. As Yin (2009) points out, one should not talk about a sample of cases, given that one would not aim to generalize to a population. Instead, one would like to generalize to similar contexts, and find supporting cases and conflicting cases for theories, and by doing that being able to conduct cross-case comparison (Petersen & Gencel, 2013). Practitioners are often most interested in cases, in particular those that match their company context (e.g. in terms of domain, size and complexity of development, use of similar processes, and so forth). Hence, reporting context is very important to know which cases to compare (Petersen & Wohlin, 2009). Overall, this makes clear that case studies should not be rejected due to that they represent only a single case, each case is an important contribution to learning, in particular as case studies provide a deep understanding (Runeson & Höst, 2009; Yin, 2009) of a situation in a particular context. The same applies to action research, which is also focused on being conducted in the real world, and hence produces context dependent results (Kock, 2004).

8.5.2.2 Action Research

One may view the choice of Action Research over Design Science Research a limitation, as it is evident that the development of the artefact (BITSMMF) is core to this research. However, the primary focus of this research was to address the real-world business problem of exploring the association of ITSM Process Capability, Performance and Business Performance.

As described in *section 3.2.1* p.67, the researcher's philosophical worldview of pragmatism, and in particular, methodological pragmatism, underpinned this research study. Please see *section 3.2.1* for details of the researcher's philosophical stance that underpinned the research approach.

Researchers with other worldviews, for example critical realism, may consider the Design Science Research approach to further extend and enhance the BITSMMF. This philosophical stance may focus on the improvement of the artefact developed and applied in this study.

8.5.2.3 Scholar-Practitioner Approach

The researcher may not be seen as an *objective and neutral observer*, as the researcher is professionally involved with the case organization and academically embedded in ITSM. However, this study should not be seen as being compromised by my involvement, as the methods of rigor discussed in chapter 3 are executed and upheld to counteract this. Moreover, given each researcher's individual and unique perceptions and interpretations of phenomena, research is essentially biased to begin with, so there is no point in trying to "establish validity" in any external or objective sense (Trochim & Donnelly 2007).

8.5.3 Process Capability

This study used the SMPA tool for the process capability assessment, primarily for its transparency and convenience. As discussed in the reflection on process capability assessment results, in §6.3.2, the SMPA process attribute scores are not granular enough to determine improvement in ITSM process capability. Using a process capability assessment instrument that offers a finer degree of granularity may produce more accurate process capability results.

Furthermore, the SMPA tool ignores the survey responses of "Do not know" and "Do not understand" to calculate the process capability level. These two answer responses and vital to a process improvement program, as they indicate the lack of knowledge or communication.

The SMPA tool does not provide an automated mechanism to incorporate reliability scores to determine process attribute scores. A path for future research when using the

SMPA approach or any process assessment instrument is to further analyze the reliability of the assessment results before determining the capability rating of a process. The process attribute scores and corresponding maturity level should be considered in light of the reliability measures. This study did not analyze the assessment reliability scores in detail but merely used the results at face value.

Results from other process assessment methods can be easily incorporated into the measurement. The SMPA survey was conducted as a cross-sectional survey annually at two points in time. A cross-sectional survey presents a single snapshot in time and further understanding may be provided by a longitudinal survey that will provide multiple snapshots across time.

Using the SMPA Tool as an instrument to access ITSM process capability of an organization has some potential issues. Survey participants are required to assess capability by responding to questions that are directly mapped to an ordinal scale (NPLF). This is problematic as one survey participant's interpretation of maturity or the question being posed may differ from another participant's. People with different roles in different parts of an organization may have different views on the capability of processes, as evidenced in §5.8.1 and §6.2.1. Additionally, the assessment instrument creates a proxy measure of the process capability of an organization and there is always inherent error in such an approach.

8.5.4 Process Performance

The limitations around process performance comprise the accuracy and quality of data used to populate the $ITSM^3$. Although §7.3.2.2 discussed how issues around the accuracy and quality of data were addressed in this study, the KPI scoring method and the use of weighted averages in $ITSM^3$ may be viewed as limitations that could prompt further research.

8.5.4.1 KPI Scoring

KPIs can measure different kinds of data, which are often quantified differently using different units of measurement, for example, currency, integers, ratios, and time.

The KPI scores in this study were not normalized to a linear range using consistent thresholds. In order to evenly distribute the scores future research could investigate the application of consistency to underpin all score calculations.

For example, Commercial software tools, such as Microsoft Power BI™ (Microsoft 2017), use a method referred to as *banding* to evenly distribute KPI scores (Hulen, Chau & Yang 2005). The banding method is the choice of calculation to use to compare the actual KPI result to a target result. This method creates a normalized range (0% to n%) for the KPI using this calculation.

8.5.4.2 Weighted Averages

The use of weighted averages to score CSF attainment levels, business risk mitigation levels, and derive scores for $ITSMP^2$, may be perceived as a limitation as the "pattern" of thinking of the human assignee is reflected in the weights assigned, which is often referred to as the utility function (Mill 1901).

In decision processes, such as deciding which business risk is more important to mitigate from a set of related business risks, the value of the weights are at best imprecise, and heuristically arrived at with parameters which are likely to have little or no relationship to each other as they are not integrated through any physical process with quantifiable parameters. Scores and weights are deliberately biased by human evaluators, and no single unique value can represent human thought processes.

8.5.5 Business Performance

Business performance was measured using the constraints of the $ITSMP^2$. The model confines the performance measures to nine high-level dimensions. Using other performance measurement systems may provide additional performance dimensions to consider. The focus of this research was the financial dimension, so future research can focus on other specific dimensions or provide more in-depth analysis into other business performance measures.

8.5.5.1 Financial Measurement

The primary focus of this research was to provide a monetary value to the cost savings realized by improving ITSM processes, in both capability and performance. However, this may be limiting, as there are numerous other financial measures that were unveiled by the literature review. Future studies can incorporate other measures into the BITSMMF, or use $ITSM^3$ to model ITIL's Financial Management for IT Services.

A further limitation to the financial measurement is that the BITSMF did not incorporate the costs involved with staff participation in the surveys, focus groups, meetings, and the setup of the Zendesk metrics, as these costs were negligible. These costs can be easily included in the measurement model.

8.6 Chapter Summary

This research established a connection between theory and practice by drawing on academic and practitioner literature and collaborating with academia and industry to develop a measurement model and method (framework) to improve ITSM processes, with the ultimate intention of determining whether there is an association of ITSM process capability, ITSM process performance, and business performance.

The objectives of this research have been achieved.

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List of Appendices

Appendix A.1. List of Terms[1]

alert - A notification that a threshold has been reached, something has changed, or a failure has occurred. Alerts are often created and managed by system management tools and are managed by the event management process.

assessment - Inspection and analysis to check whether a standard or set of guidelines is being followed, that records are accurate, or that efficiency and effectiveness targets are being met.

baseline - A snapshot that is used as a reference point. Many snapshots may be taken and recorded over time but only some will be used as baselines. For example: An ITSM baseline can be used as a starting point to measure the effect of a service improvement plan. A performance baseline can be used to measure changes in performance over the lifetime of an IT service. A configuration baseline can be used as part of a back-out plan to enable the IT infrastructure to be restored to a known configuration if a change or release fails. A baseline that is used to compare related data sets as part of a benchmarking exercise. For example, a recent snapshot of a process can be compared to a previous baseline of that process, or a current baseline can be compared to industry data or best practice. The process responsible for comparing a benchmark with related data sets such as a more recent snapshot, industry data or best practice. The term is also used to mean creating a series of benchmarks over time, and comparing the results to measure progress or improvement. This process is not described in detail within the core ITIL publications

best practice - Proven activities or processes that have been successfully used by multiple organizations. ITIL is an example of best practice.

business - An overall corporate entity or organization formed of a number of business units. In the context of ITSM, the term includes public sector and not-for-profit organizations, as well as companies. An IT service provider provides IT services to a customer within a business. The IT service provider may be part of the same business

[1] ITIL® Glossary of Terms English v.1.0

as its customer (internal service provider), or part of another business (external service provider).

business objective - The objective of a business process, or of the business as a whole. Business objectives support the business vision, provide guidance for the IT strategy, and are often supported by IT services.

business unit - A segment of the business that has its own plans, metrics, income and costs. Each business unit owns assets and uses these to create value for customers in the form of goods and services.

capability - The ability of an organization, person, process, application, IT service or other configuration item to carry out an activity. Capabilities are intangible assets of an organization. -

Capability Maturity Model Integration (CMMI) - A process improvement approach developed by the Software Engineering Institute (SEI) of Carnegie Mellon University, US. CMMI provides organizations with the essential elements of effective processes. It can be used to guide process improvement across a project, a division or an entire organization. CMMI helps integrate traditionally separate organizational functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for appraising current processes. See www.sei.cmu.edu/cmmi for more information.

Change - The addition, modification or removal of anything that could have an effect on IT services. The scope should include changes to all architectures, processes, tools, metrics and documentation, as well as changes to IT services and other configuration items.

Change Management - The process responsible for controlling the lifecycle of all changes, enabling beneficial changes to be made with minimum disruption to IT services.

Circuit Breaker - A software development design pattern used to detect failures and encapsulates the logic of preventing a failure from constantly recurring, during maintenance, temporary external system failure or unexpected system difficulties.

Continual Service Improvement (CSI) - A stage in the lifecycle of a service. Continual service improvement ensures that services are aligned with changing business needs by identifying and implementing improvements to IT services that support business processes. The performance of the IT service provider is continually measured and improvements are made to processes, IT services and IT infrastructure in order to increase efficiency, effectiveness and cost effectiveness. Continual service improvement includes the seven-step improvement process. Although this process is associated with continual service improvement, most processes have activities that take place across multiple stages of the service lifecycle.

Cost - The amount of money spent on a specific activity, IT service or business unit. Costs consist of real cost (money), notional cost (such as people's time) and depreciation.

Critical Success Factor (CSF) - Something that must happen if an IT service, process, plan, project or other activity is to succeed. Key performance indicators are used to measure the achievement of each critical success factor. For example, a critical success factor of *protect IT services when making changes* could be measured by key performance indicators such as *percentage reduction of unsuccessful changes*, *percentage reduction in changes causing incidents*, and so on.

effectiveness - A measure of whether the objectives of a process, service or activity have been achieved. An effective process or activity is one that achieves its agreed objectives.

Efficiency - A measure of whether the right amount of resource has been used to deliver a process, service or activity. An efficient process achieves its objectives with the minimum amount of time, money, people or other resources.

Failure - Loss of ability to operate to specification, or to deliver the required output. The term may be used when referring to IT services, processes, activities, configuration items etc. A failure often causes an incident.

first-line support - The first level in a hierarchy of support groups involved in the resolution of incidents. Each level contains more specialist skills, or has more time or other resources.

fit for purpose - The ability to meet an agreed level of utility. Fit for purpose is also used informally to describe a process, configuration item, IT service etc. that is capable of meeting its objectives or service levels. Being fit for purpose requires suitable design, implementation, control and maintenance.

fit for use - The ability to meet an agreed level of warranty. Being fit for use requires suitable design, implementation, control and maintenance.

follow the sun - A methodology for using service desks and support groups around the world to provide seamless 24/7 service. Calls, incidents, problems and service requests are passed between groups in different time zones.

Governance - Ensures that policies and strategy are actually implemented, and that required processes are correctly followed. Governance includes defining roles and responsibilities, measuring and reporting, and taking actions to resolve any issues identified.

Guideline - A document describing best practice, which recommends what should be done. Compliance with a guideline is not normally enforced.

incident - An unplanned interruption to an IT service or reduction in the quality of an IT service. Failure of a configuration item that has not yet affected service is also an incident – for example, failure of one disk from a mirror set.

incident management - The process responsible for managing the lifecycle of all incidents. Incident management ensures that normal service operation is restored as quickly as possible and the business impact is minimized.

International Organization for Standardization (ISO) - The International Organization for Standardization (ISO) is the world's largest developer of standards. ISO is a non-governmental organization that is a network of the national standards institutes of 156 countries.

ISO/IEC 20000 - An international standard for IT service management.

IT service - A service provided by an IT service provider. An IT service is made up of a combination of information technology, people and processes. A customer-facing IT service directly supports the business processes of one or more customers and its service level targets should be defined in a service level agreement. Other IT services, called supporting services, are not directly used by the business but are required by the service provider to deliver customer-facing services.

IT service management (ITSM) - The implementation and management of quality IT services that meet the needs of the business. IT service management is performed by IT service providers through an appropriate mix of people, process and information technology.

ITIL® - A set of best-practice publications for IT service management. Owned by the Cabinet Office, ITIL gives guidance on the provision of quality IT services and the processes, functions and other capabilities needed to support them. The ITIL framework is based on a service lifecycle and consists of five lifecycle stages (service strategy, service design, service transition, service operation and continual service improvement), each of which has its own supporting publication. There is also a set of complementary ITIL publications providing guidance specific to industry sectors, organization types, operating models and technology architectures.

key performance indicator (KPI) - A metric that is used to help manage an IT service, process, plan, project or other activity. Key performance indicators are used to measure the achievement of critical success factors. Many metrics may be measured, but only the most important of these are defined as key performance indicators and used to actively manage and report on the process, IT service or activity. They should be selected to ensure that efficiency, effectiveness and cost effectiveness are all managed.

knowledge base - A logical database containing data and information used by the service knowledge management system.

knowledge management - The process responsible for sharing perspectives, ideas, experience and information, and for ensuring that these are available in the right place and at the right time. The knowledge management process enables informed decisions, and improves efficiency by reducing the need to rediscover knowledge.

Maturity - A measure of the reliability, efficiency and effectiveness of a process, function, organization etc. The most mature processes and functions are formally aligned to business objectives and strategy, and are supported by a framework for continual improvement.

maturity level - A named level in a maturity model, such as the Carnegie Mellon Capability Maturity Model Integration.

metric - Something that is measured and reported to help manage a process, IT service or activity.

operational - The lowest of three levels of planning and delivery (strategic, tactical, operational). Operational activities include the day-to-day or short-term planning or delivery of a business process or IT service management process.

opportunity cost - A cost that is used in deciding between investment choices. Opportunity cost represents the revenue that would have been generated by using the resources in a different way. For example, the opportunity cost of purchasing a new server may include not carrying out a service improvement activity that the money could have been spent on. Opportunity cost analysis is used as part of a decision-making process, but opportunity cost is not treated as an actual cost in any financial statement.

performance - A measure of what is achieved or delivered by a system, person, team, process or IT service.

performance management - Activities to ensure that something achieves its expected outcomes in an efficient and consistent manner.

plan - A detailed proposal that describes the activities and resources needed to achieve an objective – for example, a plan to implement a new IT service or process. ISO/IEC 20000 requires a plan for the management of each IT service management process.

Priority - A category used to identify the relative importance of an incident, problem or change. Priority is based on impact and urgency, and is used to identify required times for actions to be taken. For example, the service level agreement may state that Priority 2 incidents must be resolved within 12 hours.

problem - A cause of one or more incidents. The cause is not usually known at the time a problem record is created, and the problem management process is responsible for further investigation.

problem management - The process responsible for managing the lifecycle of all problems. Problem management proactively prevents incidents from happening and minimizes the impact of incidents that cannot be prevented.

process - A structured set of activities designed to accomplish a specific objective. A process takes one or more defined inputs and turns them into defined outputs. It may include any of the roles, responsibilities, tools and management controls required to reliably deliver the outputs. A process may define policies, standards, guidelines, activities and work instructions if they are needed.

process manager -A role responsible for the operational management of a process. The process manager's responsibilities include planning and coordination of all activities required to carry out, monitor and report on the process. There may be several process managers for one process – for example, regional change managers or IT service continuity managers for each data center. The process manager role is often assigned to the person who carries out the process owner role, but the two roles may be separate in larger organizations.

process owner - The person who is held accountable for ensuring that a process is fit for purpose. The process owner's responsibilities include sponsorship, design, change management and continual improvement of the process and its metrics. This role can be assigned to the same person who carries out the process manager role, but the two roles may be separate in larger organizations.

project management office (PMO) - A function or group responsible for managing the lifecycle of projects.

RACI - A model used to help define roles and responsibilities. RACI stands for responsible, accountable, consulted and informed.

risk - A possible event that could cause harm or loss, or affect the ability to achieve objectives. A risk is measured by the probability of a threat, the vulnerability of the asset to that threat, and the impact it would have if it occurred. Risk can also be defined as uncertainty of outcome, and can be used in the context of measuring the probability of positive outcomes as well as negative outcomes.

risk assessment - The initial steps of risk management: analyzing the value of assets to the business, identifying threats to those assets, and evaluating how vulnerable each asset is to those threats. Risk assessment can be quantitative (based on numerical data) or qualitative.

risk management - The process responsible for identifying, assessing and controlling risks. Risk management is also sometimes used to refer to the second part of the overall process after risks have been identified and assessed, as in *risk assessment and management*.

role - A set of responsibilities, activities and authorities assigned to a person or team. A role is defined in a process or function. One person or team may have multiple roles – for example, the roles of configuration manager and change manager may be carried out by a single person. Role is also used to describe the purpose of something or what it is used for.

Sarbanes-Oxley (SOX) - US law that regulates financial practice and corporate governance.

second-line support - The second level in a hierarchy of support groups involved in the resolution of incidents and investigation of problems. Each level contains more specialist skills, or has more time or other resources.

service - A means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks. The term 'service' is sometimes used as a synonym for core service, IT service or service package.

service desk - The single point of contact between the service provider and the users. A typical service desk manages incidents and service requests, and also handles communication with the users.

service improvement plan (SIP) - A formal plan to implement improvements to a process or IT service.

service level - Measured and reported achievement against one or more service level targets. The term is sometimes used informally to mean service level target.

service level agreement (SLA) - An agreement between an IT service provider and a customer. A service level agreement describes the IT service, documents service level targets, and specifies the responsibilities of the IT service provider and the customer. A single agreement may cover multiple IT services or multiple customers.

service management - A set of specialized organizational capabilities for providing value to customers in the form of services.

SMART - An acronym for helping to remember that targets in service level agreements and project plans should be specific, measurable, achievable, relevant and time-bound.

stakeholder - A person who has an interest in an organization, project, IT service etc. Stakeholders may be interested in the activities, targets, resources or deliverables. Stakeholders may include customers, partners, employees, shareholders, owners etc.

standard - A mandatory requirement. Examples include ISO/IEC 20000 (an international standard), an internal security standard for Unix configuration, or a government standard for how financial records should be maintained. The term is also used to refer to a code of practice or specification published by a standards organization such as ISO or BSI.

support group - A group of people with technical skills. Support groups provide the technical support needed by all of the IT service management processes.

Utility - The functionality offered by a product or service to meet a particular need. Utility can be summarized as *what the service does*, and can be used to determine whether a service is able to meet its required outcomes, or is *fit for purpose*. The business value of an IT service is created by the combination of utility and warranty.

warranty - Assurance that a product or service will meet agreed requirements. This may be a formal agreement such as a service level agreement or contract, or it may be a marketing message or brand image. Warranty refers to the ability of a service to be available when needed, to provide the required capacity, and to provide the required reliability in terms of continuity and security. Warranty can be summarized as *how the service is delivered*, and can be used to determine whether a service is ‘fit for use’. The business value of an IT service is created by the combination of utility and warranty.

