

Determining the Challenges and Requirements of Health Information Technology
Service Management

by

Paul Payne
BSc, University of Victoria, 2012

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

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in the School of Health Information Science

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Abstract

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Information Technology (IT) systems have now become an important component of the delivery of healthcare services in Canada. Appropriately supporting healthcare technologies is critical to ensuring successful management and use of these systems. The purpose of this thesis is to determine the challenges and requirements associated with providing support services for healthcare technologies, specifically through the use of standardized IT Service Management (ITSM) frameworks. To accomplish this a systematic review is completed on the implementation, adoption and use of ITSM in healthcare. In addition, a survey of healthcare providers and health informatics professionals is conducted to explore the current gaps and challenges with supporting healthcare technologies. The results of the systematic review and survey are used to define the challenges and requirements of ITSM in the healthcare domain. Using the research findings, a conceptual Health ITSM (HITSM) framework is proposed.

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Dedication

This thesis is dedicated to the memory of my father, Dr. Raymond Payne.

Chapter 1 - Introduction

Background

As Tierney et. al. (2006) eloquently state - “information is care” illustrating the concept that information management is one of the core principles of healthcare. Everything a healthcare provider does in providing care to a patient involves the flow of information (histories, laboratory tests, referrals, physical examination, diagnoses, interventions, progress notes and follow-ups). This entire process revolves around the collection, management, and reporting of data in readable formats to the provider, thus facilitating the care process (2006). Information management is a crucial factor in the successful delivery of health care services; regardless of what technology is used i.e. paper records or Information Technology (IT) systems (Alvarez, 2002). Prior to the introduction of IT systems, the documentation of healthcare was primarily done through paper case notes, which in many instances provide an incomplete picture of the full patient story. This paper-based system led to duplication of work and the storage of information in unlinked, disparate silos, which could not be easily joined. Recognizing the potential of technology to enhance or overcome some of the challenges of information management in healthcare, IT systems and services are now a fundamental component of the delivery of healthcare services in Canada (Canada Health Infoway, 2013). In many healthcare delivery organizations, IT systems and services are used to support or enable patient care, as well as materials management and administrative functions, such as utilization planning and billing.

A number of support functions are required to ensure IT systems and services are successfully delivered. Typical functions include service desk for front line support and triaging of issues, general infrastructure services to provide technical support of servers, networks and other infrastructure, training services to ensure users can operate applications, and data quality services to ensure data is being correctly captured and stored (NHS, 2014). The above functions, along with other services such as problem management, change management and governance collectively make up IT service management (ITSM). Different frameworks have been developed to support best practice in ITSM, which provide a guide to organizations (in many industries, not just healthcare) in implementing standard processes and functions for ITSM. One such framework, the IT Infrastructure Library (ITIL) and accompanying standard (ISO/IEC 20000), is the most widely used framework for ITSM (Kabachinski, 2011). In a 2013 systematic review of healthcare technology adoption (Li, Talaei-Khoei, Seale, Ray, & MacIntyre), on-going IT support was identified as an attribute that greatly increases the acceptance of new systems. In addition, a number of systematic reviews (Boonstra and Broekhuis, 2010; Keshavjee et. al.,2006; Lau et. al., 2012), related to the adoption and implementation of Electronic Medical Records (EMRs) identified appropriate and on-going IT services as a critical success factor. From a financial perspective, on-going support and management of IT systems and services accounts for 70-90% of the total cost of ownership for a technology (Winniford, Conger, & Erickson-Harris, 2009), reinforcing the need for standardized and consistent IT support services to ensure cost effective IT management.

Research Question

The question that this thesis intends to answer is: *What are the challenges and requirements associated with providing support services for healthcare technologies, specifically through the use of a standardized ITSM framework?*

Research Objectives

The following objectives will be used to help answer the research question:

- Provide insight into service management concepts, the ITSM domain model and existing common ITSM frameworks.
- Evaluate the implementation, adoption and use of ITSM in healthcare by reviewing existing literature with respect to:
 - Study characteristics (such as publication date, research methods and study environment);
 - Factors of ITSM adoption and use (such as organizational attributes, knowledge skills and abilities and service level agreements);
 - Rationale for ITSM in healthcare (such as criticality of health IT systems and resource availability); and
 - Outcomes (such as adoption rates and maturity levels).
- Complete a survey assessing the use of ITSM in healthcare.
- Create a conceptual Health ITSM framework based on the identified challenges and requirements.