Appendix A.2. Literature Review Systematic Map

Table A.2 Literature Review Systematic Map

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Pollard, C., & Cater-Steel, A. (2009)	JA						x				x					2009
Marrone, M., & Kolbe, L. M. (2010)	JA						x									2010
Egeler, M. (2008)	JA						x									2008
Marrone, M. (2010)	JA			x			x									2010
Marrone, M., & Kolbe, L. M. (2011)	JA		x				x	x			x					2010
Gacenga, F., Cater-Steel, A., & Toleman, M. (2010)	JA						x		x		x				x	2010
Wan, S. H. C., & Chan, Y. H. (2008)	JA						x									2008
Cater-Steel, A. (2009)	JA						x				x					2009

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Marrone, M., Gacenga, F., Cater-Steel, A., & Kolbe, L. (2014)	JA					x										2014
Kanapathy, K., & Khan, K. I. (2012)	JA							x								2012
Tan, W.-G., Cater-Steel, A., & Toleman, M. (2009)	JA							x								2009
Iden, J., & Eikebrokk, T. R. (2014)	JA							x								2014
Lepmets, M., Cater-Steel, A., Gacenga, F., & Ras, E. (2012)	JA								x							2012
Lepmets, M., Mesquida, A. L., Cater-Steel, A., Mas, A., & Ras, E. (2014)	JA									x						2014
Shrestha, A., Cater-Steel, A., & Toleman, M. (2016)	JA									x						2016
Smith, H. A., McKeen, J. D., & Street, C. (2004)	JA													x		2004

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Iden, J., L. Langeland. (2010)	JA										x					2010
Kanapathy, K., & Khan, K. I. (2012)	JA										x					2012
McBride, N. (2009)	JA										x					2009
Tan, W. G., A. Cater-Steel, M. Toleman. (2009)	JA										x					2009
Wan, J., & Wan, D. (2011)	JA										x					2011
Suhonen, A., Heikkinen, S., Kurenniemi, M., & Jäntti, M. (2013)	JA							x				x				2010
Winniford, M., S. Conger, L. Erickson-Harris. (2009)	JA							x								2009
Hochstein, A., Tamm, G., & Brenner, W. (2005)	JA										x					2005
Cater-Steel, A., Tan, W. G., & Toleman, M. (2006)	JA										x					2006

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		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Kashanchi, R. & Toland, J. (2006)	JA		x													2006
Jäntti, M., Cater-Steel, A., & Shrestha, A. (2012)	JA											x				2012
Walker, A., & Lok, H. (1995)	JA									x						1995
Rahbar, N., Zeinolabedin, N., & Afiati, S. (2013)	JA		x													2013
Silvius, A. (2008)	JA		x													2008
Weill, P., & Ross, J. W.	JA		x													2004
Peterson, R. (2004)	JA		x													2004
De Haes, S., & Van Grembergen, W. (2004)	JA		x													2004
Luftman, J. (2000)	JA		x													2000
Luftman, J., Papp, R., & Brier, T. (1999)	JA		x													1999
Luftman, J., & Ben-Zvi, T. (2011)	JA		x													2011

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Paulk, M. C., Weber, C. V., Garcia, S. M., Chrissis, M. B. C., & Bush, M. (1993)	JA									x						1993
Mesquida, A., Mas, A., Amengual, E., & Calvo-Manzano, J. (2012)	JA									x						2012
Dehning, B., & Richardson, V. J. (2002)	JA														x	2002
Kohli, R., & Hoadley, E. (2006)	JA														x	2006
Tiong, C., Cater-Steel, A., & Tan, W.-G. (2009)	JA														x	2009
Callon, M. (1999)	JA				x											1999
Latour, B. (1999)	JA				x											1999
Wernerfelt, B. (1984)	JA			x												1984
Barney, J. (1991)	JA			x												1991
Conner, K. R. (1991)	JA			x												1991

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Wade, M., & Hulland, J. (2004)	JA			x												2004
Mills, J., Platts, K., & Bourne, M. (2003)	JA			x												2003
Grant, R. (1996)	JA			x												1996
Eisenhardt, K. M., & Martin, J. A. (2000)	JA			x												2000
Colurcio, M. (2009)	JA			x												2009
Saarenketo, S. e. a. (2009)	JA			x												2009
Tsoukas, H. (1996)	JA			x												1996
De Haes, S., Debreceny, R., & Van Grembergen, W.	JA	x														2013
De Haes, S., Van Grembergen, W., & Debreceny, R. S. (2013)	JA	x														2013

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		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Galup, S. D., Dattero, R., Quan, J. J., & Conger, S. (2009)	JA	x														2009
Masuku, S. (2014)	JA	x														2014
Kaplan, R., & Norton, D. (1992)	JA	x														1992
Kaplan, R., & Norton, D. (1996)	JA	x														1996
Ahmad, M. (2009)	JA	x														2009
Norreklit, H. (2000)	JA	x														2000
Van Grembergen, W. (2000)	CP	x														2000
Schulze, W. S. (1992)	CP			x												1992
Lei, K., & Rawles, P. T. (2003)	CP														x	2003
Racz, N., Panitz, J. C., Amberg, M., Weippl, E., &	CP													x		2010

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		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Barafort, B., & Rousseau, A. (2009)	CP									x						2009
Chen, H.-M. (2008)	CP		x													2008
Tapia, R. S. (2007)	CP		x													2007
Licker, P. (2007)	CP		x													2007
Webb, P., Pollard, C., & Ridley, G. (2006)	CP		x													2006
Hochstein, A., Tamm, G., & Brenner, W. (2005)	CP						x									2005
Cater-Steel, A., Toleman, M., & Tan, W.-G. (2006)	CP						x									2006
Disterer, G. (2012)	CP						x									2012
Salling Pedersen, A., & Bjørn-Andersen, N. (2011)	CP					x										2011
Mohammed, T. (2008)	CP										x					2008
Cater-Steel, A., & McBride, N. (2007)	CP				x						x					2007

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Gacenga, F., Cater-Steel, A., Tan, W., & Toleman, M. (2011)	CP								x	x						2011
Wulf, J., Winkler, T. J., & Brenner, W. (2015)	CP									x						2015
Göbel, H., Cronholm, S., & Seigerroth, U. (2013)	CP									x						2013
Conger, S., Winniford, M., & Erickson-Harris, L. (2008)	CP	x						x			x					2008
Coelho, A. M., & Rupino da Cunha, P. (2009)	CP							x								2009
Flores, J., Rusu, L., & Johanneson, P. (2010)	CP							x								2010
Zajac, A., & Soja, P. (2012)	CP							x								2012
de Espindola, R. S., Luciano, E. M., & Audy, J. L. N. (2009)	CP							x								2009
Duffy, K. P., & Denison, B. B. (2008)	CP		x													2008

		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Heikkinen, S., Suhonen, A., Kurenniemi, M., & Jäntti, M.	CP											x				2013
Jäntti, M., Rout, T., Wen, L., Heikkinen, S., & Cater-Steel, A. (2013)	CP	x										x	x			2013
Jäntti, M., & Niskala, J. (2014)	CP											x				2014
Lahtela, A., Jäntti, M. (2014)	CP											x				2014
Jäntti, M., Kurenniemi, M. (2013)	CP											x				2013
Fraser, P., Moultrie, J., & Gregory, M. (2002)	CP	x								x						2002
Pasquini, A., & Galiè, E. (2013)	CP	x														2013
Grant, R. (2002)	B			x												2002
Nonaka, I., & Takeuchi, H. (1995)	B			x												1995
Mettler, T. (2012)	B									x						2012

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		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Juran, J., & Godfrey, A. (1999)	B									x						1999
Tarantino, A. (2008)	B													x		2008
Moeller, R. R. (2011)	B													x		2011
Sadgrove, K. (2016)	B													x		2016
Steinberg, R. A. (2013)	B													x		2013
Callon, M., & Latour, B. (1981)	B				x											1981
Law, J. (2009)	B				x											2009
Law, J., & Hassard, J. (1999)	B				x											1999
Shrestha, A. (2015)	T									x						2015
Mainville, D. (2014)	IR									x						2014
Coopers, P. (2004)	IR													x		2004
ISACA. (2012)	IR	x														2012
Glenfis-AG. (2014)	IR	x														2014
Cabinet Office (2011)	IR	x														2011
Forbes. (2017)	IR	x														2017

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		Underpinning Theories				ITSM Process Capability			ITSM Process Performance					Business Performance		
Researcher/Author	Source	ITSM Best Practice Frameworks	IT Governance & Business-IT Alignment	Resource-Based View	Actor-Network Theory	ITSM Adoption	ITSM Outcomes and Benefits	ITSM Implementation	ITSM Performance Measurement	ITSM Capability Assessment	CSFs/KPIs	KISMET	ITSM Process Improvement	Business Metrics	ITSM Financial Measurement	Year Published
Count		17	15	14	6	2	11	11	3	14	14	7	1	7	5	

Legend					
JA	Journal Article	IR	Industry Resource	T	Thesis
CP	Conference Paper	B	Book		

Appendix B. Documentation related to research ethics approval

Appendix B.1. Ethics Approval Letter

OFFICE OF RESEARCH
Human Research Ethics Committee
PHONE +61 7 4631 2690| FAX +61 7 4631 5555
EMAIL ethics@usq.edu.au

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

23 October 2015

Mr Suren Behari
1336 Blackfield Dr
Santa Clara CA 95051
USA

Dear Suren

The USQ Human Research Ethics Committee has recently reviewed your responses to the conditions placed upon the ethical approval for the project outlined below. Your proposal is now deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethical approval has been granted.

Approval No.	**H15REA220**
Project Title	Exploring the impact of Information Technology Service Management (ITSM) maturity on business performance
Approval date	23 October 2015
Expiry date	23 October 2018
HREC Decision	**Approved**

The standard conditions of this approval are:

(a) conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
(b) advise (email: ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
(c) make submission for approval of amendments to the approved project before implementing such changes
(d) provide a 'progress report' for every year of approval
(e) provide a 'final report' when the project is complete
(f) advise in writing if the project has been discontinued.

For (c) to (e) forms are available on the USQ ethics website:

University of Southern Queensland
Toowoomba I Springfield I Fraser Coast

usq.edu.au
CRICOS QLD 00244B NSW 02225M
TEQSA PRV 12081

http://www.usq.edu.au/research/ethicsbio/human

Please note that failure to comply with the conditions of approval and the *National Statement (2007)* may result in withdrawal of approval for the project.

You may now commence your project. I wish you all the best for the conduct of the project.

Annmaree Jackson
Ethics Coordinator

Copies to: suren.behari@gmail.com

Appendix B.2. Company X Approval Letter

[redacted]

October 8, 2015

Human Research Ethics Committee
University of Southern Queensland
West Street
Toowoomba Qld 4350
Australia

RE: Approval for Research Project Participation

To Whom It May Concern,

[redacted] hereby grants the researcher Mr. Suren Behari approval to recruit Integral employees as survey, interview and focus group participants for his research project "Exploring the Impact of ITSM Maturity on Business Performance".

It is understood that participation in the research may be a time imposition for employees. This letter also serves as an endorsement that participants will budget time to participate in the research.

Sincerely,

[redacted]

Vice President, Trading Operations

Appendix B.3. Interview/Meeting Participant Information Sheet

University of Southern Queensland

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Participant Information for USQ Research Project Interview

Project Details

Title of Project:	Exploring the Impact of Information Technology Service Management (ITSM) Maturity on Business Performance
Human Research Ethics Approval Number:	**H15REA220**

Research Team Contact Details

Principal Investigator Details
Mr Suren Behari
Email: suren.behari@gmail.com
Telephone: +1 415 609 8800
Mobile: +1 415 609 8800

Supervisor Details
Professor Aileen Cater-Steel
Email: aileen.cater-steel@usq.edu.au
Telephone: +61 7 4631 1276
Mobile:

Description

This project is being undertaken as part of a Doctor of Business Administration (DBAR) project.

The purpose of this project is to assess the capability of Incident Management, Problem Management and Change Management at Integral Development Corporation.

The research team requests your assistance because you a directly involved with these ITSM processes at Integral and your domain knowledge and views will provide invaluable insights to this research.

Participation

Your participation will involve participation in interviews at three points in time that will take approximately 1 hour of your time each time.

The interview will take place at a time and venue that is convenient to you or the interview will be conducted by video conference at a date and time that is convenient to you.

Questions will include:
Incident Management:
1. Are incidents identified, recorded and classified?
2. Are incidents prioritized and analyzed?

Problem Management:
1. Are problems identified, recorded and classified?
2. Are problems prioritized and analyzed?

Change Management:
1. Are changes to the services, service components, service requirements, catalogue of services, service level agreements and other documented agreements recorded and classified?
2. Is a schedule of change established, containing details of the approved changes and their proposed deployment dates?

The interview will be recorded.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You may also request that any data collected about you be destroyed. If you do wish to withdraw from this project or withdraw data collected about you, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland or Integral Development Corporation.

Expected Benefits

It is expected that this project will directly benefit you and will help you by providing an assessment of Integral's critical IT service processes in terms of international standards-based ISO/IEC 15504 capability levels. The assessment tool will use an international standard measurement framework to conduct effective, objective and repeatable assessments with relatively minimal time and resource commitments. The recommendations provided by the assessment tool can also be followed by you to enhance your process efficiency. A further benefit of this project is to explore whether improving process capabilities is associated with financial profitability for Integral.

Risks

There are no anticipated risks beyond normal day-to-day living associated with your participation in this project.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law.

- After the interview you will receive a copy of the transcribed interview and you will have the opportunity to verify your comments and responses prior to final inclusion.
- Audio recording will be stored on secure data storage at USQ.
- The recording will not be used for any other purpose.
- The research team (investigator and his supervisors) will have access to the recording. The researcher will be responsible for transcribing the audio recording.
- If you wish to participate in the study without voice recording, please advise the investigator. In this case the interview may take longer as the researcher will need more time to take notes during the interview.

Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

Appendix B.4. Interview/Meeting Consent Form

University of Southern Queensland

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Consent Form for USQ Research Project Interview

Project Details

Title of Project:	Exploring the Impact of Information Technology Service Management (ITSM) Maturity on Business Performance
Human Research Ethics Approval Number:	**H15REA220**

Research Team Contact Details

Principal Investigator Details
Mr Suren Behari
Email: suren.behari@gmail.com
Telephone: +1 415 609 8800
Mobile: +1 415 609 8800

Supervisor Details
Professor Aileen Cater-Steel
Email: aileen.cater-steel@usq.edu.au
Telephone: +61 7 4631 1276
Mobile:

Statement of Consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that I will be provided with a copy of the transcript of the interview for my perusal and endorsement prior to inclusion of this data in the project.
- Understand that you are free to withdraw at any time, without comment or penalty.
- Understand that you can contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au if you do have any concern or complaint about the ethical conduct of this project.
- Are over 18 years of age.
- Agree to participate in the project.

Participant Name	
Participant Signature	
Date	

Please return this sheet to a Research Team member prior to undertaking the interview.

Appendix B.5. Focus Group Participant Information Sheet

University of Southern Queensland

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Participant Information for USQ Research Project Focus Group

Project Details

Title of Project: Exploring the Impact of Information Technology Service Management (ITSM) Maturity on Business Performance

Human Research Ethics Approval Number: **H15REA220**

Research Team Contact Details

Principal Investigator Details
Mr Suren Behari
Email: suren.behari@gmail.com
Telephone: +1 415 609 8800
Mobile: +1 415 609 8800

Supervisor Details
Professor Aileen Cater-Steel
Email: aileen.cater-steel@usq.edu.au
Telephone: +61 7 4631 1276
Mobile:

Description

This project is being undertaken as part of a Doctor of Business Administration (DBAR) project.

The purpose of this project is to assess the capability of Incident Management, Problem Management and Change Management at Integral Development Corporation.

The research team requests your assistance because you a directly involved with these ITSM processes at Integral and your domain knowledge and views will provide invaluable insights to this research.

Participation

Your participation will involve contributing your thoughts and ideas in a group discussion (focus group) that will take approximately 1 hour of your time.

The focus group will take place at a time and venue that is convenient to you or the interview will be conducted by video conference at a date and time that is convenient to you.

Questions will include:

1. Can you tell me about your experience of the online assessment surveys?
2. What challenges did you encounter filling in the online assessment surveys?

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You will be unable to withdraw data collected about yourself after you have participated in the focus group. If you wish to withdraw from the project, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland or Integral Development Corporation.

Expected Benefits

It is expected that this project will directly benefit you and will help you by providing an assessment of Integral's critical IT service processes in terms of international standards-based ISO/IEC 15504 capability levels. The assessment tool will use an international standard measurement framework to conduct effective, objective and repeatable assessments with relatively minimal time and resource commitments. The recommendations provided by the assessment tool can also be followed by you to enhance your process efficiency. A further benefit of this project is to explore whether improving process capabilities is associated with financial profitability for Integral.

Risks

There are no anticipated risks beyond normal day-to-day living associated with your participation in this project.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law.

Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your focus group.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

Appendix B.6. Focus Group Consent Form

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

University of Southern Queensland

Consent Form for USQ Research Project
Focus Group

Project Details

Title of Project:	Exploring the Impact of Information Technology Service Management (ITSM) Maturity on Business Performance
Human Research Ethics Approval Number:	**H15REA220**

Research Team Contact Details

Principal Investigator Details
Mr Suren Behari
Email: suren.behari@gmail.com
Telephone: +1 415 609 8800
Mobile: +1 415 609 8800

Supervisor Details
Professor Aileen Cater-Steel
Email: aileen.cater-steel@usq.edu.au
Telephone: +61 7 4631 1276
Mobile:

Statement of Consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that you are free to withdraw at any time, without comment or penalty.
- Understand that you can contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au if you do have any concern or complaint about the ethical conduct of this project.
- Are over 18 years of age.
- Agree to participate in the project.

Participant Name	
Participant Signature	
Date	

Please return this sheet to a Research Team member prior to undertaking the focus group.

Appendix B.7. Steinberg's Consent to use his ITSM Metrics Modelling Tool

RE: Your Book on Measuring ITSM - Message (HTML)

FILE MESSAGE

Mon 11/23/2015 7:09 AM

Randy Steinberg <randyasteinberg@gmail.com>

RE: Your Book on Measuring ITSM

To 'Suren Behari'

You replied to this message on 10/10/2017 5:30 PM.

Suren – thanks for the kind words. Some thoughts:

I've enclosed some items that I hope will help. Some of these are a few years older, but the I believe the general efficiencies cited in these still hold from a percentage value.

The key problem in the industry (from my view) is that most It organizations still have not embraced the business side (specifically Service Portfolio and IT Financial Management) aspects of ITSM. The key aspects of this are:

1) CIO should be able to articulate what services they provide
2) CIO should be able to articulate the costs (by service) to deliver these
3) The CIO should be able to articulate the demand for those services – how they are being consumed and will be consumed in the future

Without the above, the IT organization is only reacting to things and not in control. In the clients where we have been able to provide transparency and costs information by service, the savings have been substantial, typically in the millions of dollars (U.S). There is a lot of waste in the typical IT organization. The White Paper – Presenting The Executive Business Case For ITSM attachment describes this more thoroughly. The results where this has been done have been significant.

More tactical measures might include:

1) Measuring unplanned labor (time IT spends on incidents and rework) where you can translate labor hours into labor costs
2) Measuring unplanned capital and service costs to deal with unplanned purchases of hardware, software and support services from poor capacity management
3) Fines and penalties paid by the business organization related to IT outages
4) Business loss in revenue related to IT outages (some businesses actually state this "….we lose x$ in sales for each hour we are out…"

Hope some of this helps a bit. Certainly feel free to stay in touch if you want to discuss further or have any questions. You are certainly free to utilize the model in any way that helps you. This is a very key area that is poorly addressed by IT worldwide.

Thanks!

From: Suren Behari [mailto:suren.behari@gmail.com]
Sent: Friday, November 20, 2015 10:36 PM
To: RandyASteinberg@gmail.com
Subject: Your Book on Measuring ITSM

Hi Randy,

I just purchased your book **"Measuring ITSM…"** and I am very impressed with your work on the model presented in the Excel workbook.

I am a doctoral student with the University of Southern Queensland Australia, studying part time from Santa Clara California.

My action research project is entitled **"Exploring the Impact of ITSM Maturity on Business Performance".**

What I am really seeking are financial measures I can tie back to both process capability and process performance for Incident, Problem and Change Management.

I would like to use your model, creating software around it to determine if ITSM maturity is associated with financial profitability for my case study.

Is there any chance we can have a conversation around this?

Thanks,
Suren

RE: Your Book on Measuring ITSM - Message (HTML)

FILE MESSAGE

Fri 10/13/2017 12:14 PM

Randy Steinberg <randyasteinberg@gmail.com>

RE: Your Book on Measuring ITSM

To 'Suren Behari'

Apologize for responding so late. Been a busy week.

You have my permission to adapt the ITSM Metrics Modeling Tool for your case study. Good luck!

From: Suren Behari [mailto:suren.behari@gmail.com]
Sent: Tuesday, October 10, 2017 7:31 PM
To: 'Randy Steinberg' <randyasteinberg@gmail.com>
Subject: RE: Your Book on Measuring ITSM

Hi Randy,

I am pretty close to finalizing my thesis and submitting.

To cover the ethics requirements of the research project, I would like your permission to use your ITSM Metrics Modelling tool, adapt it so that it is a fit-for-purpose tool for my case study, and of course use you as a reference.

Thanks,
Suren

Appendix C. ARC1 - Documentation related to Process Capability Assessment

Appendix C.1. Process assessment survey invitation email

Mon 11/16/2015 6:51 PM

Suren Behari

ITSM Process Improvement at [redacted]

To Suren Behari

Cc [redacted]

Bcc [redacted]

You replied to this message on 10/11/2016 10:52 PM.

Hi guys,

As many of you know, I am a doctoral student with the University of Southern Queensland Australia, undertaking an action research project entitled "**Exploring the Impact of Information Technology Service Management (ITSM) Maturity on Business Performance**".

The purpose of this project is to assess the capability and performance of processes for Incident Management, Problem Management and Change Management at [redacted].

I am requesting your assistance because you are directly involved with these ITSM processes at Integral and your domain knowledge and views will provide invaluable insights to this research.

Your participation may involve the completion of online surveys, interviews and/or focus group discussions at 3 or 6 points in time over the next 3 years. The questions are based on the international standard of ITSM: ISO/IEC 20000 and the international standard of process assessment: ISO/IEC 15504. This survey is **NOT** an assessment of your individual performance but a general process assessment in a research setting.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland or [redacted].

It is expected that this project will directly benefit you and will help you by providing an assessment of Integral's critical IT service processes in terms of international standards-based ISO/IEC 15504 capability levels. In collaboration with an industry partner, Assessment Portal Pty Ltd, we get to use an assessment tool (for free) that uses an international standard measurement framework to conduct effective, objective and repeatable assessments with relatively minimal time and resource commitments. The recommendations provided by the assessment tool can also be followed by us to enhance our process efficiency. A further benefit of this project is to explore whether improving process capabilities is associated with financial profitability for [redacted].

All comments and responses will be treated confidentially unless required by law. The names of individual persons are not required in any of the responses. Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Expect to receive an email from donotreply@myassessmentportal.com very shortly. Please **DO NOT** delete this email. It contains valuable information on the survey and should be used as a reference when taking the survey. Please try to complete the survey(s) by the completion date. The survey will only require between 13 and 35 minutes of your time to complete, depending on the role you play in the process. Clicking on the 'Submit' button at the conclusion of the online survey is accepted as an indication of your consent to participate in this project.

Thanks for your participation in supporting the research and [redacted].

Cheers,
Suren

Appendix C.2. Follow-up email

Thu 11/19/2015 8:43 PM

Suren Behari

RE: ITSM Process Improvement at [redacted]

To

Bcc [redacted]

Deconstructing the academic language used in the email below in my everyday Suren-like lingo:

- I am conducting a Doctoral Research Project
- The surveys will help us obtain a baseline process capability assessment for Incident, Problem & Change Management at [redacted]
- Your responses are anonymous – no personal information is collected
- The email from donotreply@myassessmentportal.com is legit
- You are encouraged to fill out comments, as this will form the foundation for the interviews and focus groups when we start planning action
- You can start, pause and take off from where you left off at any time
- The due date is 30 November 2015 UTC +10:00

Your help is much appreciated.

Thanks,
Suren

Appendix C.3. Email to extend survey due date

Mon 11/30/2015 10:23 AM

Suren Behari

RE: ITSM Process Improvement at [redacted]

To

Bc [redacted]

Follow up. Completed on Friday, December 4, 2015.

Thanks to all who feverishly completed the surveys by the due date (30 November 2015).

However, only about 50% of participants completed in 2 weeks and as explained in my previous email, I need all invited participants to complete the surveys.

So, due to the overwhelming enthusiasm to participate and contribute to the study and Integral, I have extended the due date by a week - to this Friday, 4 December 2015.

This is not really asking for much. I completed surveys for all 3 processes in under 30 minutes. Most of you have only one survey to complete.

Please see what you can do to make this happen.

Thanks,
Suren

Appendix C.4. Focus Group Invitation Email

Mon 1/4/2016 7:14 PM

Suren Behari

ITSM Process Improvement Focus Group

To [redacted]

Cc Suren Behari

Message | Information Sheet Focus Group.docx (48 KB) | Consent Form Focus Group.docx (45 KB)

Hi guys,

Now that you have fully recovered from me nagging you about taking the surveys, it's time to get together as a group to engage in a brief post-mortem analysis of the surveys.

You have been purposefully selected for this focus group discussion to

- collect data in order to evaluate the experience of using the Software Mediated Process Assessment (SMPA) tool at [redacted]
- discuss the summary of the assessment survey results
- evaluate the reliability of the outcome
- address some of the comments entered in the surveys.

This meeting will be time boxed to no more than 1 hour, so please find the time to participate.

Please find attached the Focus Group Information Sheet providing more detail about Focus Group and a Consent Form that needs to be signed by you prior to your participation.

I would like to meet for an hour this Wednesday (6 January 2016), so please let me know of your availability before I set up the meeting request.

Thanks,
Suren

Appendix C.5. Email communicating Process Capability Results

Tue 10/11/2016 10:53 PM

Suren Behari

Update: ITSM Process Improvement at [redacted]

To Suren Behari

Cc [redacted]

Bcc [redacted]

Hi,

Yes, it is me again, and it's almost that time of year again.

First off, thank you to all who participated in the 2015 ITSM surveys.

In an effort to better communicate this initiative, we've put together a site (https://sites.google.com/a/[redacted].com/itsm/) that provides all things ITSM related at [redacted]. Please note that this is work-in-progress and that the data may not be 100% accurate at this time – but the information gives you a general idea of the status. The information covers the outcome of the 2015 surveys, the process improvement plans and the results.

Please read the information as time permits. This will help formulate your responses to the upcoming survey for 2016.

After about a year of active participation in the processes and the intense data collection and analysis, it is my belief that we have fully achieved capability level 1 and largely achieved level 2 for Incident and Problem Management Processes, i.e. *we are certain that the activity is usually performed* for the process attributes at level 1 and *we are certain that the activity is performed in the majority of cases* for level 2 process attributes.

Capability Level	Answer options	Selecting this options means
1	Yes, always	You are certain that the activity is usually performed.
2	Yes, most of the time	You are certain that the activity is performed in the majority of cases.
3	Yes, but only sometimes	You know that the activity is performed but not frequently.
	No, never	You are certain that the activity is not or rarely performed.
	Don't know or unable to comment	You do not have enough information to answer the question.
	Don't understand the question	You do not think the question is clear or relevant in your context.

So please read through what we have achieved thus far and you be the judge.

I have also included a copy of the survey questions (with examples) to familiarize yourself with what's being asked.

If you have any questions, please feel free to contact me.

Thanks for your support.

Suren

Appendix C.6. Incident Management SMPA Process capability assessment report with Action Plan

Table C.6.1 below presents all knowledge items relating to how well the incident management process has achieved its purpose and expected outcomes. These recommendations and the level of achievement determined by survey responses provide specific guidelines to optimally perform Incident Management process activities (also called **base practices**).

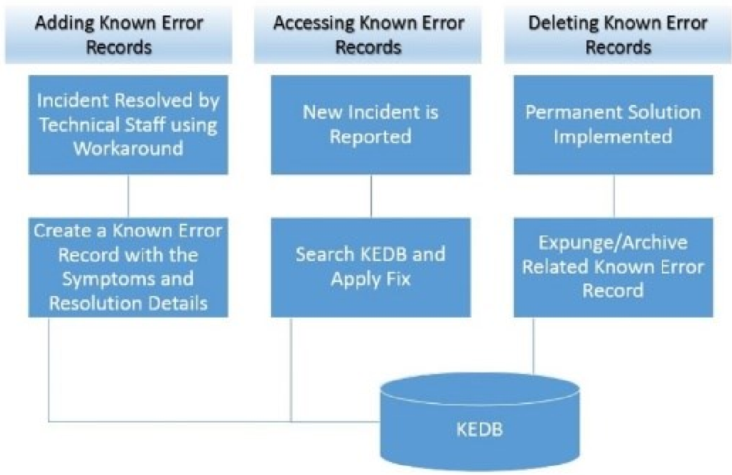
The recommendation items for process improvement guidelines presented in Table C.6.1 are defined to specific activities of the Incident Management process. If any of the level of achievements in Table C.6.1 is not F; that is, there is no certainty these process activities are usually performed; those activities must be reviewed and performed according to the recommendations provided to fully achieve Capability Level 1.

Table C.6.1 Incident Management Process Performance – Base Practices (Level 1)

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 1: How well the implemented Incident Management process achieves its purpose and expected outcomes.				
RES1.1	High	L	All incidents must be recorded, including priority and date/time of the incident. This applies to incidents received via the service desk as well as those that are detected automatically via an event warning system. Incidents are typically recorded or logged by Business Support. Most of the service disruptions are characterized by one or several incidents. Incidents can also be recorded directly by users either via the service desk or via other tools such as self-service.	Review incident logging workflow and communicate the policy to the field.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES1.1	High	L	An appropriate coding technique can be used to classify incidents according to their type. This is important to analyze incident types and frequencies at a later date. An example of an incident classification scheme can be: Hardware > Server > Email > Exchange Server configuration.	Communicate that classification is being recorded in Zendesk when identified.
RES1.1	High	L	Appropriate priority status must be assigned to all incidents so that major incidents are distinguished from other incidents. This is important so that support staff and tools can handle major incidents following a major incident procedure where applicable.	Train Business Support on how to prioritize incidents. Develop a matrix of criteria for each priority.

<table>
<tr><th>Indicator</th><th>Score Reliability</th><th>Score Rating</th><th>Observation & Recommendation</th><th>Action Plan</th></tr>
<tr><td>RES1.2</td><td>High</td><td>L</td><td>The impact and urgency of the incident must be considered to prioritize and analyze the incidents. The impact of an incident is indicated by the number of users affected by an incident. The urgency of an incident is indicated by the priority of business requirements to resolve the incident.</td><td>
<table>
<tr><th colspan="3">Incident Priority</th><th colspan="3">Severity</th></tr>
<tr><td colspan="3"></td><td>3 - Low
Issue prevents the user from performing a portion of their duties.</td><td>2 - Medium
Issue prevents the user from performing critical time sensitive functions</td><td>1 - High
Service or major portion of a service is unavailable</td></tr>
<tr><td rowspan="3">Impact</td><td>3 - Low</td><td>One or two personnel
Degraded Service Levels but still processing within SLA constraints</td><td>3 - Low</td><td>3 - Low</td><td>2 - Medium</td></tr>
<tr><td>2 - Medium</td><td>Multiple personnel in one physical location
Degraded Service Levels but not processing within SLA constraints or able to perform only minimum level of service
It appears cause of incident falls across multiple functional areas</td><td>2 - Medium</td><td>2 - Medium</td><td>1 - High</td></tr>
<tr><td>1 - High</td><td>All users of a specific service
Personnel from multiple agencies are affected
Public facing service is unavailable
Any item listed in the Crisis Response tables</td><td>1 - High</td><td>1 - High</td><td>1 - High</td></tr>
</table>
</td></tr>
<tr><td>RES1.3</td><td>High</td><td>L</td><td>Resolution and recovery efforts of an incident must be monitored and verified so that the affected users are satisfied with the solution. When the resolution is complete, the incident can be formally closed after following any closing procedures your organization may have.</td><td>Review incident resolution closure workflow and communicate policy.</td></tr>
</table>

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES1.4	Moderate	L	The service desk examines diagnostic scripts and known error database to resolve the incident in the first instance. If this is not possible, the incident is escalated in one of two ways: (a) functional escalation - to second-tier and/or third-tier support team based on technical expertise; and (b) hierarchical escalation - to relevant supervisors and managers based on management hierarchy so that adequate resources can be allocated or suppliers can be called upon to handle the incident.	Collaborate with DevOps to tool up for improved diagnostics. Investigate ways of creating and maintaining a knowledge base. 
RES1.5	High	L	The status and progress of incidents should be readily available to be communicated to interested parties. This increases the visibility and communication of incidents to business and IT support staff.	Automate Status updates to relevant parties.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP1.1.1	High	L	Incident management process manages every event that disrupts or might potentially disrupt a service so that proper resolution can be found to restore service to agreed levels.	Integration with DevOps.

Table C.6.2 below presents relevant knowledge items relating to all **generic practices** of the incident management process, i.e. from capability level 2 (PA2.1) to capability level 3 (PA3.2). These recommendations are extracted from the knowledge base only when any process area demonstrates significant risks based on survey responses, i.e. when the final score of any question is either P or N.

The recommendation items for process improvement guidelines presented in Table C.6.2 are defined at a broader level. Discussions with key stakeholders of the problem management process are very important to consider these recommendations; contextualize them to your organization and process environment, and finally, produce actionable items to address the risks in the process areas as highlighted in the table. This will ensure the progressive achievement of process capability scores above Capability Level 1.

Table C.6.2 Incident Management - Generic Practices (Levels 2 to 3)

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 2.1: How well the performance of Incident Management process is managed. It is important to apply basic process management techniques to provide reasonable assurance that incident management performance objectives are met.				

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.1.1	Poor	P	The scope of the Incident Management KPIs should be defined, and all stakeholders in the process should be informed of the scope. For instance, some processes (e.g., management level processes) may not require planning for each instance but may be managed under common planned arrangements.	Define Key Performance Indicators and communicate the scope to all stakeholders.
GP2.1.1	Poor	P	The assumptions and constraints should be considered while identifying Incident Management KPIs so that the resultant KPIs are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).	Ensure that the KPIs defined above are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).
GP2.1.2	Poor	P	The approach to performing Incident Management activities should be defined and aligned with a schedule to track and monitor whether the Incident Management process can fulfill its identified objectives.	Create tracking dashboards in Zendesk and make it available to all stakeholders.
Level 3.1: How well a standard Incident Management process is maintained to support process activities? It is important to establish a standard process, use it as a basis for the performance of the process activities and finally collect the performance data of the process activities to better understand and improve the standard process.				

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP3.1.2	Poor	P	The standard Incident Management process workflow should address interfaces with other processes typically using a process model diagram or schema. A process workflow may interface with other service management processes; other business processes (HR, security) or even processes from external service providers. For example, consider the interfaces between Service Level Management, Change Management, Release Management and Configuration Management during an update of service provision to a customer. Such visible interfaces should be defined in the process workflow and maintain integrity with the related processes. Note that the sequence and interaction of processes do not necessarily imply sequential activities; it may mean concurrent activities, feedback cycle or another form of interaction as well.	Revisit process workflow to include other interfaces and communicate workflow to all stakeholders.
GP3.1.5	Poor	P	There should be a mechanism to monitor actual process activities with the standard Incident Management process so that the data about real process activities provide a basis for accumulating a better understanding the behavior of the standard process.	Ensure that the KPIs defined above are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).
Level 3.2: How well the standard Incident Management process is implemented as process activities to achieve its outcomes. It is important to effectively implement process activities tailored to the standard process using resources available in the organization.				

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP3.2.3	Poor	P	The current competencies of Incident Management staff should be ascertained to ensure whether they are adequate to perform Incident Management activities or not. If they are inadequate, hiring competent staff and training existing staff properly should be considered.	Consider training.
GP3.2.6	Poor	P	The analysis of appropriate data regarding implementation of the Incident Management process should be conducted to provide a basis for understanding the behavior of the process and its compliance with the standard Incident Management process. This, in turn, contributes to the ongoing improvement of the implemented process and the standard Incident Management process upon which the implemented process is based.	Ensure that the KPIs defined above are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).

Comments

Comments from Survey Participants provide a rich source of qualitative information about process capabilities, interpretation of survey questions and responses; discussions regarding process strengths, weaknesses, opportunities and threats; contextual information about organization related processes, people issues, technology factors, constraints, etc.

These components provide useful information to help in process assessments in two ways:

(a) Feedback for further improvement of questions in the software tool;

(b) Information to discuss current process issues and improvements opportunities.

Question	Selected Option	Comment	Action Plan
Do you know if process inputs and outputs are regularly reviewed? For Incident Management, inputs could be: (a) customer feedback; and (b) events triggered from event management and outputs could be: (a) incident management records; and (b) escalation of problem records for incidents whose underlying cause has not been identified.	P	Depends on the urgency or how important the customer is.	Develop a review plan.
Do you know if required experience, knowledge and skills are clearly defined to perform process activities? For Incident Management, minimum qualifications, number of years of experience and skill set could be defined in a job description.	L	Number of years of experience may not correlate with the skill set each analyst currently has.	Consider training.
Do you know if process outcomes are easily accessible? For Incident Management, this means that process outcomes such as "incident and resolution history" are available for its interfaces such as "service level management process".	Do Not Know	Maybe recorded in Jira or somewhere, but not everyone has access to review. We only depend on internal communication at the moment.	Knowledgebase.

Question	Selected Option	Comment	Action Plan
Do you know if the standard process provides information to implement multiple requirements? For Incident Management, the standard process could relate to several process requirements such as “incident identification”, “incident logging”, “incident categorization” and “incident prioritization” requirements.	Do Not Know	If this process is documented, it's not disseminated to all team members.	Document process and disseminate to all stakeholders.
Do you know if process activities in your organization follow the standard process? For Incident Management, process activities should conform to the requirements of the standard process, possibly based on IT frameworks such as ITIL, ISO/IEC 20000 or COBIT.	Do Not Know	This is possible, but I doubt it.	Need to document and distribute the standard.
Do you know if there is required information is available in your organization to understand the process activities? For Incident Management, information could be available in corporate social networks, knowledge management systems, help files or through support staff to understand the process activities.	N	The overall process is “understood.” I don't think we have proper documentation (at least that's been shared to all involved) detailing the process to the degree that's being asked in this survey, no.	Need to document and distribute the standard.
Do you know if incidents are classified with an appropriate priority?	L	Sometimes identifying the root cause, which is part of the classification, is difficult even though the required corrective actions may be obvious.	Training.

Question	Selected Option	Comment	Action Plan
Do you know if incidents are managed until they are resolved and closed?	P	If incidents are moved to an engineering queue, the PO does not follow up consistently on these	Develop a communication plan.
Do you know if the status and progress of incidents are communicated to interested parties as needed?	L	It’s partly built into the ticketing system; requestors can see activity on the issue, but it is up to agents to summarize the activity in a concise form for requestors for any state other than “open, delayed, or closed”.	Automate communication.

Appendix C.7. Problem Management SMPA Process capability assessment report with Action Plan

Recommendations and Plan of Action

Table C.7.1 below presents all knowledge items relating to how well the problem management process has achieved its purpose and expected outcomes. These recommendations and the level of achievement determined by survey responses provide specific guidelines to optimally perform Problem Management process activities (also called **base practices**).

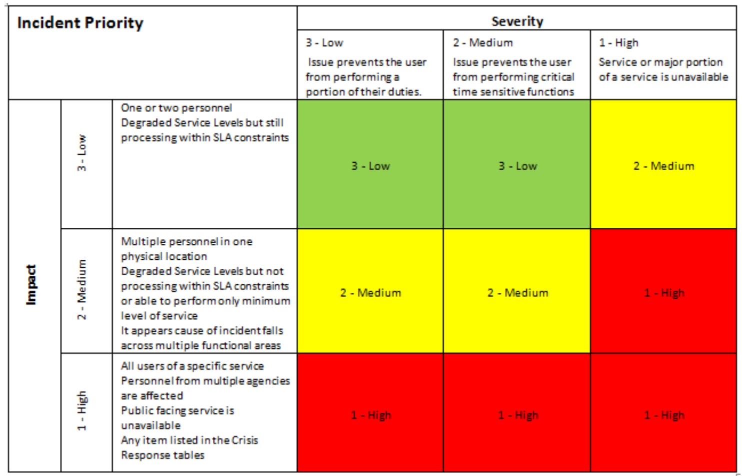
Score rating provides an overall score (*Fully*, *Largely*, *Partially* & *Not*) for how well the recommended action is performed based on the responses to the question related to each standard indicator. Score reliability defines how reliable the score rating is (*High*, *Moderate*, *Poor*) based on the degree of variation in the responses.

The recommendation items for process improvement guidelines presented in Table C.7.1 are defined to specific activities of the Problem Management process. If any of the level of achievements in Table C.7.1 is not F; that is, there is no certainty these process activities are usually performed; those activities must be reviewed and performed according to the recommendations provided to fully achieve Capability Level 1.

Table C.7.1 Problem Management Process Performance – Base Practices (Level 1)

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 1: How well the implemented Problem Management process achieves its purpose and expected outcomes.				
RES3.1	Moderate	L	Problems should be comprehensively identified from different sources. Consider the following scenarios and ensure problems are properly identified in these cases, among others: • The service desk may identify an unknown cause of one or more incidents and registers a problem. • The technical support group may identify an underlying problem while analyzing an incident. • An event or alert tool in the ITSM software may automatically trace an error that registers problems. • A supplier may report a problem that they identified. • Proactive problem management activities may identify problems during analysis of incidents.	Problem identification should include: 1) detection of an unknown root cause of one or more incidents; 2) the analysis of one or more incidents revealing an underlying problem; 3) notification from a supplier or an internal group of a problem with a component of the service.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.1	Moderate	L	Identified problems should be properly recorded. In most cases, it means an entry in the ITSM software tool. This ensures that a comprehensive historic problem report could be made available for control and escalation if required.	The problem records should include relevant details of the problem, including the date and time, and a cross-reference to the incident(s) that initiated the problem record.
RES3.1	Moderate	L	Problems should be accurately classified (for example problem areas could be hardware, network, and software). This helps in analyzing the cause of and solution to the problem quickly.	Problem classification and prioritization should ensure that: 1) each problem is categorized to help determine its nature and to provide meaningful information, making use of the same classification criteria that are used in the incident and service request management process; 2) each problem is given a priority for resolution according to its urgency and the impact of related incidents; 3) time and resources for investigating the problem and identifying the best options for resolution are allocated according to the priority of the problem; 4) the resolution of the problem is allocated time and resources according to the priority of the problem and the benefit of making the change in order to fulfill service requirements.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.2	Moderate	L	Problems should be assigned a priority because not all problems are equally important to fix as soon as they occur. For example, the status of a problem could be emergency, urgent, important, and not urgent. While prioritizing a problem, the frequency and impact of the related incidents and the seriousness of the problem in relation to the costs involved, resolution time and impact on mission-critical services should be considered.	

Incident Priority			Severity		
			3 - Low Issue prevents the user from performing a portion of their duties.	2 - Medium Issue prevents the user from performing critical time sensitive functions	1 - High Service or major portion of a service is unavailable
Impact	3 - Low	One or two personnel Degraded Service Levels but still processing within SLA constraints	3 - Low	3 - Low	2 - Medium
	2 - Medium	Multiple personnel in one physical location Degraded Service Levels but not processing within SLA constraints or able to perform only minimum level of service It appears cause of incident falls across multiple functional areas	2 - Medium	2 - Medium	1 - High
	1 - High	All users of a specific service Personnel from multiple agencies are affected Public facing service is unavailable Any item listed in the Crisis Response tables	1 - High	1 - High	1 - High

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.2	Moderate	L	Analyses of any problem largely depend on the nature and priority of the problem. However in general problems that are carefully analyzed should follow formal diagnosis, investigation, and problem-solving techniques. For example, consider using techniques such as fault isolation, chronological analysis, pareto analysis, ishikawa diagrams, brainstorming, pain value analysis, 5 whys, Kepner Tregoe Methodology. (see ITIL guidelines for further information on the problem-solving techniques).	Problem investigation and diagnosis, which should ensure that: 1) each problem is investigated to diagnose the root cause; 2) a method of resolution can be identified, which depends on the impact of the related incident(s) and potential incidents, whether or not a temporary fix exists and the estimated cost of resolution; 3) a decision to resolve the problem depends on the impact of related incidents, whether a temporary fix exists and the cost of resolution; 4) a decision not to resolve the problem is managed according to the problem management policy; 5) the problem management process is able to support the incident and service request management process even before the known error is found, through identifying a temporary fix; 6) problem diagnosis is complete when the root cause is identified and a method of resolving the problem is identified.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.3	Moderate	L	As soon as a solution to a problem has been found, the solution should be applied to resolve the problem whether it is a workaround solution or a permanent fix. However, effective problem resolution may require testing so that a solution does not cause other problems. Effective problem resolution may also require changes that should follow the change management process.	Ensure that all problem resolutions go through QA and Change Management.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.3	High	L	A problem should be closed along with its related outstanding incidents when a solution has been successfully applied to the problem. Any changes resulting from problem resolution should also be properly reviewed following the change management process. When a problem is closed, a known error record should also be generated.	Documenting known errors should ensure that: 1) when the root cause and a proposed method of resolving the problem is identified, a known error is recorded in the known error database, together with details of any temporary fix; 2) a known error record is not closed until after the permanent solution has been successfully implemented via the change management process; 3) known error records are made available to all relevant personnel, and they are regularly made aware of any new or updated known error records; 4) if a known error record stays open for a defined duration of time, it is reviewed and kept up to date so that no obsolete information is held in the known error database; 5) all known errors are recorded against the current and potentially affected services and the configuration item suspected of being at fault.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.4	Moderate	L	An unresolved problem should be escalated to the expert technical team (either in-house or outsourced) who specialize in that type of problem resolution. This is particularly important when problems seriously impact services offered according to the agreed service levels. It is also common practice to escalate unresolved critical problems to management for reporting.	Define escalation points and procedures.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
RES3.5	Moderate	L	While any problem is unresolved, different activities should be undertaken to minimize its adverse effect where applicable. • In some cases, a temporary solution, a workaround, should be provided for resolving incidents that were caused by a problem if applicable. • As soon as the diagnosis is undertaken to find the cause, the identified known errors should be listed in a known error report and recorded in the known error database to provide up-to-date information.	Example activities: 1) identification of related incident(s) breaching service targets; 2) cascading information to the customer so they can take appropriate actions to minimize the impact of the unresolved problem; 3) enable the service desk or level 1 support to provide regular updates to affected users or customers; 4) defining the escalation points.
RES3.6	Moderate	L	It is important to notify all concerned stakeholders (for example problem manager, incident manager, service level manager, and customer) about the status and progress of problem resolution to keep them up-to-date and to enable management to monitor and review the process for future improvements.	Keep all concerned in the loop by: 1) cascading information to the customer so they can take appropriate actions to minimize the impact of the unresolved problem; 2) enable the service desk or level 1 support to provide regular updates to affected users or customers;

GP1.1.1	Moderate	L	Problem management process overall must be reviewed and improved in order to fulfill its current and expected outcomes.	Major problem reviews held to investigate unresolved, unusual or high impact problems, should ensure: 1) risks to the business, the customer or service provider are identified and managed; 2) there is management visibility into the reasons for unresolved problems, as well as their ongoing business impact. Problem reviews should be recorded and should include appropriate recommendations for improvements to the service. They should examine: 1) opportunities to improve the problem management process; 2) opportunities to improve other processes, services or the SMS; 3) how to prevent recurrence or a particular type of problem; 4) whether training or awareness should be provided to correct or prevent incidents caused by human error; 5) whether there has been any responsibility on the part of suppliers, customers or internal groups for problems that have occurred and whether any follow-up actions are required. Proactive problem management should ensure that: 1) incident and problem data, the CMDB and other relevant information sources are analyzed to identify trends; 2) incident and problem data, the CMDB and other relevant information sources can be used to improve decision making and assist with pre-empting possible degradations of service;

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
				3) the knowledge gained from a problem review is communicated to the customer to ensure that the customer is aware of the actions taken and the service improvement recommendations identified; 4) key measurements that demonstrate the business value of proactive problem management are defined; 5) potential single points of failure, emerging trends and risks to services are identified and options are proposed through the change management process.