Research Methodology

This thesis will use two research methods: a systematic review and survey research. The systematic review will be conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The survey will be constructed based on the findings of the systematic review.

Ethical Approval

Ethical approval was required for the survey portion of the thesis. This approval was obtained from the University of Victoria (UVic) Human Research Ethics Board. See Appendix A for the certificate of approval.

Research Structure

The thesis is structured as follows:

- Chapter one provides a background and explanation of the research aims;
- Chapter two defines key concepts within the domain of ITSM;
- Chapter three presents the findings of the systematic review;
- Chapter four outlines the results of the survey;
- Chapter five provides a discussion related to the research findings and presents the conceptual health ITSM framework; and
- Chapter six concludes and summarizes the research findings.

Chapter 2 - Key Concepts and Domain Model

Overview

The need for service management in IT developed out of the increasing complexity of IT solutions in the 1980s and 1990s (Winniford, Conger, & Erickson-Harris, 2009). With the introduction of enterprise-wide business critical systems and services, such as EMRs in the healthcare domain, support requirements for IT systems and services became a vital part of technology planning. These critical IT systems and services required technology across different silos to operate seamlessly to the end-users and required new definitions of availability, performance and support to be sustainable (2009). The new challenges presented by complex enterprise-wide IT solutions required pro-active management of the service and systems using a structured and standardized service management approach. The actual term of ITSM came from the first versions of the British Government's ITIL 1989 (2009). The overall concept of ITSM that was presented in ITIL V1 was a process based approach to the management of IT services, which aimed to address the complex needs of technology and cover the complete technology lifecycle from inception to decommissioning. Because ITSM is process-focused, it shares common themes with other process improvement methodologies, such as Six Sigma, Business Process Management and Total Quality Management (Galup, Dattero, Quan, & Conger, 2009).

In 2005 (and most recently updated in 2011), the International Organization for Standards (ISO)/International Electrotechnical Commission (IEC) issued the ISO/IEC 20000 standard covering the concept of ITSM. ISO/IEC 20000 brings together several service

management concepts “under a common set of principles, which are generally called IT Service Management” (Winniford, Conger, & Erickson-Harris, 2009, p.154). The standard defines ITSM as a “set of capabilities and processes to direct and control the service provider's activities and resources for the design, transition, delivery and improvement of services to fulfil the service requirements” (“IEEE Standard - Adoption of ISO/IEC 20000-1,” 2013, p.6). More plainly, ITSM is concerned with the management of IT services through the use and coordination of people, processes and technology. A number of different frameworks exist that cover the concept of ITSM, which will be discussed below. Even though between frameworks there are differences in processes, terminology, technology and scope, at their core, all ITSM frameworks must take a service orientated approach to IT operations, ensure IT services provided meet the needs of the business area, define and monitor service levels and ensure there are adequate processes in place for IT services (Winniford, Conger, & Erickson-Harris, 2009). These concepts make up the core characteristics for ITSM.

Despite the standard definition of ITSM provided by ISO/IEC 20000 there is still confusion on the scope and overlap between several of the IT service concepts and frameworks, particularly between ITSM and ITIL (Winniford, Conger, & Erickson-Harris, 2009). This is perhaps due to ITSM concepts growing out of the early versions of ITIL, as mentioned above. However, the literature is consistent in identifying ITSM as the overall concept domain, with ITIL, ISO/IEC 20000 or other specific frameworks and standards falling within the ITSM concept. Figure 1, which was adapted from Iden & Eikebrokk (2013), provides an overview of the ITSM domain model.