Table C.7.2 below presents relevant knowledge items relating to all **generic practices** of the problem management process, i.e. from capability level 2 (PA2.1) to capability level 3 (PA3.2). These recommendations are extracted from the knowledge base only when any process area demonstrates significant risks based on survey responses, that is, when the final score of any question is either P or N.

The recommendation items for process improvement guidelines presented in Table C.7.2 are defined at a broader level. Discussions with key stakeholders of the problem management process are very important to consider these recommendations; contextualize them to your organization and process environment, and finally, produce actionable items to address the risks in the process areas as highlighted in the table. This will ensure the progressive achievement of process capability scores above Capability Level 1.

Table C.7.2 Problem Management - Generic Practices (Levels 2 to 3)

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 2.1: How well the performance of Problem Management process is managed. It is important to apply basic process management techniques to provide reasonable assurance that problem management performance objectives are met.				
GP2.1.1	Poor	N	The objectives of Problem Management KPIs should be identified based on the business goals of the process and customer requirements for the service that uses Problem Management process. The objectives of Problem Management KPIs can define deadlines, constraints or targets to achieve for a process in regards to quality, process cycle time or resource usage. Such objectives may be expressed in qualitative terms (e.g., peer reviews) or quantitative terms (e.g., average service downtime).	Define Key Performance Indictors and communicate the scope to all stakeholders.
GP2.1.1	Poor	P	The scope of the Problem Management KPIs should be defined, and all stakeholders in the process should be informed of the scope. For instance, some processes (e.g., management level processes) may not require planning for each instance but may be managed under common planned arrangements.	Ensure that the KPIs defined above are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).
GP2.1.1	Poor	P	The assumptions and constraints should be considered while identifying Problem Management KPIs so that the resultant KPIs are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).	Create tracking dashboards in Zendesk and make it available to all stakeholders.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.1.2	Moderate	P	Problem Management process inputs and outputs should be regularly reviewed according to plan to ensure that the process activities are correctly executed.	Inputs: • Problem classification scheme • Problem disposition report • Problem management known error log • Problem mitigation report • Problem record • Problem report user communication list Outputs: • Communication record • Problem disposition report • Problem management known error log • Problem mitigation report

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.1.2	Poor	P	The activities of Problem Management should be driven by the identified performance targets so that the Problem Management can be monitored against the plans.	Establish process performance KPIs.
GP2.1.3	Poor	P	When the Problem Management activities are not well performed, the potential issues of such cases should be identified. This can be discussed in a process performance review meeting.	To discuss in Product Questions meeting on Thursday mornings.
GP2.1.3	Poor	P	When the Problem Management performance targets and KPIs are not achieved, corrective actions should be taken to re-define the targets and KPIs, or to address the issues identified in the process activities wherever appropriate.	Revisit KPIs regularly.
GP2.1.4	Poor	P	The need for experience, knowledge, and skills to perform Problem Management activities should be clearly defined. This helps in determining training needs and in understanding current and future staff competencies required to perform the process activities.	Ensure that the component owner troubleshoots problems.
GP2.1.5	Poor	P	Proper human and infrastructure resources that include competent people, reliable partners (vendors and suppliers), well-performed processes (based on ITIL guidelines) and relevant technologies (e.g. ITSM tools) – these resources should be sufficient enough to perform Problem Management activities effectively. It is especially important to be prepared to make appropriate changes to the resources as the process is changed for improvements.	None
Level 2.2: How well the work products (inputs and outputs) produced by Problem Management process is managed. It is important to apply basic process management techniques to ensure that the deliverables of the process are appropriately identified, documented, and controlled.				

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.2.1	Poor	P	The requirements for Problem Management deliverables should be identified to provide a basis for the development and verification of those deliverables (which are mainly records and documents concerning the process). The requirements for process deliverables could be functional requirements (e.g., performance, quality, compliance, etc.) or non-functional requirements that are not directly related to the deliverables (e.g., reporting structure, notification to customer, etc.) or a combination of both.	None
GP2.2.1	Poor	P	In certain circumstances, it is important to set quality criteria for the Problem Management deliverables since such deliverables likely have a significant influence on the requirements of the process performance.	None
GP2.2.2	Poor	P	The dependencies between various Problem Management deliverables should be identified and understood to determine how the deliverables contribute together in the achievement of the process objectives.	None
GP2.2.2	Poor	P	The approval and review of Problem Management deliverables should also be defined using controls such as versioning, consistent document naming, setting up of access rules and maintaining the confidentiality of the concerned documents in the organization.	None
GP2.2.3	Moderate	P	All the required deliverables (documents) which are necessary in performing Problem Management activities properly should be identified.	None
GP2.2.3	Poor	P	Change control should be set up for the Problem Management deliverables based on the defined requirements for documentation and control of those deliverables.	None

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.2.4	Poor	P	The Problem Management deliverables resulting from the implementation of the process should be reviewed in accordance with planned arrangements and adjusted as necessary to meet the defined requirements.	None
GP2.2.4	Poor	N	After a careful review of the Problem Management deliverables, corrective actions should be undertaken to resolve any issues identified as part of the management of the process deliverables.	None
Level 3.1: How well is a standard Problem Management process maintained to support process activities? It is important to establish a standard process, use it as a basis for the performance of the process activities and finally collect the performance data of the process activities to better understand and improve the standard process.				
GP3.1.1	Poor	P	There should be a formal description of a standard Problem Management process with explicit specification of goals, scope, and policies at a general level. This will be a basis for performance of the "defined" process – that is, implementing the standard process to suit the organizational constraints and conditions.	None
GP3.1.1	Moderate	P	The defined standard Problem Management process should consider and cater for different conditions and criteria for its implementation. The standard process by itself is defined at a general level that may not be directly usable to perform a process, but it should support diverse contexts in the organization.	None
GP3.1.1	Poor	P	The standard Problem Management process should define some form of "tailoring guidelines" to enable implementation of the standard process in different situations so that the process can be altered for different requirements to meet the objectives, constraints, and environment of the project or activities involved.	None

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP3.1.2	Poor	P	The standard Problem Management process workflow should address interfaces with other processes typically using a process model diagram or schema. A process workflow may interface with other service management processes; other business processes (HR, security) or even processes from external service providers. For example, consider the interfaces between Service Level Management, Change Management, Release Management and Configuration Management during an update of service provision to a customer. Such visible interfaces should be defined in the process workflow and maintain integrity with the related processes. Note that the sequence and interaction of processes does not necessarily imply sequential activities; it may mean concurrent activities, feedback cycle or another form of interaction as well.	None
GP3.1.3	Moderate	P	The standard Problem Management process should clearly define the required competencies in order to execute the activities defined in the standard process properly. This can help organizations to hire new staff and train existing staff to ensure the required competencies exist before implementing the process.	None
GP3.1.4	Poor	P	The standard Problem Management process should clearly specify the infrastructure required to execute the activities defined in the standard process properly. Such infrastructure could include facilities, tools, new methods and documentation and they can help the organization to ensure adequate resources are available for smooth execution of the standard process.	None

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP3.1.4	Poor	P	The standard Problem Management process should clearly identify and describe the work environment required to execute the activities defined in the standard process properly. Such work environment factors could include ergonomics (worker movement, fatigue, location, social interaction, heat, light, noise, and airflow), personal safety and facility conditions that are conducive to perform the process. For example, a well-defined Occupational Health and Safety (OH&S) policy can address work environment requirements in a standard process.	None
GP3.1.5	Poor	P	There should be a mechanism to monitor actual process activities with the standard Problem Management process so that the data about real process activities provide a basis for accumulating a better understanding the behavior of the standard process.	None
GP3.1.5	Poor	P	It is important to explicitly establish a need to audit and review the standard Problem Management process by management so that the collected review data could be used for the improvement of the standard process.	None
Level 3.2: How well the standard Problem Management process is implemented as process activities to achieve its outcomes. It is important to effectively implement process activities tailored to the standard process using resources available in the organization.				
GP3.2.1	Poor	P	The defined activities of Problem Management process should conform to the requirements of the standard Problem Management process and implemented following the tailoring guidelines (if any) to consider the specific constraints and conditions. This will ensure that the activities undertaken in the Problem Management process is consistent across the organization.	None

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP3.2.3	Poor	P	The current competencies of Problem Management staff should be ascertained to ensure whether they are adequate to perform Problem Management activities or not. If they are inadequate, hiring competent staff and training existing staff properly should be considered.	None
GP3.2.6	Poor	P	Information about the Problem Management process activities such as process documentation (e.g., procedures) and location of the latest version of documents should be collected and made readily available to understand and monitor the Problem Management activities for suitability and effectiveness.	None
GP3.2.6	Poor	P	Information about the Problem Management process activities such as process documentation (e.g., procedures) and location of the latest version of documents should be collected and made readily available to understand and monitor the Problem Management activities for suitability and effectiveness.	None
GP3.2.6	Poor	P	The analysis of appropriate data regarding implementation of the Problem Management process should be conducted to provide a basis for understanding the behavior of the process and its compliance with the standard Problem Management process. This, in turn, contributes to the ongoing improvement of the implemented process and the standard Problem Management process upon which the implemented process is based.	None

Comments

Comments from Survey Participants provide a rich source of qualitative information about process capabilities, interpretation of survey questions and responses; discussions regarding process strengths, weaknesses, opportunities and threats; contextual information about organization related processes, people issues, technology factors, constraints, etc.

These components provide useful information to help in process assessments in two ways:

(a) Feedback for further improvement of questions in the software tool;

(b) Information to discuss current process issues and improvements opportunities.

Question	Selected Option	Comment	Action Plan
Do you know if roles and responsibilities are clearly defined, assigned and communicated to perform process activities? For Problem Management, roles and responsibilities could be defined, assigned and communicated in the form of a responsibility assignment matrix (or RACI matrix) that describes participation by various roles to perform process activities, or in the job description and employment contracts as well.	L	Implicitly understood by participants.	Define and communicate roles and responsibilities.

Question	Selected Option	Comment	Action Plan
Do you know if required experience, knowledge and skills are clearly defined to perform process activities? For Problem Management, minimum qualifications, number of years of experience and skill set could be defined in a job description.	L	It's not documented, but everyone around has a fairly good idea of people's skills and experience. So, it's clearly defined in the minds of decision-makers, but don't think it's recorded anywhere.	Consider training.
Do you know if corrective actions are undertaken to resolve any issues arising from review of process outcomes? For Problem Management, if a process outcome target such as "90% problem resolution" is consistently missed by your organization; corrective actions are taken to revise the process.	N	Review is not done so corrective actions are not taken.	Implement review process.
Do you know if the standard process is actually implemented with the help of procedures or work instructions? For Problem Management, the standard process could be institutionalized in your organization in the form of guidelines and templates to follow.	N	One man defines everything	Define standards and procedure and communicate to all stakeholders.

Question	Selected Option	Comment	Action Plan
Do you know if there is a good organizational support to manage and perform process activities effectively? For Problem Management, organizational support could mean the provision of a good working relationship between IT service functions: service desk, IT Operations, Technical Management and Applications Management team - for effective process activities.	P	Support to actually fix the problems is not there. Until that priority (fixing issues vs. adding new features) is changed this whole process will continue to be broken as far as customer is concerned. My response is, 'Yes, but in reality this would be a 'Yes - only if you're deemed a priority.'	Revisit priorities and business impact.
Do you know if problems are assigned a priority?	P	Automatically, but not really followed	Define an impact/severity matrix.
Do you know if problems are effectively resolved? *NOTE: Problems are effectively resolved when a workaround (or even better a permanent solution) has been found.*	F	If a stakeholder is aware	Review Known Error database regularly.
Do you know if stakeholders are kept informed about the status and progress of problem resolution?	P	based on priority	Automate communication.
Do you know if stakeholders are kept informed about the status and progress of problem resolution?	P	there should be a Yes, hardly	Automate communication.

Appendix C.8. Change Management SMPA Process capability assessment report with Action Plan

Recommendations and Plan of Action

Table C.8.1 below presents all knowledge items relating to how well the change management process has achieved its purpose and expected outcomes. These recommendations and the level of achievement determined by survey responses provide specific guidelines to optimally perform Change Management process activities (also called **base practices**).

The recommendation items for process improvement guidelines presented in Table C.8.1 are defined to specific activities of the Change Management process. If any of the level of achievements in Table C.8.1 is not F; that is, there is no certainty these process activities are usually performed; those activities must be reviewed and performed according to the recommendations provided to fully achieve Capability Level 1.

Table C.8.1 Change Management Process Performance – Base Practices (Level 1)

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 1: How well the implemented Change Management process achieves its purpose and expected outcomes.				

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
CON1.1	Moderate	L	A change should be raised by a request requiring the change. Such requests for change (RFCs) should be properly recorded either in a document or ideally in a change management system. The scope and impact of the change should typically determine how much information is required to record the change.	Enforce scope and impact of change requests.
CON1.1	Moderate	L	Changes should be classified (for example normal change, standard change, emergency change) based on the issue of risk and/or priority. The likelihood that the risk will occur and its possible impact should determine the risk category of the change.	Ensure that the change record caters for classification of changes.
CON1.2	Poor	L	Impact assessment of the change requests should be guided by "the seven R's of change management" (see ITIL guidelines for the seven aspects to be considered during assessment of a change request). One of the activities during change assessment is to evaluate the impact of the change on the existing information security policy and controls. Another activity during change assessment is to evaluate the impact of the change on releases and implementation plans.	Who **RAISED** the Change? What is the **REASON** for the change? What **RETURN** will the change deliver? What **RISKS** are there is we do or do not carry out the change? What **RESOURCES** will be required to perform this change? Who is **RESPONSIBLE** for this change being performed? What **RELATIONSHIPS** are there between this and other changes?

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
CON1.3	Moderate	L	Every change should have formal authorization from a change authority for implementation. The change authority should consider the risks associated with the change and the potential impacts to services, the customer, service requirements, business benefits, technical feasibility and financial impact associated with the change before approving changes.	In addition to the process owner, process manager and personnel performing the procedures of the process, authorities, and responsibilities required within the change management process should include those listed below. a) The roles and individuals that can record and classify a request for change. b) An owner that is responsible for managing the lifecycle of each request for change, e.g. service owner, process owner. c) Nominated representatives to provide advice on the impact of changes. This may be a change advisory board that typically includes representatives of the service provider, customer and interested parties depending on the scope and impact of the change on the service and business environment. d) A change authority to make decisions on the acceptance and approval of the change. A change authority should be relevant to the change type and may be a nominated role, an individual or a change advisory board and emergency change advisory board.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
CON1.4	Poor	L	The approved changes should be scheduled on the change calendar: "the Schedule of Change (SC)" where applicable. The change calendar should contain details of all approved changes and their plans, e.g. implementation dates. *NOTE: a Schedule of Change (SC) is also termed as a Forward Schedule of Change (FSC) in ITIL.*	If we don't have one already, let's create one for at least end of week changes.
CON1.4	Poor	L	It is important to make sure that implementation plans (which are performed in detail using a Release and Deployment Management process) is well coordinated with the change management process. In consultation with the relevant IT departments, the Change Advisory Board (CAB) should set up fixed times to implement new changes, choosing times when existing services will be impacted as little as possible.	We should discipline ourselves in following a schedule for changes based on impact.
CON1.4	Poor	L	Authorized changes should be passed to the relevant stakeholders to develop a release for the change. The Release and Deployment Management process should discuss this activity in detail.	Ensure that the automated communication methods are sufficient to achieve this.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
CON1.5	Poor	L	It is important to make sure that the schedule of change is communicated to the concerned stakeholders in a timely manner.	Communicate approved changes to Product Owners and other stakeholders prior to making changes.
CON1.6	Poor	L	Authorized changes should be passed to the relevant technical groups for developing a release for the change. The Release and Deployment Management process should detail this activity in detail. Likewise, the changes, its remediation and implementation methods should be tested thoroughly. The service validation and testing process (if implemented) should discuss this activity in detail.	Ensure that Release Management, QA, and DevOps are in sync.
CON1.7	High	L	A recovery plan should be prepared in case a change implementation is unsuccessful detailing how to roll back or remedy problematic changes.	This needs to be addressed in the change request ticket.
GP1.1.1	Poor	P	Change management process overall must be reviewed and improved in order to fulfil its current and expected outcomes.	Kick-off regular meetings around change management.

Table C.8.2 below presents relevant knowledge items relating to all **generic practices** of the change management process, i.e. from capability level 2 (PA2.1) to capability level 5 (PA5.2). These recommendations are extracted from the knowledge base only when any process area demonstrates significant risks based on survey responses, that is, when the final score of any question is either P or N.

The recommendation items for process improvement guidelines presented in Table C.82 are defined at a broader level. Discussions with key stakeholders of the change management process are very important to consider these recommendations; contextualize them to your organization and process environment, and finally, produce actionable items to address the risks in the process areas as highlighted in the table. This will ensure the progressive achievement of process capability scores above Capability Level 1.

Table C.8.2 Change Management - Generic Practices (Levels 2 to 5)

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 2.1: How well the performance of Change Management process is managed. It is important to apply basic process management techniques to provide reasonable assurance that change management performance objectives are met.				
GP2.1.1	Poor	P	The objectives of Change Management KPIs should be identified based on the business goals of the process and customer requirements for the service that uses Change Management process. The objectives of Change Management KPIs can define deadlines, constraints or targets to achieve for a process in regards to quality, process cycle time or resource usage. Such objectives may be expressed in qualitative terms (e.g., peer reviews) or quantitative terms (e.g., average service downtime).	Ensure that the KPIs defined above are specific, measurable, achievable, relevant and timely (S.M.A.R.T.).

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.1.1	Poor	P	The scope of the Change Management KPIs should be defined, and all stakeholders in the process should be informed of the scope. For instance, some processes (e.g., management level processes) may not require planning for each instance but may be managed under common planned arrangements.	Define Key Performance Indicators and communicate the scope to all stakeholders.
GP2.1.2	Poor	P	The activities and tasks of Change Management should be clearly defined to perform them effectively.	Define the change management activities and communicate to all stakeholders.
Level 2.2: How well the work products (inputs and outputs) produced by Change Management process is managed. It is important to apply basic process management techniques to ensure that the deliverables of the process are appropriately identified, documented, and controlled.				

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP2.2.3	Poor	P	All the required deliverables (documents) which are necessary for performing Change Management activities properly should be identified.	The documents, including records that should be produced and retained: a) change management policy; b) change management process documentation and procedures, including an emergency change procedure and a standard change procedure; c) a list of approved standard changes; d) a schedule of changes; e) recorded requests for change and any related information e.g. risk assessment, remediation plan, deployment plan; f) change management process effectiveness and efficiency reports; g) change management reports, including post-implementation reviews.
GP2.2.4	Poor	P	The Change Management deliverables resulting from the implementation of the process should be reviewed in accordance with planned arrangements and adjusted as necessary to meet the defined requirements.	Define a review plan.
GP2.2.4	Poor	P	After a careful review of the Change Management deliverables, corrective actions should be undertaken to resolve any issues identified as part of the management of the process deliverables.	Define corrective action procedures.

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
Level 3.1: How well is a standard Change Management process maintained to support process activities? It is important to establish a standard process, use it as a basis for performance of the process activities and finally collect the performance data of the process activities to better understand and improve the standard process.				
GP3.1.2	Poor	P	The standard Change Management process workflow should address interfaces with other processes typically using a process model diagram or schema. A process workflow may interface with other service management processes; other business processes (HR, security) or even processes from external service providers. For example, consider the interfaces between Service Level Management, Change Management, Release Management and Configuration Management during an update of service provision to a customer. Such visible interfaces should be defined in the process workflow and maintain integrity with the related processes. Note that the sequence and interaction of processes does not necessarily imply sequential activities; it may mean concurrent activities, feedback cycle or another form of interaction as well.	None
GP3.1.4	Poor	P	The standard Change Management process should clearly specify the infrastructure required to execute the activities defined in the standard process properly. Such infrastructure could include facilities, tools, new methods and documentation and they can help the organization to ensure adequate resources are available for smooth execution of the standard process.	None

Indicator	Score Reliability	Score Rating	Observation & Recommendation	Action Plan
GP3.1.5	Poor	P	There should be a mechanism to monitor actual process activities with the standard Change Management process so that the data about real process activities provide a basis for accumulating a better understanding the behavior of the standard process.	None
Level 3.2: How well the standard Change Management process is implemented as process activities to achieve its outcomes. It is important to effectively implement process activities tailored to the standard process using resources available in the organization.				
GP3.2.3	Poor	P	The current competencies of Change Management staff should be ascertained to ensure whether they are adequate to perform Change Management activities or not. If they are inadequate, hiring competent staff and training existing staff properly should be considered.	None
GP3.2.6	Poor	P	Information about the Change Management process activities such as process documentation (e.g. procedures) and location of the latest version of documents should be collected and made readily available to understand and monitor the Change Management activities for suitability and effectiveness.	None
GP3.2.6	Poor	P	The analysis of appropriate data regarding implementation of the Change Management process should be conducted to provide a basis for understanding the behavior of the process and its compliance with the standard Change Management process. This, in turn, contributes to the ongoing improvement of the implemented process and the standard Change Management process upon which the implemented process is based.	None

Comments

Comments from Survey Participants provide a rich source of qualitative information about process capabilities, interpretation of survey questions and responses; discussions regarding process strengths, weaknesses, opportunities and threats; contextual information about organization related processes, people issues, technology factors, constraints, etc.

These components provide useful information to help in process assessments in two ways:

(a) Feedback for further improvement of questions in the software tool;

(b) Information to discuss current process issues and improvements opportunities.

Question	Selected Option	Comment	Action Plan
Do you know if process inputs and outputs are regularly reviewed? For Incident Management, inputs could be: (a) customer feedback; and (b) events triggered from event management and outputs could be: (a) incident management records; and (b) escalation of problem records for incidents whose underlying cause has not been identified.	P	Depends on the urgency or how important the customer is.	Develop a review plan.

Question	Selected Option	Comment	Action Plan
Do you know if required experience, knowledge and skills are clearly defined to perform process activities? For Incident Management, minimum qualifications, number of years of experience and skill set could be defined in a job description.	L	Number of years of exp may not correlate with the skill set each analyst currently has.	Consider training.
Do you know if process outcomes are easily accessible? For Incident Management, this means that process outcomes such as “incident and resolution history” are available for its interfaces such as “service level management process”.	Do Not Know	Maybe recorded in Jira or somewhere, but not everyone has access to review. We only depend on internal communication at the moment.	Knowledgebase.
Do you know if the standard process provides information to implement multiple requirements? For Incident Management, the standard process could relate to several process requirements such as “incident identification”, “incident logging”, “incident categorization”, and “incident prioritization” requirements.	Do Not Know	If this process is documented, it's not disseminated to all team members.	Document process and disseminate to all stakeholders.
Do you know if process activities in your organization follow the standard process? For Incident Management, process activities should conform to the requirements of the standard process, possibly based on IT frameworks such as ITIL, ISO/IEC 20000 or COBIT.	Do Not Know	This is possible, but I doubt it.	Need to document and distribute the standard.

Question	Selected Option	Comment	Action Plan
Do you know if there is required information is available in your organization to understand the process activities? For Incident Management, information could be available in corporate social networks, knowledge management systems, and help files or through support staff to understand the process activities.	N	The overall process is “understood.” I don't think we have proper documentation (at least that's been shared to all involved) detailing the process to the degree that's being asked in this survey, no.	Need to document and distribute the standard.
Do you know if incidents are classified with an appropriate priority?	L	Sometimes identifying the root cause, which is part of the classification, is difficult even though the required corrective actions may be obvious.	Training.
Do you know if incidents are managed until they are resolved and closed?	P	If incidents are moved to an engineering queue, the PO does not follow up consistently on these	
Do you know if the status and progress of incidents are communicated to interested parties as needed?	L	It’s partly built into the ticketing system; requestors can see activity on the issue, but it is up to agents to summarize the activity in a concise form for requestors for any state other than “open, delayed, or closed”.	Automate communication.

Appendix D. Documentation related Process Guidelines

Appendix D.1. Email Communication of Process Guidelines

Fri 10/14/2016 8:50 PM

RE: Update: ITSM Process Improvement at [redacted]

To [redacted]

Cc [redacted]

You replied to this message on 11/3/2016 8:19 PM.

Message | Problem Management Process Guide.pdf (432 KB) | Incident Management Process Guide.pdf (406 KB)

Hi,

The site (https://sites.google.com/a/ com/itsm/) has been updated to include process guides for Incident and Problem Management. Change Management is more challenging and requires more of my time.

These guides were developed using both academic and practitioner resources. The material draws from process standards and models, as well as from interviews I conducted with 3 Bay Area companies (Palo Alto Networks, Oracle and ServiceNow).

Please note that these are somewhat of generic guides that need a pragmatic element to make it work for us, but it does provide enough detail to envision our target state.

To make my life easier, please subscribe to the site or pages for up-to-the-minute breaking updates.

Thanks for your support (no pun intended).

Have a good weekend.

Suren

Appendix D.2. Incident Management Guidelines

An incident is an unplanned interruption to a service. An interruption to a service is a reduction in quality below the agreed service levels. The purpose of Incident Management is to restore service to the user. Incident Management can be measured on the restoration of service.

Primary goal

The primary goal of the Incident Management process is to restore normal service operation as quickly as possible and minimize the adverse impact on business operations, thus ensuring that the best possible levels of service quality and availability are maintained. 'Normal service operation' is defined here as service operation within SLA limits (be it internal or external).

Process Definition:

Incident Management includes any event which disrupts, or which could disrupt a service. This includes events which are communicated directly by users or Company X staff through the Service Desk or through an interface from Event Management to Incident Management tools.

Objectives - Provide a consistent process to track incidents that ensure:

- Incidents are properly logged
- Incidents are properly routed
- Incident status is accurately reported
- Queue of unresolved incidents is visible and reported
- Incidents are properly prioritized and handled in the appropriate sequence
- Resolution provided meets the requirements of the SLA for the customer

Definitions

Customer

A customer is someone who buys goods or Services. The Customer of an IT Service Provider is the person utilizing the service purchased by the customer's organization. The term Customers is also sometimes informally used to mean Users, for example, "Company X is a Customer focused Organization".

Impact

The impact is determined by how many personnel or functions are affected. There are three grades of impact:

- 3 - Low – One or two personnel. Service is degraded but still operating within SLA specifications
- 2 - Medium – Multiple personnel in one physical location (or company). Service is degraded and still functional but not operating within SLA specifications. It appears the cause of the incident falls across multiple service provider groups
- 1 - High – All users of a specific service. Personnel from multiple organizations are affected. Public facing service is unavailable

The impact of an incident will be used in determining the priority for resolution.

Incident

An incident is an unplanned interruption to an IT Service or reduction in the Quality of an IT Service. Failure of any Item, software or hardware, used in support of a system that has not yet affected service is also an Incident. For example, the failure of one component of a redundant high availability configuration is an incident even though it does not interrupt service.

An incident occurs when the operational status of a production item changes from working to failing or about to fail, resulting in a condition in which the item is not functioning as it was designed or implemented. The resolution of an incident involves implementing a repair to restore the item to its original state.

A design flaw does not create an incident. If the product is working as designed, even though the design is not correct, the correction needs to take the form of a service request to modify the design. The service request may be expedited based upon the need, but it is still a modification, not a repair.

Incident Repository

The Incident Repository is a database containing relevant information about all Incidents whether they have been resolved or not. General status information along with notes related to activity should also be maintained in a format that supports standardized reporting. At Company X, the incident repository is currently contained within Zendesk.

Priority

Priority is determined by utilizing a combination of the incident's impact and severity. For a full explanation of the determination of priority refer to the paragraph titled Priority Determination.

Response

Time elapsed between the time the incident is reported and the time it is assigned to an individual for resolution.

Resolution

Service is restored to a point where the customer can perform their job. In some cases, this may only be a workaround solution until the root cause of the incident is identified and corrected.

Service Agreement

A Service Agreement is a general agreement outlining services to be provided, as well as costs of services and how they are to be billed. A service agreement may be initiated between Company X and another entity. A service agreement is distinguished from a Service Level Agreement in that there are no ongoing service level targets identified in a Service Agreement.

Service Level Agreement

Often referred to as the SLA, the Service Level Agreement is the agreement between Company X and the customer outlining services to be provided, and operational support levels as well as costs of services and how they are to be billed.

Service Level Target

Service Level Target is a commitment that is documented in a Service Level Agreement. Service Level Targets are based on Service Level Requirements and are needed to ensure that the IT Service continues to meet the original Service Level Requirements.

Severity

Severity is determined by how much the user is restricted from performing their work. There are three grades of severity:

- 3 - Low - Issue prevents the user from performing a portion of their duties.
- 2 - Medium - Issue prevents the user from performing critical time-sensitive functions
- 1 - High - Service or major portion of a service is unavailable

The severity of an incident will be used in determining the priority for resolution.

Incident Scope

The Incident process applies to all specific incidents in support of larger services already provided by Company X.

Exclusions

Request fulfillment, i.e., Service Requests and Service Catalogue Requests are not handled by this process.

Root cause analysis of the original cause of the incident is not handled by this process. Refer to Problem Management. The need for restoration of normal service supersedes the need to find the root cause of the incident. The process is considered complete once normal service is restored.

Inputs and Outputs

Input	From
Incident (verbal or written)	Customer
Categorization Tables	Functional Groups
Assignment Rules	Functional Groups

Output	To
Standard notification to the customer when case is closed	Customer

Metrics

Metric	Purpose
Process tracking metrics # of incidents by type, status, and customer – see detail under Reports and Meetings	To determine if incidents are being processed in reasonable time frame, frequency of specific types of incidents, and determine where bottlenecks exist.

Roles and Responsibilities

Responsibilities may be delegated, but escalation does not remove responsibility from the individual accountable for a specific action.

The following roles and responsibilities were defined:

Service Desk

- Owns all reported incidents
- Ensure that all incidents received by the Service Desk are recorded in Zendesk
- Identify nature of incidents based on reported symptoms and categorization rules supplied by provider groups
- Prioritize incidents based on impact to the users and SLA guidelines
- Responsible for incident closure
- Delegates responsibility by assigning incidents to the appropriate provider group for resolution based on the categorization rules
- Performs post-resolution customer review to ensure that all work services are functioning properly and all incident documentation is complete
- Prepare reports showing statistics of Incidents resolved / unresolved

Service Provider Group

- Composed of technical and functional staff involved in supporting services
- Correct the issue or provide a workaround to the customer that will provide functionality that approximates normal service as closely as possible.

- If an incident reoccurs or is likely to reoccur, notify problem management so that root cause analysis can be performed and a standard workaround can be deployed

Incident Categorization, Target Times, Prioritization, and Escalation

In order to adequately determine if SLA's are met, it will be necessary to correctly categorize and prioritize incidents quickly.

Categorization

The goals of proper categorization are:

- Identify Service impacted and appropriate SLA and escalation timelines
- Indicate what support groups need to be involved
- Provide meaningful metrics on system reliability

For each incident, the specific service (subtype) will be identified. It is critical to establish with the user the specific area of the service being provided. Identifying the service properly establishes the appropriate Service Level Agreement and relevant Service Level Targets.

In addition, the severity and impact of the incident need to also be established. All incidents are important to the user, but incidents that affect large groups of personnel or mission-critical functions need to be addressed before those affecting 1 or 2 people.

Does the incident cause a work stoppage for the user or do they have other means of performing their job? An example would be a broken link on a web page is an incident, but if there is another navigation path to the desired page, the incident's severity would be low because the user can still perform the needed function.

The incident may create a work stoppage for only one person, but the impact is far greater because it is a critical function.

Priority Determination

The priority given to an incident that will determine how quickly it is scheduled for resolution will be set depending upon a combination of the incident severity and impact.

Incident Priority			Severity		
			3 - Low Issue prevents the user from performing a portion of their duties.	2 - Medium Issue prevents the user from performing critical time-sensitive functions	1 - High Service or major portion of a service is unavailable
Impact	**3 - Low**	• One or two personnel • Degraded Service Levels but still processing within SLA constraints	**3 - Low**	**3 - Low**	**2 - Medium**
	2 - Medium	• Multiple personnel in one physical location (or organization) • Degraded Service Levels but not processing within SLA constraints or able to perform only minimum level of service • It appears cause of incident falls across multiple functional areas	**2 - Medium**	**2 - Medium**	**1 - High**
	1 - High	• All users of a specific service • Personnel from multiple organizations are affected • Public facing service is unavailable • Any item listed in the Crisis Response tables	**1 - High**	**1 - High**	**1 - High**

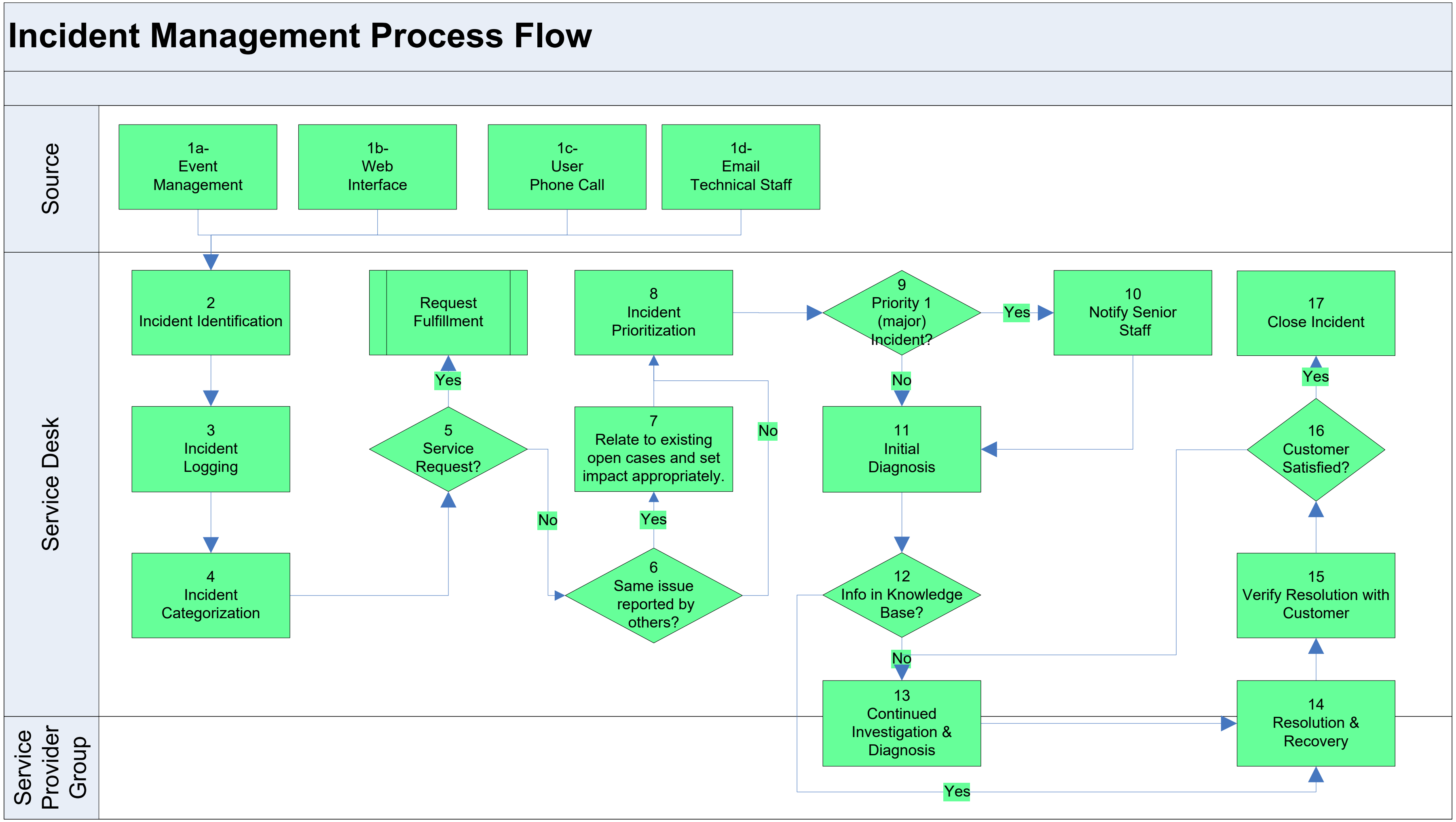
Target Times

Incident support for existing services is provided 24 hours per day, 5 1/2 days per week, and 365 days per year. Following are the current targets for response and resolution for incidents based upon priority.

Priority	**Target**	
	Response	**Resolve**
3 - Low	90% - 24 hours	90% - 7 days
2 - Medium	90% - 2 hours	90% - 4 hours
1 - High	95% - 15 minutes	90% - 2 hours

Process Flow

The following is the standard incident management process flow outlined in ITIL Service Operation but represented as a swim lane chart with associated roles within Company X.


Incident Management Process Flow
Source
Service Desk
Service Provider Group
1a- Event Management
1b- Web Interface
1c- User Phone Call
1d- Email Technical Staff
2 Incident Identification
Request Fulfillment
8 Incident Prioritization
9 Priority 1 (major) Incident?
Yes
10 Notify Senior Staff
17 Close Incident
Yes
No
3 Incident Logging
5 Service Request?
7 Relate to existing open cases and set impact appropriately.
No
11 Initial Diagnosis
16 Customer Satisfied?
No
Yes
Yes
4 Incident Categorization
6 Same issue reported by others?
12 Info in Knowledge Base?
15 Verify Resolution with Customer
No
13 Continued Investigation & Diagnosis
14 Resolution & Recovery
Yes

Incident Management Process Flow Steps

Role	Step	Description
Requesting Customer	1	Incidents can be reported by the customer or internal staff through various means, i.e., phone, email, or a self-service web interface. Incidents may also be reported through the use of automated tools performing Event Management.
Company X Service Desk	2	Incident identification Work cannot begin on dealing with an incident until it is known that an incident has occurred. As far as possible, all key components should be monitored so that failures or potential failures are detected early so that the incident management process can be started quickly.
	2	Incident logging All incidents must be fully logged and date/time stamped, regardless of whether they are raised through a Service Desk telephone call or whether automatically detected via an event alert. All relevant information relating to the nature of the incident must be logged so that a full historical record is maintained – and so that if the incident has to be referred to another support group (s), they will have all relevant information at hand to assist them.

Role	Step	Description
	4	Incident categorization All incidents will relate to one of the published services listed in the Service Catalogue. If the customer is calling about an issue they have that is not related to one of the services in the catalogue, then it is not an incident.
	5	Is this actually a Service Request incorrectly categorized as an incident? If so, update the case to reflect that it is a Service Request and follow the appropriate Service Request process.
	6	Has this issue already been reported by others?
	7	If this is another person reporting the same issue, relate the issue to the cases already reported. More people reporting the same issue means the impact of the issue is broader than what might have been reported at first. The impact needs to be recorded based on current knowledge of the impact.
	8	Incident prioritization Before an incident priority can be set, the severity and impact need to be assessed. See paragraph 3.2 Incident Prioritization. Once the severity and impact are set, the priority can be derived using the prescriptive table.
	9	Is this a priority 1 (major) incident?

Role	Step	Description
	10	If this is a priority 1 incident meaning that a service is unavailable in part or whole, all Senior Management at Company X should be alerted to make certain any resources necessary to the resolution will be immediately made available.
	11	Initial diagnosis If the incident has been routed via the Service Desk, the Service Desk analyst must carry out the initial diagnosis, using diagnostic scripts and known error information to try to discover the full symptoms of the incident and to determine exactly what has gone wrong. The Service Desk representative will utilize the collected information on the symptoms and use that information to initiate a search of the Knowledge Base to find an appropriate solution. If possible, the Service Desk Analyst will resolve the incident and close the incident if the resolution is successful.
	12	Is the necessary information in the Knowledge Base to resolve the incident? If not, the case should then be assigned to the provider group that supports the service.
	13	If the necessary information to resolve the incident is not in the Knowledge Base, the incident must be immediately assigned to an appropriate provider group for further support. The assignee will then research the issue to determine cause and remediation options.

Role	Step	Description
	14	After a possible resolution has been determined either from the Knowledge Base or through research, attempt the resolution.
	15	Verify with the customer that the resolution was satisfactory and the customer is able to perform their work. An incident resolution does not require that the underlying cause of the incident has been corrected. The resolution only needs to make it possible for the customer to be able to continue their work.
	16	If the customer is satisfied with the resolution, proceed to closure, otherwise, continue investigation and diagnosis.

Role	Step	Description
Company X Service Desk	17	Incident Closure The Service Desk should check that the incident is fully resolved and that the users are satisfied and willing to agree the incident can be closed. The Service Desk should also check the following: **Closure categorization**. Check and confirm that the initial incident categorization was correct or, where the categorization subsequently turned out to be incorrect, update the record so that a correct closure categorization is recorded for the incident – seeking advice or guidance from the resolving group(s) as necessary. **User satisfaction survey**. Carry out a user satisfaction call-back or e-mail survey for the agreed percentage of incidents. **Incident documentation**. Chase any outstanding details and ensure that the Incident Record is fully documented so that a full historical record at a sufficient level of detail is complete. **Ongoing or recurring problem?** Determine (in conjunction with resolver groups) whether it is likely that the incident could recur and decide whether any preventive action is necessary to avoid this. In conjunction with Problem Management, raise a Problem Record in all such cases so that preventive action is initiated. **Formal closure**. Formally close the Incident Record.

Incident Escalation

According to ITIL standards, although assignment may change, ownership of incidents always resides with the Service Desk. As a result, the responsibility of ensuring that an incident is escalated when appropriate also resides with the Service Desk.