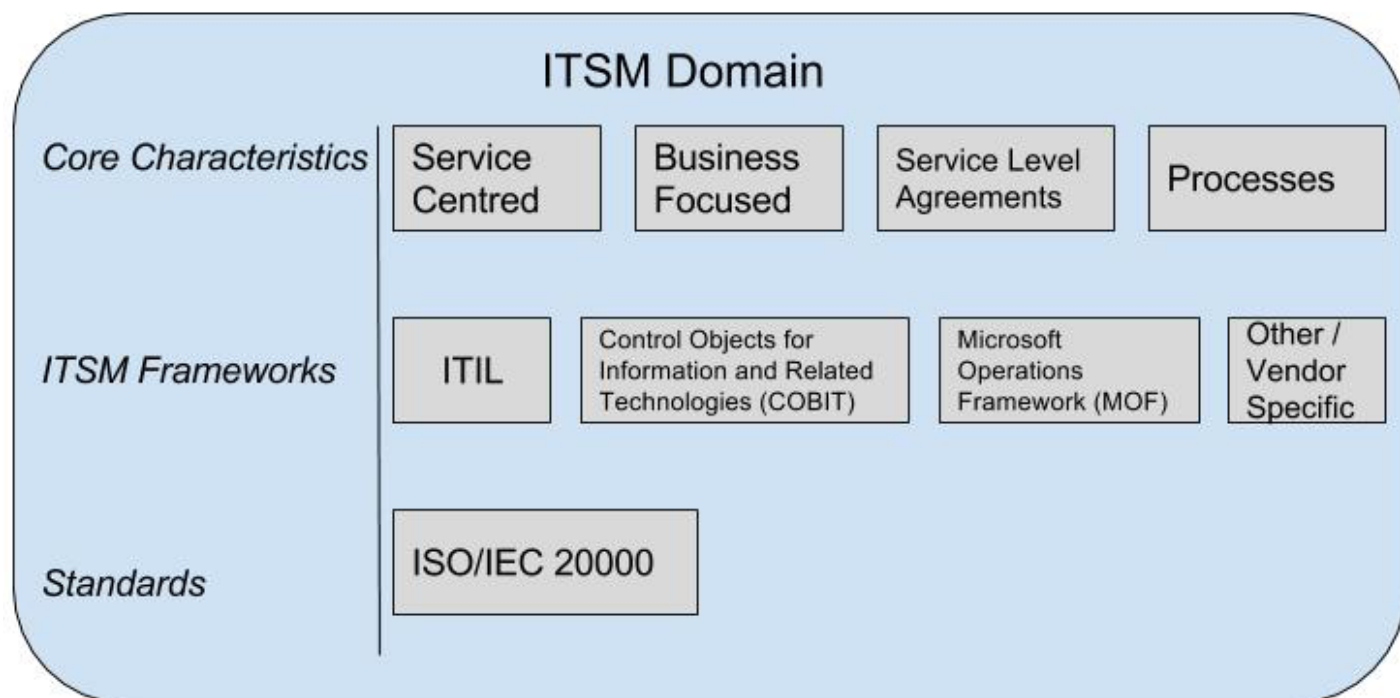


Figure 1 - The ITSM Domain Model

Core Characteristics

Service Centred

A service centred approach is a shared characteristic of all ITSM frameworks. In a service centred approach, IT system and services are treated as a service that enables users to accomplish their activities. This is in contrast to the traditional technology oriented approaches to IT operations in which IT systems and services were based on how the technology was structured (Winniford, Conger, & Erickson-Harris, 2009). Structuring IT as a service helps to ensure alignment to organizational needs because services are developed to enable specific organizational activities and are defined using the organization's nomenclature.

Business Focused

In an ITSM framework, IT services must be focused on the needs of the organization.

The overall IT strategy needs to align with the strategy of the organization to ensure that IT services are efficient, effective and meet the requirements of the organization (Marrone & Kolbe, 2011). This concept aligns with the requirement for ITSM to be service focused.