The Service Desk will monitor all incidents, and escalate them based on the following guidelines:

Priority	**Time Limit before Escalation**	
3 - Low	3 business days	Manager
2 - Medium	4 hours	Manager
	If on-call contact cannot be reached during non-business hours	Manager
	If neither on-call contact or their manager cannot be reached during non-business hours	Senior Mgt
	48 hours	Senior Mgt
1 - High	Immediate	Manager
	Immediate	Senior Mgt

Functional Escalation

When the Service Desk receives notification of an incident, they are to perform the initial identification and diagnosis to classify the incident according to service category and prioritization. If the incident is a known problem with a known solution, the Service Desk will attempt a resolution. If it is not a known problem or if the attempted solution fails, they will delegate responsibility for an incident to an appropriate provider group.

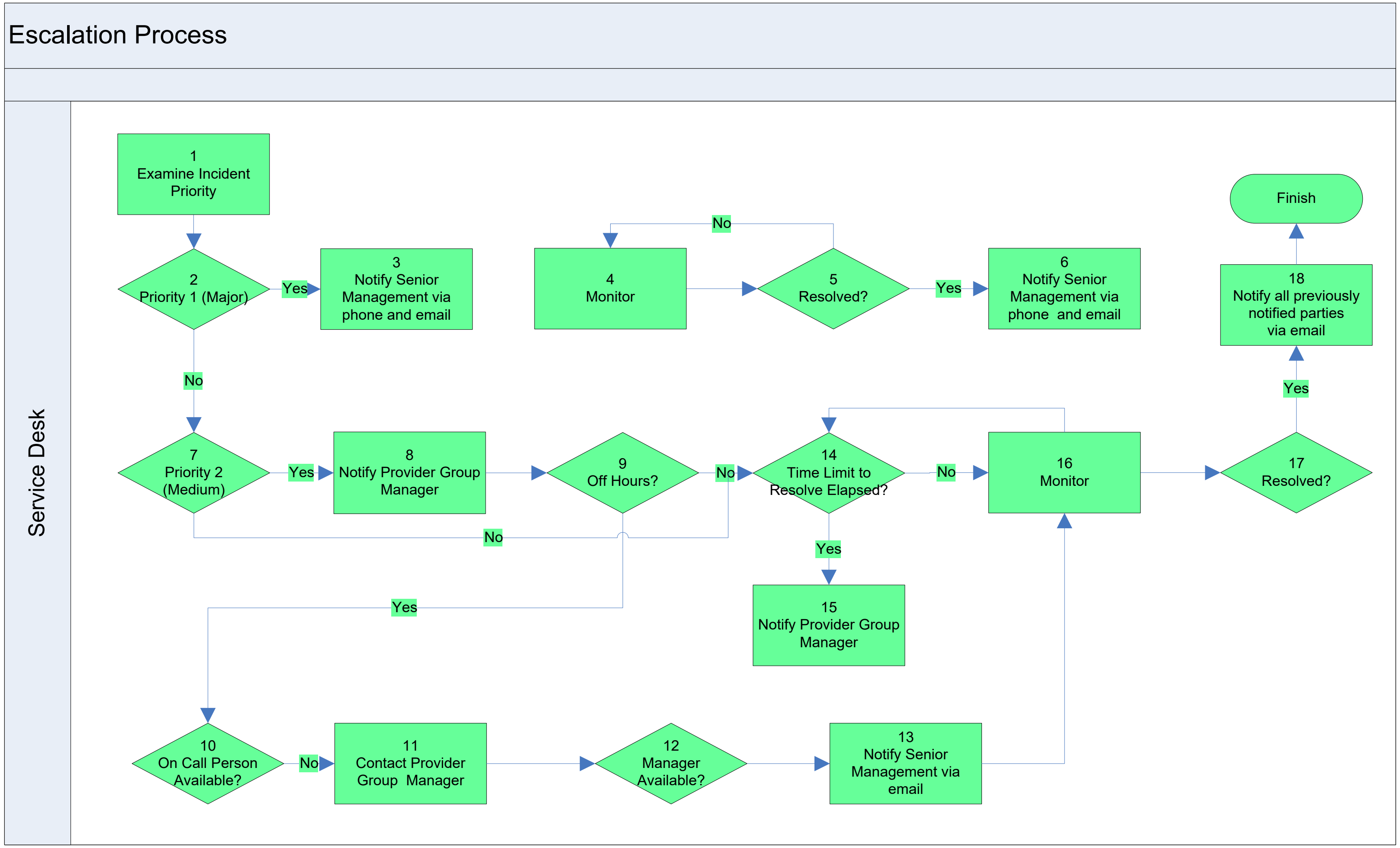
Escalation Notifications:

Any time a case is escalated, notification will occur to various individuals or groups depending upon the priority of the incident. Following are basic guidelines for notifications:

- The default mechanism for notification will be by email unless otherwise explicitly stated.

- Whenever escalation or notification by phone is indicated, all known numbers for contact should be utilized, leaving voicemail on each until the person is contacted.
- Senior management notification will include VP, CEO, and all functional managers. Escalation of a case does not remove the assignment from an individual. It is up to the manager of the provider group to make certain the right personnel are assigned. When additional personnel needs to be involved, they may be added as interested parties.
- Any time a case is escalated, the case will be updated to reflect the escalation and the following notifications will be performed by the Service Desk:
    - Customer will receive a standard escalation email informing them of the escalation.
    - Person to whom the case is currently assigned will be notified.
    - Manager of the functional group to whom case is currently assigned will be notified

Incident Escalation Process:



Incident Escalation Process Steps:

All escalation process steps are performed by the Service Desk. Some of the steps may be automated.

Step	Description
1	Examine all open incidents and determine actions based upon incident priority.
2	Is this a priority 1 (high priority) incident?
3	If it is a high priority incident, immediately notify Company X senior management personnel. Senior management personnel should be contacted by email and phone.
4	Monitor the status of the priority 1 incident providing informational updates to management at a minimum of every 4 hours.
5	Has the incident been resolved? If not continue to monitor.
6	If the incident has been resolved, notify Company X senior management of the resolution. Senior management should be notified by email and phone.
7	Is this a priority 2 (medium priority) incident?
8	If so, notify the manager of the provider group performing the resolution. Notification should be by email.

Step	Description
9	Has the incident occurred during business hours or off hours? If during business hours, proceed to step 14.
10	If the incident occurred during off-hours, is the on-call person available?
11	If the on-call person is not available, call the manager of the provider group assigned for resolution.
12	Is the manager of the provider group available?
13	If neither the provider group on-call person nor the manager of the provider group is available, notify senior management via email and phone.
14	Has the time limit to resolve the incident elapsed?
15	If the time limit to resolve has elapsed, notify the manager of the provider group via email.
16	Continue to monitor the incident
17	Has the incident been resolved?
18	If the incident has been resolved notify the customer and all personnel previously contacted of the resolution.

RACI Chart

Obligation	Role Description
Responsible	Responsible for performing the assigned task
Accountable (only 1 person)	Accountable to make certain work is assigned and performed
Consulted	Consulted about how to perform the task appropriately
Informed	Informed about key events regarding the task

Activity	Senior Manager	Service Provider Manager	Service Provider	Service Desk	Company X Service Desk Manager
Record Incident in Zendesk				R	A
Accept Information from Customer	R	R	R	R	A/R

Reports and Meetings

A critical component of success in meeting service level targets is for Company X Trading Operations to hold itself accountable for deviations from acceptable performance. This will be accomplished by producing meaningful reports that can be utilized to focus on areas that need improvement. The reports must then be used in coordinated activities aimed at improving the support.

Reports

Service Interruptions

A report showing all incidents related to service interruptions will be reviewed weekly during the operational meeting. The purpose is to discover how serious the incident was, what steps are being taken to prevent reoccurrence and if root cause needs to be pursued.

Metrics

Metrics reports should generally be produced monthly with quarterly summaries. Metrics to be reported are:

- Total numbers of Incidents (as a control measure)
- Breakdown of incidents at each stage (e.g., logged, work in progress, and closed)
- Size of current incident backlog
- Number and percentage of major incidents
- Mean elapsed time to achieve incident resolution or circumvention, broken down by impact code
- Percentage of incidents handled within agreed response time as defined by SLA's standards
- Number of incidents reopened and as a percentage of the total
- Number and percentage of incidents incorrectly assigned
- Number and percentage of incidents incorrectly categorized

- Percentage of Incidents closed by the Service Desk without reference to other levels of support (often referred to as 'first point of contact')
- Number and percentage the of incidents processed per Service Desk agent
- Breakdown of incidents by time of day, to help pinpoint peaks and ensure matching of resources.

Meetings

The Quality Assurance Manager will conduct sessions with each service provider group to review performance reports. The goal of the sessions is to identify:

- Processes that are working well and need to be reinforced.
- Patterns related to incidents where support failed to meet targets
- Reoccurring incidents where the underlying problem needs to be identified and resolution activities are pursued
- Identification of work around solutions that need to be developed until root cause can be corrected

Incident Policy

- The Incident process should be followed for all incidents covered by an existing service agreement, regardless of whether the request is eventually managed as a project or through the Incident process.
- Support for or enhancement of existing services identified in existing Service Agreements requires an Incident case to be opened.
- If Company X already provides a service to a customer, but that customer wants to significantly expand that service beyond the existing cost support model in place, the request should be treated as a Service Catalogue Request and forwarded to the Company X Service Desk.
- Incidents should be prioritized based upon impact to the customer and the availability of a workaround.
- "Incident Ownership remains with the Service Desk! Regardless of where an incident is referred to during its life, ownership of the incident remains with the Service Desk at all times. The Service Desk remains responsible for

tracking progress, keeping users informed and ultimately for Incident Closure." – *ITIL Service Operation*

- Rules for re-opening incidents - Despite all adequate care, there will be occasions when incidents recur even though they have been formally closed. If the incident recurs within one working day then it can be re-opened – but that beyond this point a new incident must be raised, but linked to the previous incident(s).
- Work arounds should be in conformance with OSF ISD standards and policies.

Appendix D.3. Problem Management Guidelines

Primary goal

Problem Management is the process responsible for managing the lifecycle of all problems. The primary objectives of Problem Management are to:

- prevent problems and resulting incidents from happening;
- eliminate recurring incidents;
- minimize the impact of incidents that cannot be prevented.

Process Definition

Problem Management includes the activities required to diagnose the root cause of incidents and to determine the resolution to those problems. It is also responsible for ensuring that the resolution is implemented through the appropriate control procedures.

Objectives

Provide a consistent process to track Problems that ensures:

- Problems are properly logged
- Problems are properly routed
- Problem status is accurately reported
- Queue of unresolved Problems is visible and reported
- Problems are properly prioritized and handled in the appropriate sequence
- Resolution provided meets the requirements of the SLA for the customer

Definitions

Impact

The impact is determined by how many personnel or functions are affected. There are three grades of impact:

- 3 - Low – One or two personnel. Service is degraded but still operating within SLA specifications

- 2 - Medium – Multiple personnel in one physical location (or organization). Service is degraded and still functional but not operating within SLA specifications. It appears the cause of the Problem falls across multiple service provider groups
- 1 - High – All users of a specific service. Personnel from multiple organizations are affected. Public facing service is unavailable

The impact of the incidents associated with a problem will be used in determining the priority for resolution.

Incident

An incident is an unplanned interruption to an IT Service or reduction in the Quality of an IT Service. Failure of any Item, software or hardware, used in support of a system that has not yet affected service is also an Incident. For example, the failure of one component of a redundant high availability configuration is an incident even though it does not interrupt service.

An incident occurs when the operational status of a production item changes from working to failing or about to fail, resulting in a condition in which the item is not functioning as it was designed or implemented. The resolution of an incident involves implementing a repair to restore the item to its original state.

A design flaw does not create an incident. If the product is working as designed, even though the design is not correct, the correction needs to take the form of a service request to modify the design. The service request may be expedited based upon the need, but it is still a modification, not a repair.

Known Error Record

An entry in Zendesk which includes the symptoms related to open problems and the incidents the problem is known to create. If available, the entry will also have a link to entries in the Knowledge Base which show potential workarounds to the problem.

Knowledge Base

A database housed within Zendesk that contains information on how to fulfill requests and resolve incidents using previously proven methods / scripts.

Problem

A problem is the underlying cause of an incident.

Problem Repository

The Problem Repository is a database containing relevant information about all problems whether they have been resolved or not. General status information along with notes related to activity should also be maintained in a format that supports standardized reporting. At Company X, the Problem Repository is contained within Zendesk and Jira.

Priority

Priority is determined by utilizing a combination of the problem's impact and severity. For a full explanation of the determination of priority refer to the paragraph titled Priority Determination.

Response

Time elapsed between the time the problem is reported and the time it is assigned to an individual for resolution.

Resolution

The root cause of incidents is corrected so that the related incidents do not continue to occur.

Service Agreement

A Service Agreement is a general agreement outlining services to be provided, as well as costs of services and how they are to be billed. A service agreement may be initiated between Company X and another entity. A service agreement is distinguished from a Service Level Agreement in that there are no ongoing service level targets identified in a Service Agreement.

Service Level Agreement

Often referred to as the SLA, the Service Level Agreement is the agreement between Company X and the customer outlining services to be provided, and operational support levels as well as costs of services and how they are to be billed.

Service Level Target

Service Level Target is a commitment that is documented in a Service Level Agreement. Service Level Targets are based on Service Level Requirements, and are needed to ensure that the IT Service continues to meet the original Service Level Requirements. Service Level Targets are relevant in that they are tied to Incidents and Assistance Service Requests. There are no targets tied to Problem Management.

Severity

Severity is determined by how much the user is restricted from performing their work. There are three grades of severity:

3 - Low - Issue prevents the user from performing a portion of their duties.

2 - Medium - Issue prevents the user from performing critical time-sensitive functions

1 - High - Service or major portion of a service is unavailable

The severity of a problem will be used in determining the priority for resolution.

Problem Scope

Problem Management includes the activities required to diagnose the root cause of incidents and to determine the resolution to those problems. It is also responsible for ensuring that the resolution is implemented through the appropriate control procedures, especially Change Management and Release Management.

Problem Management will also maintain information about problems and the appropriate workarounds and resolutions so that the organization is able to reduce the number and impact of incidents over time. In this respect, Problem Management has a strong interface with Knowledge Management, and tools such as the Known Error Database will be used for both.

Although Incident and Problem Management are separate processes, they are closely related and will typically use the same tools, and use the same categorization, impact and priority coding systems. This will ensure effective communication when dealing with related incidents and problems.

Exclusions

Request fulfillment, i.e., Service Requests and Service Catalogue Requests are not handled by this process.

Initial incident handling to restore service is not handled by this process. Refer to Incident Management.

Inputs and Outputs

Input	From
Problem	Service Desk, Problem Management Team, Service Provider Group
Categorization Tables	Functional Groups
Assignment Rules	Functional Groups

Output	To
Standard notification to the problem reporter and QA when case is closed	Problem Reporter, QA Manager

Metrics

Metric	Purpose
Process tracking metrics # of Problems by type, status, and customer – see detail under	To determine if problems are being processed in reasonable time frame, frequency of specific types of problems, and

Reports and Meetings	determine where bottlenecks exist.

Roles and Responsibilities

Responsibilities may be delegated, but escalation does not remove responsibility from the individual accountable for a specific action.

Service Desk

- Ensure that all problems received by the Service Desk are recorded in Zendesk
- Delegates responsibility by assigning problems to the appropriate provider group for resolution based on the categorization rules
- Performs post-resolution customer review to ensure that all work services are functioning properly

Quality Assurance

- Owns all reported problems
- Identify nature of problems based on reported symptoms and categorization rules supplied by provider groups
- Prioritize problems based upon impact to the users and SLA guidelines
- Responsible for problem closure
- Prepare reports showing statistics of problems resolved / unresolved

Service Provider Group

- Composed of technical and functional staff involved in supporting services
- Perform root cause analysis of the problem and develop potential solutions
- Test potential solutions and develop implementation plan

Problem Reporter

- Anyone within Company X can request a problem case to be opened.
- The typical sources of problems are the Service Desk, Service Provider Groups, and proactive problem management through Quality Assurance.

Problem Management Review Team

- This may be multiple teams depending upon the service supported
- Composed of technical and functional staff involved in supporting services, Service Desk, and Quality Assurance

Problem Categorization, Target Times, Prioritization, and Escalation

In order to adequately determine if SLA's are met, it will be necessary to correctly categorize and prioritize problems quickly.

Categorization

The goals of proper categorization are:

- Identify Service impacted
- Associate problems with related incidents
- Indicate what support groups need to be involved
- Provide meaningful metrics on system reliability

For each problem, the specific service (as listed in the published Service Catalogue) will be identified. It is critical to establish with the user the specific area of the service being provided. Identifying the service properly establishes the appropriate Service Level Agreement and relevant Service Level Targets.

In addition, the severity and impact of the problem need to also be established. All problems are important to the user, but problems that affect large groups of personnel or mission-critical functions need to be addressed before those affecting 1 or 2 people.

Does the problem cause a work stoppage for the user or do they have other means of performing their job? An example would be a broken link on a web page is an incident, but if there is another navigation path to the desired page, the incident's severity would be low because the user can still perform the needed function.

The problem may create a work stoppage for only one person, but the impact is far greater because it is a critical function.

Priority Determination

The priority given to a problem that will determine how quickly it is scheduled for resolution will be set depending upon a combination of the related incidents' severity and impact.

Problem Priority			**Severity**		
			3 - Low Issue prevents the user from performing a portion of their duties.	2 - Medium Issue prevents the user from performing critical time-sensitive functions	1 - High Service or major portion of a service is unavailable
Impact	**3 - Low**	• One or two personnel • Degraded Service Levels but still processing within SLA constraints	**3 - Low**	**3 - Low**	**2 - Medium**
Impact	**2 - Medium**	• Multiple personnel in one physical location • Degraded Service Levels but not processing within SLA constraints or able to perform only minimum level of service • It appears cause of incident falls across multiple functional areas	**2 - Medium**	**2 - Medium**	**1 - High**

Problem Priority		**Severity**		
		3 - Low Issue prevents the user from performing a portion of their duties.	2 - Medium Issue prevents the user from performing critical time-sensitive functions	1 - High Service or major portion of a service is unavailable
1 - High	• All users of a specific service • Personnel from multiple agencies are affected • Public facing service is unavailable • Any item listed in the Crisis Response tables	**1 - High**	**1 - High**	**1 - High**

Workarounds

In some cases, it may be possible to find a workaround to the incidents caused by the problem – a temporary way of overcoming the difficulties.

In some cases, the workaround may be instructions provided to the customer on how to complete their work using an alternate method. These workarounds need to be communicated to the Service Desk so they can be added to the Knowledge Base and therefore be accessible by the Service Desk to facilitate resolution during future recurrences of the incident.

In cases where a workaround is found, it is important that the problem record remains open and details of the workaround are always documented within the Problem Record.

Known Error Record

As soon as the diagnosis is far enough along to clearly identify the problem and its symptoms, and particularly where a workaround has been found (even though it may not yet be a permanent resolution), a Known Error Record must be raised and placed in the Known Error tables within Zendesk or other repository – so that if further incidents or problems arise, they can be identified, and the service restored more quickly.

However, in some cases it may be advantageous to raise a Known Error Record even earlier in the overall process – just for information purposes, for example – even though the diagnosis may not be complete or a workaround found.

The known error record must contain all known symptoms so that when a new incident occurs, a search of known errors can be performed and find the appropriate match.

Major Problem Review

Each major (priority 1) problem will be reviewed on an ad-hoc basis to determine progress made and what assistance may be needed. The review will include:

- Which configuration items failed
- Specifics about the failure

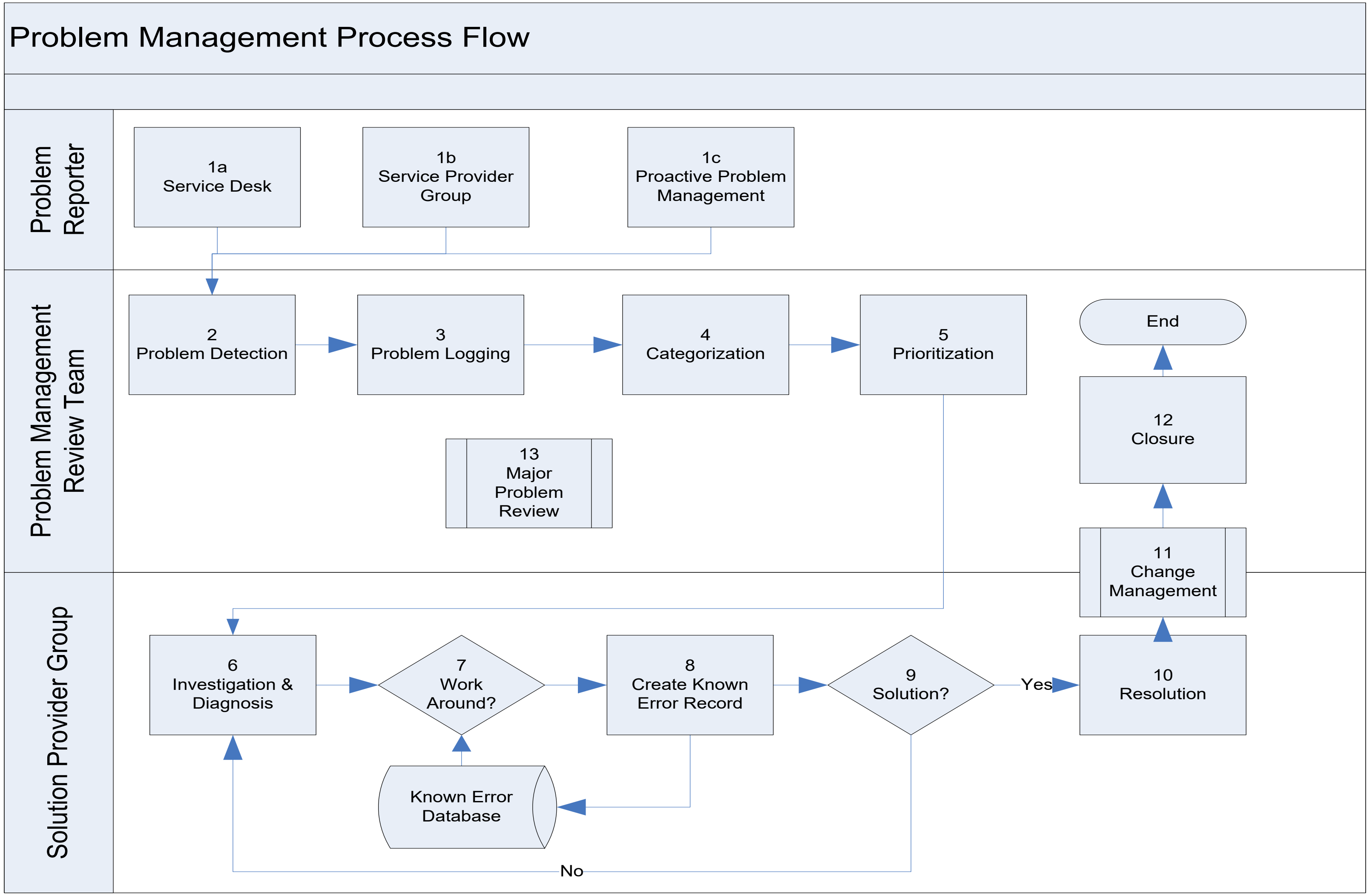
- Efforts toward root cause analysis are being taken
- Solutions are being considered
- Time frame to implement solution
- What could be done better in the future to identify the issue for earlier correction
- How to prevent recurrence
- Whether there has been any third-party responsibility and whether follow-up actions are needed.