Service Level Agreements

Agreement on the level of services required for IT systems and services is another core area common to all ITSM frameworks. Like IT services, service level agreements (SLAs) are written in the language of the organization. This approach of using the language of the organization to define SLAs is in contrast to earlier approaches, in which SLAs defined lower-level capabilities and primarily used technology terms (i.e. network or system uptime, dropped packets, or megabytes of data storage) (Winniford, Conger, & Erickson-Harris, 2009).

Processes

Standardized, repeatable processes are also core to all ITSM frameworks. Processes can be used to outline how IT services are provisioned along with how support and maintenance activities are undertaken. Having a standardized set of processes supports the creation of standardized operating procedures, which helps to ensure consistency and quality in the services that are provided. An example of a common process is incident management, which outlines how incidents are resolved, escalated and reported on.

ITSM Frameworks

ITIL

As discussed above, ITIL was developed in the UK on behalf of the Central Communications and Telecommunications Agency. From its inception in the late 1980s, ITIL has evolved and continues to be updated. In 2007, the most recent version ITIL was released, version 3 (V3). ITIL V3 introduced a number of changes to the framework, however, the most predominant change was to the structure of the material, which is now ordered and grouped according to the stages of the service lifecycle (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011). ITIL V3 now covers the following key areas:

- Service Strategy
 - Service strategy covers concepts and strategies related to IT services during their lifecycle.
- Service Design
 - Service design outlines the definition of services and service management processes. Included in service design is the creation of principles and guidelines for the strategic goals defined by the service strategy mentioned above.
- Service Transition
 - Service transition provides methodologies and processes to transform service strategy requirements and service design aspects into operational services.
- Service Operation

- Service operation describes the delivery of services during operations. Topics covered are service support, service stability and the constant delivery of an agreed service level.
- Continual Service Improvement (CSI)
 - CSI aims at constantly maintaining and improving service quality. CSI impacts service design, service transition and service operation. It covers quality management, change management and process improvement by linking these methodologies to the respective phases in the lifecycle of a service.

Overall, the current version of ITIL describes 26 processes, which range from financial management of IT services to incident management (Long, 2008). In addition to processes, ITIL also contains a set of functions: Service Desk, Application Management, IT Operations Management, IT Operations Control, IT Facility Management, and Technical Management (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011). ITIL was the first ITSM framework developed and has influenced and inspired several other approaches to ITSM (2011). ITIL is still the most widely used framework for ITSM (Kabachinski, 2011).

COBIT

Control Objectives for Information and Related Technology (COBIT) is an IT management and governance framework created by the Information Systems Audit and Control Association. COBIT groups 300 objectives that cover planning and organizing, acquiring and implementing, delivering and supporting, and monitoring and evaluating of IT systems and services. COBIT primarily focuses on IT governance but also covers

ITSM concepts. It is not uncommon for organizations to implement both ITIL and COBIT as part of their ITSM solution (Winniford, Conger, & Erickson-Harris, 2009).

MOF

The Microsoft Operations Framework (MOF) is a series of guides aimed at establishing and implementing reliable, cost-effective IT services. MOF is structured into four phases: plan, deliver, operate and manage. MOF is an alternate approach to ITSM compared with ITIL, however, still shares the same core components outlined above.

Other / Vendor Specific Frameworks

The list of frameworks only represents some of the commonly used approaches to ITSM. A number of additional ITSM frameworks also exist, including those that are specific to a vendor or proprietary to an organization. Other common frameworks include ITSM frameworks from Hewlett Packard (HP) and International Business Machines (IBM), which combine both ITSM frameworks and specific software tools to support those frameworks.

Standards

As described above, ISO/IEC 20000 is a series of standards related to ITSM. The ISO/IEC standards replace the previous standard from the British Standards Institute, British Standard (BS) 15000, which was ratified in 2000 (Galup, Dattero, Quan, & Conger, 2009). BS 15000 is primarily IT operations-oriented and based upon ITIL version 1 and 2. ISO/IEC 20000, which was ratified 2005 (and most recently updated in 2011), replaces BS 15000 as an international standard. The ISO/IEC 20000 series consists of five parts. Part one specifies the requirements for a service management

system. Part two contains guidance information based on an industry consensus for service improvement and auditing against part one. The remaining portions (sections three through five) contain information for organizations wishing to become ISO/IEC 20000 certified. ISO/IEC 20000 is based on an integrated process approach to IT service management and adopts the processes of the ITIL framework.