Any lessons learned will be documented in appropriate procedures, work instructions, diagnostic scripts or Known Error Records. The Problem Manager (Quality Assurance Manager) facilitates the session and documents any agreed actions.

Process Flow

The following is the standard problem management process flow outlined in ITIL Service Operation but represented as a swim lane chart with associated roles within Company X.

Appendix D.3



Problem Management Process Flow
Problem Reporter
Problem Management Review Team
Solution Provider Group
1a Service Desk
1b Service Provider Group
1c Proactive Problem Management
2 Problem Detection
3 Problem Logging
4 Categorization
5 Prioritization
End
12 Closure
13 Major Problem Review
11 Change Management
6 Investigation & Diagnosis
7 Work Around?
8 Create Known Error Record
9 Solution?
Yes
10 Resolution
Known Error Database
No

Problem Management Process Flow Steps

Role	Step	Description
Problem Reporter	1	Problems can be reported by any group within Company X that has the opportunity to recognize a situation that is likely to create incidents. The Service Desk or the Service Provider Group may recognize there is a problem because of multiple related incidents. Quality Assurance or other groups may do trend analysis to identify potential recurring issues.
Problem Management Review Team	2	Problem detection It is likely that multiple ways of detecting problems will exist in all organizations. These will include: • Suspicion or detection of an unknown cause of one or more incidents by the Service Desk, resulting in a Problem Record being raised – the desk may have resolved the incident but has not determined a definitive cause and suspects that it is likely to recur, so will raise a Problem Record to allow the underlying cause to be resolved. Alternatively, it may be immediately obvious from the outset that an incident, or incidents, has been caused by a major problem, so a Problem Record will be raised without delay. • Analysis of an incident by a technical support group which reveals that an underlying problem exists, or is likely to exist. • Automated detection of an infrastructure or application fault, using event/alert tools automatically to raise an incident which may reveal the need for a Problem Record. • Analysis of incidents as part of proactive Problem Management – resulting in the need to raise a Problem Record so that the underlying fault can be investigated further.

Role	Step	Description
Problem Management Review Team	3	Problem Logging Regardless of the detection method, all the relevant details of the problem must be recorded so that a full historical record exists. This must be date and time stamped to allow suitable control and escalation. A cross-reference must be made to the incident(s) which initiated the Problem Record – and all relevant details must be copied from the Incident Record(s) to the Problem Record. It is difficult to be exact, as cases may vary, but typically this will include details such as: • User details • Service details • Date/time initially logged • Priority and categorization details • Incident description • Details of all diagnostic or attempted recovery actions taken.
	4	Problem Categorization Problems must be categorized in the same way as incidents using the same codes so that the true nature of the problem can be easily tied to the supported service and related incidents.

Role	Step	Description
	5	Problem Prioritization Problems must be prioritized in the same way and for the same reasons as incidents – but the frequency and impact of related incidents must also be taken into account. Before a problem priority can be set, the severity and impact need to be assessed. See paragraph 3.2 Incident Prioritization. Once the severity and impact are set, the priority can be derived using the prescriptive table.
Solution Provider Group	6	Problem Investigation and Diagnosis An investigation should be conducted to try to diagnose the root cause of the problem – the speed and nature of this investigation will vary depending upon the priority.
	7	Workarounds In some cases, it may be possible to find a workaround to the incidents caused by the problem – a temporary way of overcoming the difficulties. In cases where a workaround is found, it is important that the problem record remains open, and details of the workaround are always documented within the Problem Record.
	8	Raising a Known Error Record As soon as the diagnosis has progressed enough to know what the problem is even though the cause may not yet be identified, a Known Error Record must be raised and placed in the Known Error Database – so that if further incidents arise, they can be identified and related to the problem record.
	9	Has the root cause been determined and a solution identified?

Role	Step	Description
	10	Problem resolution As soon as a solution has been found and sufficiently tested, it should be fully documented and prepared for implementation.
Problem Management Review Team / Change Management / Solution Provider Group	11	Changes to production to implement the solution need to be scheduled and approved through the Change Management process.
Problem Management Review Team	12	Problem Closure When any change has been completed (and successfully reviewed), and the resolution has been applied, the Problem Record should be formally closed – as should any related Incident Records that are still open. A check should be performed at this time to ensure that the record contains a full historical description of all events – and if not, the record should be updated. The status of any related Known Error Record should be updated to shown that the resolution has been applied.
Service Provider Group Managers & VP	13	Weekly review of the status of open major (priority 1) problems (See Paragraph 3.5 Major Problem Review)

RACI Chart

Obligation	**Role Description**				
Responsible	Responsible for performing the assigned task				
Accountable (only 1 person)	Accountable to make certain work is assigned and performed				
Consulted	Consulted about how to perform the task appropriately				
Informed	Informed about key events regarding the task				
Activity	**Service Desk**	**Service Desk Manager**	**Service Provider Group**	**Service Provider Group Manager**	**QA Manager**
Record Problem in Zendesk	R	A	I	I	C
Categorize problem according to service and priority	C	I	R	A	I
Perform Root Cause Analysis		I	R	A	I
Develop Solution	I	I	R	A	I
Document conditions for known problem record	I	I	R	A	I
Create known problem record	R	A	C	I	I
Document workaround solution	I	I	R	A	I
Enter workaround solutions into knowledge base	R	A	C	I	I
Update Zendesk with current status on problem analysis & resolution	I	I	R	A	I
Verify solution with customer	R	A	C	C	I

Reports and Meetings

A critical component of success in meeting service level targets is for Company X Trading Operations to hold itself accountable for deviations from acceptable performance. This will be accomplished by producing meaning reports that can be utilized to focus on areas that need improvement. The reports must then be used in coordinated activities aimed at improving the support.

Reports

Service Interruptions

A report showing all problems related to service interruptions will be reviewed weekly during the operational meeting. The purpose is to discover how serious the problem was, what steps are being taken to prevent reoccurrence and if root cause needs to be pursued.

Metrics

Metrics reports should generally be produced monthly with quarterly summaries. Metrics to be reported are:

- Total numbers of problems (as a control measure)
- Breakdown of problems at each stage (e.g., logged, work in progress, and closed.)
- Size of current problem backlog
- Number and percentage of major problems

Meetings

The Quality Assurance Manager will conduct sessions with each service provider group to review performance reports. The goal of the sessions is to identify:

- Status of previously identified problems
- Identification of work around solutions that need to be developed until root cause can be corrected
- Discussion of newly identified problems

Problem Policy

- The Problem process should be followed to find and correct the root cause of significant or recurring incidents.
- Problems should be prioritized based on impact to the customer and the availability of a workaround.
- <u>Problem Ownership remains with Quality Assurance!</u> Regardless of where a problem is referred to during its life, ownership of the problem remains with the

Quality Assurance at all times. Quality Assurance remains responsible for tracking progress, keeping users informed and ultimately for Problem Closure.

- Rules for re-opening problems - Despite all adequate care, there will be occasions when problems recur even though they have been formally closed. If the related incidents continue to occur under the same conditions, the problem case should be re-opened. If similar incidents occur, but the conditions are not the same, a new problem should be opened.
- Workarounds should be in conformance with Company X standards and policies.

Appendix D.4. Change Management Guidelines

The purpose of the change management process is to ensure that:

• Standardized methods and procedures are used for efficient and prompt handling of all changes

• Business risk is managed and minimized

• All authorized changes support business needs and goals

Changes should be managed to:

• Reduce risk exposure

• Minimize the severity of any impact and disruption

• Be successful on the first attempt

Benefits of Change Management

Risk Reduction

Change Management minimizes the risk of introducing harmful changes into the production environment.

Service Quality Improvement

The proper assessment of the impact of changes prevents unscheduled service outages. This increases service quality. Change records allow for continuous process improvement and facilitate the resolution of issues related to change.

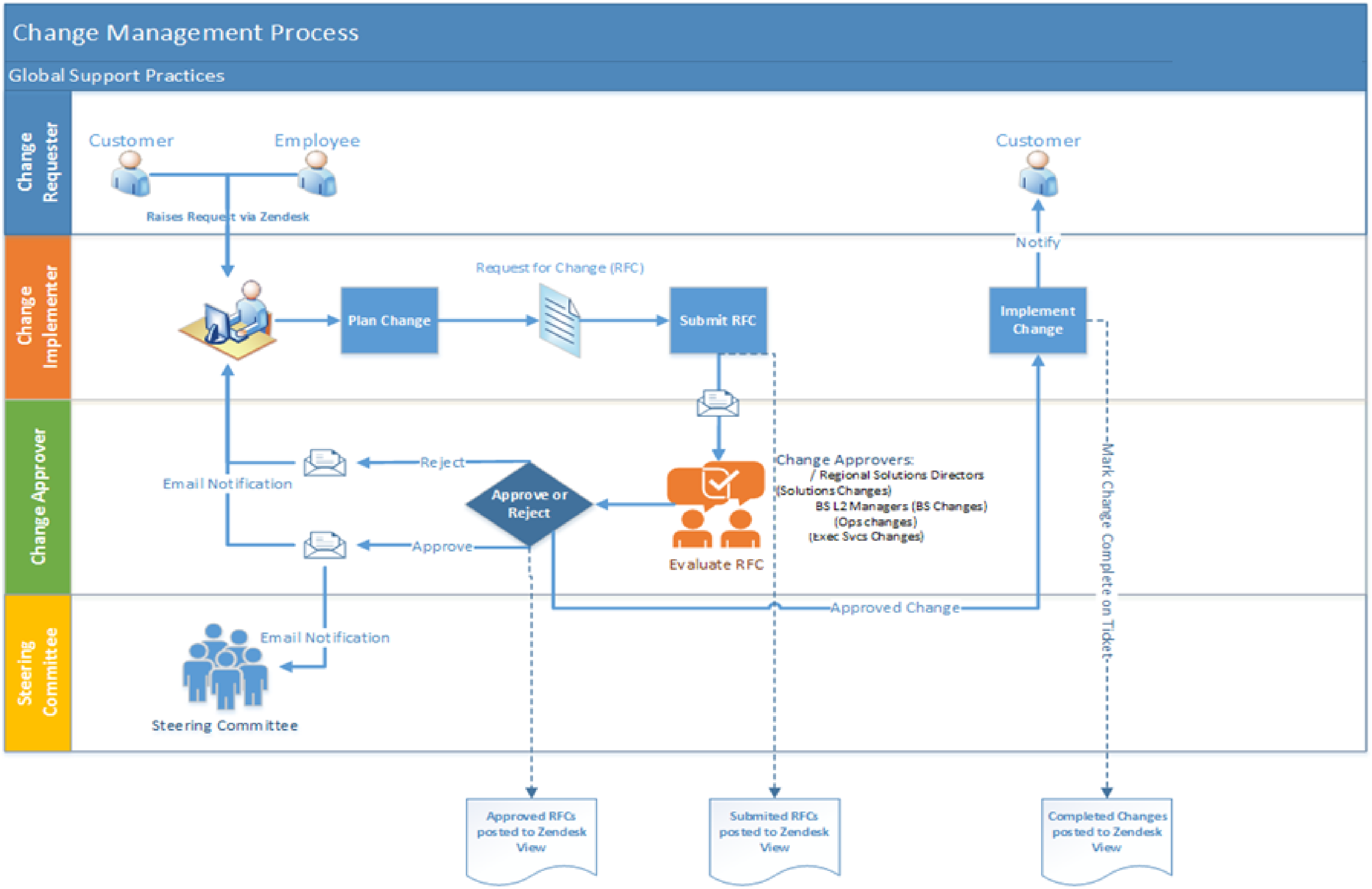
Cost Reduction

Effective change management reduces rework and backouts.

List of change categories which require adherence to this process:

Business Support	**Solutions**	**Executions Services**	**MAS\Ops**
Production Changes pertaining to the following: 1. Any config portal changes 2. Liquidity Rule changes 3. Any Server Bounce (aka restarts) during Trading week	Production Changes pertaining to the following: 1. Config Portal - Multihost Property 2. Config Portal - Partial Fill' 3. Config Portal - any global scope change involving a provider 4. Currency Pair Group Changes 5. Customer server migrations 6. Liquidity Provisioning - Any Change	All Production Changes	All Production Changes with the exception of the following: 1. DNS Record Adds/Changes 2. Script changes for reports 3. STP queue creation 4. Database queries run on standby servers

The list of changes which require the Change Management process may be modified by the Change Management steering committee as needed.


Change Management Process
Global Support Practices
Change Requester
Change Implementer
Change Approver
Steering Committee
Customer
Employee
Customer
Raises Request via Zendesk
Notify
Request for Change (RFC)
Plan Change
Submit RFC
Implement Change
Reject
Email Notification
Approve or Reject
Approve
Change Approvers:
/ Regional Solutions Directors
(Solutions Changes)
BS L2 Managers (BS Changes)
(Ops changes)
(Exec Svcs Changes)
Evaluate RFC
Approved Change
Mark Change Complete on Ticket
Email Notification
Steering Committee
Approved RFCs posted to Zendesk View
Submited RFCs posted to Zendesk View
Completed Changes posted to Zendesk View

Change Management Process:

1. An RFC (Request for Change) triggers the process. RFC’s are raised and submitted by the person making the change (hereinafter referred to as “change implementer”.)
2. The RFC answers a set of predefined questions which help teams analyze proposed changes and plan for successful implementation.
3. The RFC becomes a change record that tracks the change through the process.
4. All RFC’s should be associated with an existing Zendesk ticket.
5. RFC’s are created on an existing ticket by using the Zendesk Macro “Change Control”. This macro populates the ticket with a private comment containing the RFC questions. *described in further detail in the Submit a Request For Change section of this document.*
6. After the RFC is completed, the change implementer needs to set the Change Control Status to *Submitted.*
7. Submitting an RFC triggers a notification email to be sent to the change implementer’s authorized approver group.
8. The Change Approvers are comprised of managers of Business Support, Operations, Solutions, and Execution Services.
9. Change approvers will review submitted RFC’s for completeness and adequate documentation of change steps, validation plans, and rollback steps. The change approver reviewing the RFC has the right to reject the RFC, which sends it back to the ticket assignee to modify the RFC as needed.
10. To approve the RFC, the Change Approver needs to set the Change Control Status to *Approved.* Upon saving the ticket with the approved status, notification emails are sent to both the change implementer, as well as the Change Management steering committee.
11. The notification to the steering committee allows managers from other global support groups to be aware of changes being made by other groups. Members of the change management steering committee may raise objections or questions to the approved changes by commenting on the ticket directly.
12. Upon receiving the approval, the change implementer is authorized to proceed with implementation of the changes per the steps and schedule defined in the

RFC. Any deviation from the RFC will require modification to the RFC and submission for re-evaluation.

13. After implementation of the changes, the change implementer is responsible for setting the Change Control status field to *Completed.* This ends the workflow of change management

The 4 steps of Distributed Change Management

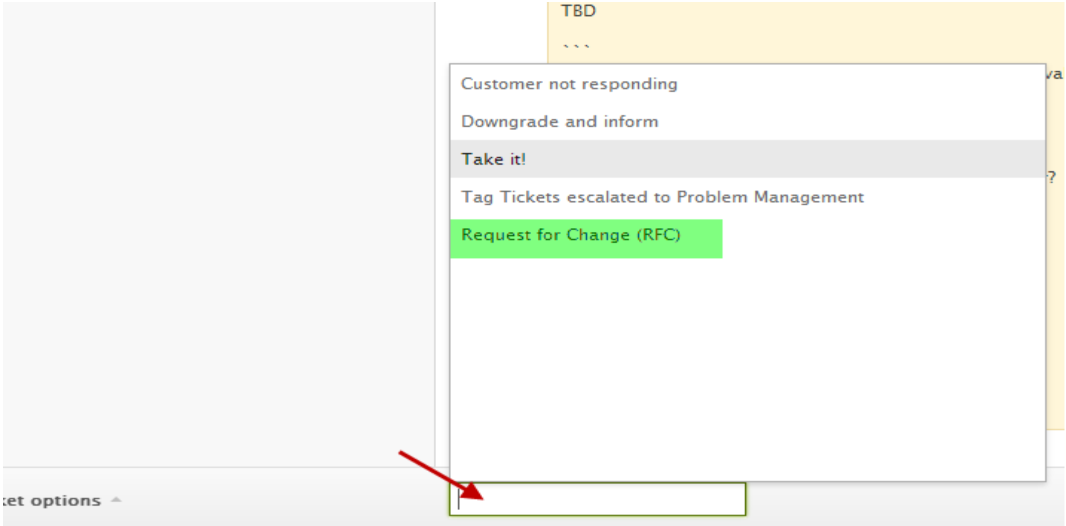
1. Submit Request for Change (RFC)
2. Evaluate and Approve RFC
3. Implement the change and Complete RFC
4. Post Implementation Review in Change Management Steering Committee

1) Submit a Request for Change (RFC)

The change implementer is ultimately responsible for completing the RFC form and having the necessary evaluations done prior to the RFC being reviewed.

RFC Questions	**Instructions**
Describe the change being made	Brief summary explaining the proposed changes and the business need for the changes
Who requested the change? (Customer, Product Owner, eStaff member, ...)	If Customer, list the name(s) of the requester. If applicable, list FXI OrgID of the customer. If request is being made internally, list the person's name
Which individual(s) are implementing the changes?	List all people involved in implementing the changes.
List the configuration items involved with the change (orgs, servers, config portal properties, network devices)	i.e., Admin Portal, Config Portal. Which Org namespace(s) involved in changed? If physical infrastructure, list device name, hostname, IP address.
What is the impact if this change?	Explain how this change impacts the functionality of the system\application

RFC Questions	**Instructions**
	being changed
List the specific steps taken to make this change	All steps involved in this change MUST be listed.
Scheduled date and time of change	Date and time when this change should be implemented. Make note If the change can only be implemented outside of trading hours.
Who will be affected? Impact to customers? How many customers impacted?	
Who reviewed this change before it is implemented	Changes should be reviewed by a peer or manager to ensure the implementation steps are correct
What is the checkout plan? (How will the change be validated for success?)	List, in detail, how this change will be validated once the change is implemented
Does this change require validation by the customer? If so, how?	For changes that have significant impact to the customer(s), we should ask the customer to validate that the changes they are requesting have been implemented successfully, without any negative impact.
How to roll back the change	List the steps needed to successfully rollback to the state immediately prior to making the changes.



Selecting the Macro **Request For Change (RFC),** will populate the RFC questions in a new Private comment on the ticket. The Change Implementer will need to fill in the highlighted TBD sections.

Appendix D.4

Public reply | Internal note | your comment is visible to agents only | Preview

~~~~
Change Control

### Describe the change being made
```
TBD

```
### Who requested the change? (Customer, Product Owner, eStaff member, ...)
```
TBD

```
### Which individual(s) are implementing the changes?
```
TBD

```
### List the configuration items involved with the change (orgs, servers, config portal properties,
network devices, etc)
```
TBD

```
### What is the impact of this change?
```
TBD

```
### Who will be affected?  Impact to customers?  How many customers impacted?
```
TBD

```
### List the specific steps taken to make this change:
```
TBD

```
### Scheduled date and time of the change
```
  MM/DD/2014

```
### Who reviewed this change before it was implemented?
```
TBD

```
### What is the checkout plan? (How will the change be validated for success?)
```
TBD

```
### Does this change require validation by the customer?  If so, how?
```
TBD

```
### How would the change be rolled back?
```
TBD

```
~~~~

Record screencast   Attach file

2) Evaluate and Approve RFC

- There is a need for reviewers within each group to review and approve RFC's
- Reviewers are designated from each group making the change or a part of the change
- Zendesk RFC case to be updated as appropriate based on review
- When the Zendesk RFC case is approved, Zendesk will send an email to cross-functional Change Management Steering Committee. The members of this group can respond with any issues or concerns they have with the change prior to that change being implemented.
- RFC States:
- Submitted
    - Change Request has been submitted for review.
- Approved
    - Change is approved, go ahead and make the change at the requested date / time.
- Rejected
    - Change is rejected either for inadequate information in the RFC or the proposed plan is flawed.
    - If changes to scope, validation, backout plan, etc., are required the Zendesk RFC must be updated to reflect those changes. It is imperative the RFC be an accurate reflection of the change and the plan for that change.
- Completed
    - Changes have been implemented. Setting the change control status to completed signals completion of the change control process.

Authorized Change Approvers for each Group:

Business Support	Solutions	Executions Services	MAS\Ops
• BS1 • BS2 • BS3	• S1 • S2 • S3	• ES1	• OPS1 • OPS2 • OPS3

3) Complete RFC

- Approved RFC's where an attempt to implement was made will be reviewed in the next applicable Change Management Steering Committee meeting.
- It is the Change Implementer's responsibility to update the ticket's Change Control Status to "Completed" once the changes have been implemented.

4) Post Implementation Review in Change Management Steering Committee

- A weekly review of changes made:
  - What went well?
  - What didn't go well?
  - Anything learned?
- Membership
  - Primary members must designate a secondary when they cannot attend
- Chair:
- Schedules and facilitates the weekly Change Management Steering Committee meetings
- Presents the list of RFC's to be reviewed (changes made since the last meeting)
- Takes notes and action items. Follows up on outstanding action items.
- Maintains change reporting (out of Zendesk)
  - Publishes the list of changes made since the last meeting

Emergency Change Model

- For changes that must be implemented immediately, change requesters still must create an RFC case in Zendesk.
- The requestor must announce this emergency change to group reviewers explaining why the change cannot wait to be reviewed and approved before it is implemented.
- Group reviewers to review RFC post-implementation.

Change categories

- Normal = changes that must be reviewed by group reviewers
- Standard = Self-approved and may with the consent of group reviewers be removed from change management process.
- Emergency = changes that must be implemented ASAP to resolve a major incident. These go through the emergency change process

Synopsis

- We are taking this distributed review and approval to accommodate the rapid rate at which teams need to make changes to the production environment.
- This distributed model provides standards to enable a disciplined approach to make changes to the production environment. It requires change requestors to think through the changes they are making.
- The fields in the Zendesk RFC case form are designed to facilitate thinking through a change, asking change requestors to detail implementation, validation, and back out steps as well as assess risk and potential impact.
- Group reviewers are ultimately accountable for ensuring change requestors are thoughtful and careful with the changes they are making.
- We do recommend all changes (normal, standard, emergency) be logged as an RFC case in Zendesk to provide a log of all changes made to the production environment.

Appendix E. ARC2 - Documentation related to Process Capability Assessment

Appendix E.1. Process Assessment Survey Invitation Email

Mon 10/17/2016 2:54 PM

Suren Behari <[redacted]>

ITSM Process Improvement Surveys

To [redacted]

Cc suren.behari@gmail.com

Hi guys,

As many of you know, I am a doctoral student with the University of Southern Queensland Australia, undertaking an action research project entitled **"Exploring the Impact of Information Technology Service Management (ITSM) Maturity on Business Performance".**

The purpose of this project is to assess the capability and performance of processes for Incident Management, Problem Management and Change Management at [redacted].

I am requesting your assistance because you are directly involved with these ITSM processes at [redacted] and your domain knowledge and views will provide invaluable insights to this research. To spice things up a bit, I decided to part with $50 of my hard earned money to offer as an incentive for completing the surveys by the completion date. All participants that complete by the closing date will be entered into a draw to win 50 big ones.

Your participation may involve the completion of online surveys, interviews and/or focus group discussions. The survey questions are based on the international standard of ITSM: ISO/IEC 20000 and the international standard of process assessment: ISO/IEC 15504. This survey is **NOT** an assessment of your individual performance but a general process assessment in a research setting.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland or [redacted].

It is expected that this project will directly benefit you and will help you by providing an assessment of [redacted] critical IT service processes in terms of international standards-based ISO/IEC 15504 capability levels. In collaboration with an industry partner, Assessment Portal Pty Ltd, we get to use an assessment tool (for free) that uses an international standard measurement framework to conduct effective, objective and repeatable assessments with relatively minimal time and resource commitments. The recommendations provided by the assessment tool can also be followed by us to enhance our process efficiency.

All comments and responses will be treated confidentially unless required by law. The names of individual persons are not required in any of the responses. Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Expect to receive an email from donotreply@assessment-portal.com very shortly. Please **DO NOT DELETE** this email. It contains valuable information on the survey and should be used as a reference when taking the survey. Please try to complete the survey(s) by the completion date. Clicking on the 'Submit' button at the conclusion of the online survey is accepted as an indication of your consent to participate in this project.

Thanks for your participation in supporting the research and [redacted].

Best of luck.

Cheers,
Suren

Appendix E.2. Auto-generated survey invitation email

Mon 10/17/2016 2:09 PM

donotreply@assessment-portal.com

Your invitation to complete survey(s). ISO/IEC 15504 part 8 assessment for Trading Operations

To Suren Behari

This email was generated automatically please **DO NOT REPLY**.

Dear Suren,

Further to your recent email from Suren Behari you have been selected to participate in a research project to evaluate the capability of IT Service Management (ITSM) processes at [redacted]. This research is supported by the assessment sponsor Suren Behari. This is a collaborative research project supported by the University of Southern Queensland and an industry partner Assessment Portal Pty Ltd.

Participation involves completing online surveys for ITSM process assessments. The questions are based on the international standard of ITSM: ISO/IEC 20000 and the international standard of process assessment: ISO/IEC 15504. This survey is **NOT** an assessment of your individual performance but a general process assessment in a research setting.

We are aiming for the surveys to be completed by close of business on 07/11/16.

Additional information will be available when you access your survey(s) by clicking on the following link: Survey Portal

For each assessment question in the survey, please select one option that best corresponds to your answer. Questions are sequenced based on the capability levels defined in the ISO/IEC 15504 standard. At the completion of each level, the survey will inform your progress and process assessment objectives for the next level questions. Every response is saved instantly therefore you can come back to this survey and start from where you left anytime. Please note if you go BACK in any of the responses it deletes the current response. You are also encouraged to provide any specific comments that you may have to explain or justify your answer option to any question.

Answer options	**Selecting this options means**
Yes, always	You are certain that the activity is usually performed.
Yes, most of the time	You are certain that the activity is performed in the majority of cases.
Yes, but only sometimes	You know that the activity is performed but not frequently.
No, never	You are certain that the activity is not or rarely performed.
Don't know or unable to comment	You do not have enough information to answer the question
Don't understand the question	You do not think the question is clear or relevant in your context.

This research project has been approved by USQ's Human research Ethics Committee (Approval No. H15REA220). If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details:

Human Research Ethics Committee
University of Southern Queensland
Phone: +61 7 4631 2690, Email: ethics@usq.edu.au

All information will be kept confidential. Your response will be coded and no information will be reported that will identify you as the source. Your completion and submission of this survey implies informed consent. Your participation is voluntary. If at any time during the study you wish to withdraw your participation, you are free to do so without consequence and without need to provide a reason. Upon completion of the study both yourself, as a participant, and the university will have access to a summary of the study's findings.

If you have any questions prior to your participation or at any time throughout the study, please do not hesitate to contact your assessment facilitator Suren Behari @ suren.behari@usq.edu.au.

Kind Regards,
Suren Behari
suren.behari@usq.edu.au
University of Southern Queensland

Appendix E.3. Auto-generated survey reminder email

Thu 10/27/2016 12:46 AM

donotreply@assessment-portal.com

Reminder to complete survey(s). ISO/IEC 15504 part 8 assessment for Trading Operations

To Suren Behari

This email was generated automatically please DO NOT REPLY.

Dear Suren,

Further to my recent email inviting your participation in the assessment referred to in the subject line, this email is a reminder that we are approaching our completion deadline of 07/11/16 (7 November 2016).

If you are able to find the time to complete your survey(s) before close of business on this date your input will be greatly appreciated. As mentioned previously, your responses will be completely anonymous.

Additional information will be available when you access your survey(s) by clicking on the following link:Survey Portal

On behalf of the Trading Operations I would like to thank you in advance for your time and consideration. In the meantime if you have queries regarding the surveys please do not hesitate to contact me using the address below.

Don' forget the 50 bucks that's up for grabs!!!

Kind Regards,
Suren Behari
suren.behari@usq.edu.au
University of Southern Queensland

Appendix E.4. Thank you email

Tue 1/10/2017 9:38 PM

Suren Behari

RE: ITSM Process Improvement Surveys

To [redacted]

Cc suren.behari@gmail.com

I thank all participants that eventually found the time to complete the surveys.

The capability and performance measurements for 2016 are now available @ https://sites.google.com/a/[redacted]/itsm/

As promised, I have randomly selected a participant from the list that completed the surveys by the due date.

For good measure (no pun intended) I used Excel's implementation of the Mersenne Twister algorithm and normalized the results via a Monte Carlo simulation to select the winner.

[redacted] (AKA [redacted])

[redacted] has been invited to visit the [redacted] office and will be receiving the prize in person this week.

Congratulations [redacted]!!!!

Appendix E.5. Focus Group Invitation Email

Tue 4/11/2017 7:34 PM

Suren Behari

ITSM Process Improvement Focus Group

To [redacted]

Cc Suren Behari

Message | Information Sheet Focus Group.docx (48 KB) | Consent Form Focus Group.docx (45 KB)

Hi guys,

Please help me with my research by getting together as a group to engage in a brief post-mortem analysis of the surveys for one last time.

You have been purposefully selected for this focus group discussion to

- collect data in order to evaluate the experience of using the Software Mediated Process Assessment (SMPA) tool at [redacted]
- discuss the summary of the assessment survey results
- evaluate the reliability of the outcome
- address some of the comments entered in the surveys.

This meeting will be time boxed to no more than 30 minutes, so please find the time to participate.

Please find attached the Focus Group Information Sheet providing more detail about Focus Group and a Consent Form that needs to be signed by you prior to your participation.

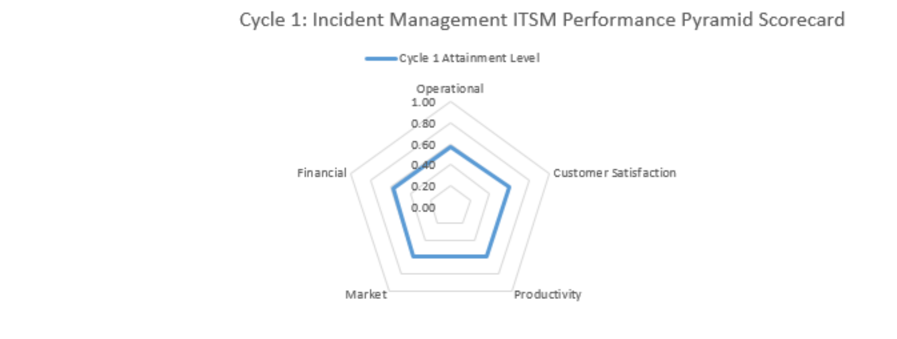
I would like to schedule this for next Tuesday (04/18/17) from 1:30pm to 2:00pm, so please let me know of your availability before I set up the meeting request.

Thanks for your support,
Suren

Appendix F. ITSM³ Spreadsheet Model

Appendix F.1. Operational Metrics

	CYCLE 1: INCIDENT MANAGEMENT DASHBOARD		
3	**Operational Metric**	**Data**	**Data Source**
4	Total Number Of Incidents	**10,171**	Incident Management System
5	Average Time To Resolve Severity 1 and Severity 2 Incidents (Hours)	**52.2**	Incident Management System
6	Number Of Incidents Resolved Within Agreed Service Levels	**3,377**	Incident Management System
7	Number Of High Severity/Major Incidents	**6,672**	Incident Management System
8	Number Of Incidents With Customer Impact	**3,371**	Incident Management System
9	Number Of Incidents Reopened	**1,116**	Incident Management System
10	Average Incident Response Time	**7.2**	Incident Management System
11	Average incident closure duration	**166.5**	Incident Management System
12	Incidents completed without escalation	**8,462**	Incident Management System
13	Total Available Labor Hours To Work On Incidents	**22,080**	Staffing Reports
14	Total Labor Hours Spent Resolving Incidents	**8,000**	Labor Reports
15	Incident Management Cost	**$1,303,416**	Salary Report
16	Cost of Outages	**$17,370**	Outage Reports
17	Incident Management Process Capability	**14.5%**	SMPA Report



Appendix F.2. Key Performance Indicators

18		Results at or better than this level indicate KPIs are met	Results at or worse than this level indicate action is needed	L = Less is desirable M = more is desirable								
19	**Key Performance Indicator**	**Target**	**Warning**	**Polarity**	**KPI Result**	**KPI Meaning**	**KPI Score**	**Quickly Resolve Incidents**	**Maintain IT Service Quality**	**Improve IT And Business Productivity**	**Effectively Resolve Incidents**	**Cost Savings**
20	Number Of Incident Occurrences	**10,000**	**11,000**	**L**	**10171**	How many incidents did we experience within our infrastructure?	2	0.00	0.00	0.15	0.00	0.00
21	Number Of High Severity/Major Incidents	**5000**	**6000**	**L**	**6672**	How many major incidents did we experience?	1	0.10	0.15	0.00	0.00	0.10
22	Incident Resolution Rate	**0.50**	**0.40**	**M**	**0.33**	How successful are we at resolving incidents per business requirements?	1	0.25	0.00	0.10	0.00	0.10
23	Customer Incident Impact Rate	**0.30**	**0.50**	**L**	**0.33**	How well are we keeping incidents from impacting customers?	2	0.00	0.15	0.00	0.00	0.00
24	Incident Reopen Rate	**0.10**	**0.20**	**L**	**0.11**	How successful are we at permanantly resolving incidents?	2	0.15	0.00	0.15	0.00	0.00
25	Average Time To Resolve Severity 1 and Severity 2 Incidents (Hours)	**40**	**60**	**L**	**52.20**	How quickly are we resolving incidents?	2	0.15	0.20	0.00	0.25	0.00
26	Average Incident Response Time	**4.0**	**8.0**	**L**	**7.2**	How quickly are we responding to incidents?	2	0.00	0.30	0.20	0.00	0.00
27	Percentage of Incidents completed without escalation	**0.90**	**0.70**	**M**	**0.83**	How successful are we at one-touch tickets?	2	0.10	0.00	0.10	0.20	0.05
28	Incident Labor Utilization Rate	**0.50**	**0.75**	**L**	**0.36**	How much available labor capacity was spent handling incidents?	3	0.05	0.20	0.00	0.20	0.10
29	Incident Management Cost	**$1,000,000**	**$1,200,000**	**L**	**$1,303,416**	What does it cost us to manage the process?	1	0.20	0.00	0.15	0.15	0.25
30	Cost of Major Issues and Outages	**$15,000**	**$20,000**	**L**	**$17,370**	What do outages and major incidents cost us?	2	0.00	0.00	0.00	0.20	0.25
31	Incident Management Process Capability	**10%**	**20%**	**L**	**14.5%**	How good is our Incident Management practices?	2	0.00	0.00	0.10	0.00	0.15
32								1.50	2.05	1.74	2.05	1.65

Appendix F.3. Critical Success Factors

	Critical Success Factor	Attainment	Weighted Average of KPIs	Service Outages	Rework	Waste	Delayed Solutions	Slow Operational Processes	Security Breaches	Slow Turnaroun	Inability to scale	Fines and Penalties	High Levels Of Non-Value Labor	Loss of Market Share	Loss of Revenue/Sales
33															
34															
35	Quickly Resolve Incidents	P	0.50	0.00	0.40	0.40	0.00	0.00	0.00	###	0.50	0.00	0.30	0.00	0.25
36	Maintain IT Service Quality	L	0.68	0.40	0.00	0.00	0.00	0.00	0.00	###	0.00	0.00	0.00	0.20	0.00
37	Improve IT And Business Productivity	L	0.58	0.00	0.20	0.20	0.60	0.60	0.00	###	0.50	0.00	0.30	0.35	0.25
38	Effectively Resolve Incidents	L	0.68	0.20	0.20	0.20	0.40	0.40	0.30	###	0.00	0.00	0.20	0.20	0.00
39	Cost Savings	L	0.55	0.40	0.20	0.20	0.00	0.00	0.70	###	0.00	1.00	0.20	0.25	0.50
40				0.63	0.56	0.56	0.62	0.62	0.59	###	0.54	0.55	0.57	0.61	0.54

Appendix F.4. Business Risks

				Enter the Weight of the Business Risk if it applies to the ITSMP[2] Dimension				
41								
42								
43	**Business Risk**	**Risk Level**	**Weighted Average of applicable CSFs**	**Operational**	**Customer Satisfaction**	**Productivity**	**Market**	**Financial**
44	Service Outages	L	0.63	0.00	0.15	0.00	0.10	0.05
45	Rework	L	0.56	0.15	0.00	0.15	0.05	0.05
46	Waste	L	0.56	0.10	0.00	0.20	0.05	0.05
47	Delayed Solutions	L	0.62	0.00	0.00	0.15	0.10	0.00
48	Slow Operational Processes	L	0.62	0.00	0.00	0.15	0.05	0.00
49	Security Breaches	L	0.59	0.00	0.25	0.00	0.00	0.05
50	Slow Turnaround Times	L	0.57	0.00	0.00	0.00	0.05	0.00
51	Unexpected Costs	L	0.59	0.20	0.20	0.05	0.05	0.15
52	Higher or escalating costs	L	0.59	0.10	0.10	0.05	0.10	0.15
53	Slow Response To Business Needs And Changes	L	0.60	0.10	0.00	0.05	0.05	0.05
54	Inability to scale	L	0.54	0.15	0.00	0.10	0.00	0.00
55	Fines and Penalties	L	0.55	0.00	0.00	0.00	0.00	0.15
56	High Levels Of Non-Value Labor	L	0.57	0.20	0.00	0.05	0.05	0.05
57	Loss of Market Share	L	0.61	0.00	0.15	0.05	0.20	0.05
58	Loss of Revenue/Sales	L	0.54	0.00	0.15	0.00	0.15	0.20
59				0.57	0.59	0.58	0.59	0.57
60				L	L	L	L	L

Appendix G. Research Timeline

Research Activity		
Research Methodology Coursework	Mar-2014	Oct-2014
Literature Review	Mar-2015	Dec-2017
Proposal Development	Mar-2015	May-2015
Proposal Submission and Revision	Jun-2015	Jun-2015
Confirmation of Candidature Presentation	Jul-2015	Jul-2015
Ethics Approval	Oct-2015	Oct-2015

Action Research Phase	KISMET Phase & Activity	Start Date	End Date
Diagnose	**Action Research Cycle 1**		
	KISMET Phase 1: Create a process improvement infrastructure	**23-Feb-2015**	**31-Oct-2015**
	Project Kickoff	23-Feb-2015	23-Feb-2015
	Meeting to review current state of ITSM processes	27-Feb-2015	27-Feb-2015
	Strategic planning meeting to establish CSFs	28-Feb-2015	2-Mar-2015
	Selection and Deployment of ITSM Software Tools	1-Mar-2015	30-Apr-2015
	Migration of data from SugarCRM and Bugzilla to Zendesk and Jira	1-May-2015	31-Jul-2015
	Set up Performance Metrics	1-Aug-2015	31-Oct-2015
	KISMET Phase 2: Assess process capability and performance	**10-Nov-2015**	**29-Feb-2016**
	Process assessment preparation	10-Nov-2015	12-Nov-2015
	Process assessment data collection	16-Nov-2015	30-Nov-2015
	Analysis of process capability assessment report	1-Dec-2015	9-Dec-2015
	Focus group workshop	13-Jan-2016	13-Jan-2016
	Financial measurement	1-Feb-2016	29-Feb-2016
	Process performance assessment	1-Feb-2016	29-Feb-2016
	Action Research Cycle 2		
	KISMET Phase 1: Create a process improvement infrastructure	**1-Oct-2016**	**30-Nov-2016**
	Meeting to identify process assessment survey participants	1-Oct-2016	1-Oct-2016
	Strategic planning meeting to review CSFs	10-Oct-2016	10-Oct-2016
	KISMET Phase 2: Assess process capability and performance	**17-Oct-2016**	**29-Feb-2016**
	Process assessment preparation	17-Oct-2016	17-Oct-2016
	Process assessment data collection	17-Oct-2016	14-Nov-2016
	Analysis of process capability assessment report	15-Nov-2016	31-Dec-2016
	Financial measurement	1-Jan-2017	31-Jan-2017
	Process performance assessment	1-Feb-2017	02/29/2017
	Focus group workshop	21-Mar-2017	21-Mar-2017

Plan	**Action Research Cycle 1**		
	KISMET Phase 3: Plan process improvement action	**22-Feb-2016**	**27-Feb-2016**
	Interviews/Meetings to discuss process improvement action	22-Feb-2016	27-Feb-2016
	Action Research Cycle 2		
	KISMET Phase 3: Plan process improvement action	**3-Apr-2017**	**21-Apr-2017**
	Interviews/Meetings to discuss process improvement action	3-Apr-2017	21-Apr-2017
Take Action	**Action Research Cycle 1**		
	KISMET Phase 4: Design process improvement guidelines	**1-Mar-2016**	**23-Mar-2016**
	Development of process guidelines	1-Mar-2016	23-Mar-2016
	KISMET Phase 5: Execute the process improvement plan	**1-May-2016**	**31-Oct-2016**
	Execute on improvement plan	1-May-2016	31-Oct-2016
	Action Research Cycle 2		
	KISMET Phase 4: Design process improvement guidelines	**24-Apr-2017**	**30-Apr-2017**
	Development of process guidelines	24-Apr-2017	30-Apr-2017
	KISMET Phase 5: Execute the process improvement plan	**1-May-2016**	**31-Oct-2016**
	Execute on improvement plan	1-May-2016	31-Oct-2016
Evaluate Action	**Action Research Cycle 1**		
	KISMET Phase 6: Evaluate process improvement	**1-Nov-2016**	**30-Nov-2016**
	Evaluate the outcomes of the process improvement program	1-Nov-2016	30-Nov-2016
	Action Research Cycle 2		
	KISMET Phase 6: Evaluate process improvement	**1-Nov-2017**	**30-Nov-2017**
	Evaluate the outcomes of the process improvement program	1-Nov-2017	30-Nov-2017
Reflect	**Action Research Cycle 1**		
	KISMET Phase 7: Continual service improvement	**1-Dec-2016**	**31-Dec-2016**
	Conduct process reviews and report process improvement ideas	1-Dec-2016	31-Dec-2016
	Action Research Cycle 2		
	KISMET Phase 7: Continual service improvement	**1-Oct-2016**	**31-Dec-2017**
	Conduct process reviews and report process improvement ideas	1-Oct-2016	31-Dec-2017