When comparing ISO/IEC 20000 and ITIL, ITIL provides organizations with guidelines of how to align IT services and ITSM within the organization whereas the ISO/IEC standard aims at benchmarking the quality of an organization's ITSM (Galup, Dattero, Quan, & Conger, 2009). In addition, individuals can be ITIL certified but organizations cannot. Whereas, organizations can be ISO/IEC 20000 certified but individuals cannot.

Chapter Summary

Chapter two provided a brief overview of the domain of ITSM. Overall, ITSM is focused management of IT services through the use and coordination of people, processes and technology. A set of core characteristics defines ITSM, which include taking a service orientated approach to IT operations, ensuring IT services provided meet the needs to the organization or business unit, defining and monitoring levels of IT services and ensuring there are adequate processes in place to support IT operations. A number of different frameworks cover the concept of ITSM, with ITIL being the most common and widely used. Most frameworks allow for individuals to be certified in the use of the framework, with ITIL once again being the most common type of certification. Two standards exist to define ITSM: BS 15000 and ISO/IEC 20000. ISO/IEC 20000 replaced BS 15000 as the international standard. ISO/IEC applies to organizations and provides a mechanism for organizations to certify their ITSM practices. For additional information on ITSM

refer to the following material (Conger, Winniford, & Erickson-Harris, 2008; Long, 2008; Winniford, Conger, & Erickson-Harris, 2009).

Chapter 3 – Systematic Review

Introduction

Chapter two introduced key concepts related to ITSM and the use of common frameworks, such as ITIL, to provide a standardized approach to IT services and support. While there has been significant research on ITSM in the IT domain, including systematic reviews on ITSM implementation, adoption and use across multiple industries (Iden and Eikebrokk, 2013; Mesquida et. al., 2012), there has been limited research on ITSM specifically in the healthcare environment (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011). To-date there have been no published systematic reviews exclusively related to ITSM in healthcare. Systematic reviews allow for the accurate and reliable summarization of results across multiple studies, giving readers the ability to gather insight into a specific research area (Liberati et al., 2009). The absence of a systematic review covering ITSM in healthcare presents a challenge for the further implementation, adoption and use of ITSM in the healthcare environment as it is unclear if the support requirements associated with healthcare technologies are met by existing ITSM frameworks.

The objective of this systematic review is to evaluate the implementation, adoption and use of ITSM in healthcare by reviewing existing literature with respect to study characteristics, factors of ITSM adoption and use, rationale for ITSM in healthcare and measured outcomes.

Due to the limited peer-reviewed material focusing on ITSM in healthcare, a variety of study designs will be considered as part of the review.

The output of the systematic review will show the current state of ITSM in healthcare, provide insights into the challenges and requirements associated with ITSM in healthcare and define areas for further research. Appendix B provides an abstract of the systematic review.

Systematic Review Methods

PRISMA guidelines have been used to guide reporting and structure of this review (Liberati et al., 2009). The Research Proposal that was submitted to commence this thesis will serve as the research protocol for the review.

Eligibility Criteria

Peer-reviewed studies related to the implementation, adoption or use of ITSM in healthcare were considered. Only those studies that contained an evaluation of results, even if only formative and descriptive, were included in the review. Journal papers, conference proceedings, and book chapters were included. Opinion pieces, editorials, letters and posters were not included. A systematic review conducted in 2013 on implementation, adoption and use of ITSM in the general IT domain (not healthcare specific) identified the first applicable study was published in 2005 (Iden & Eikebrokk, 2013). In addition, figure 2 shows the lack of research prior to 2005 associated with ITSM in healthcare using the results of a Google Scholar search for “ITSM and Healthcare”. As a result, only research published within the last 10 years (2005) was considered.

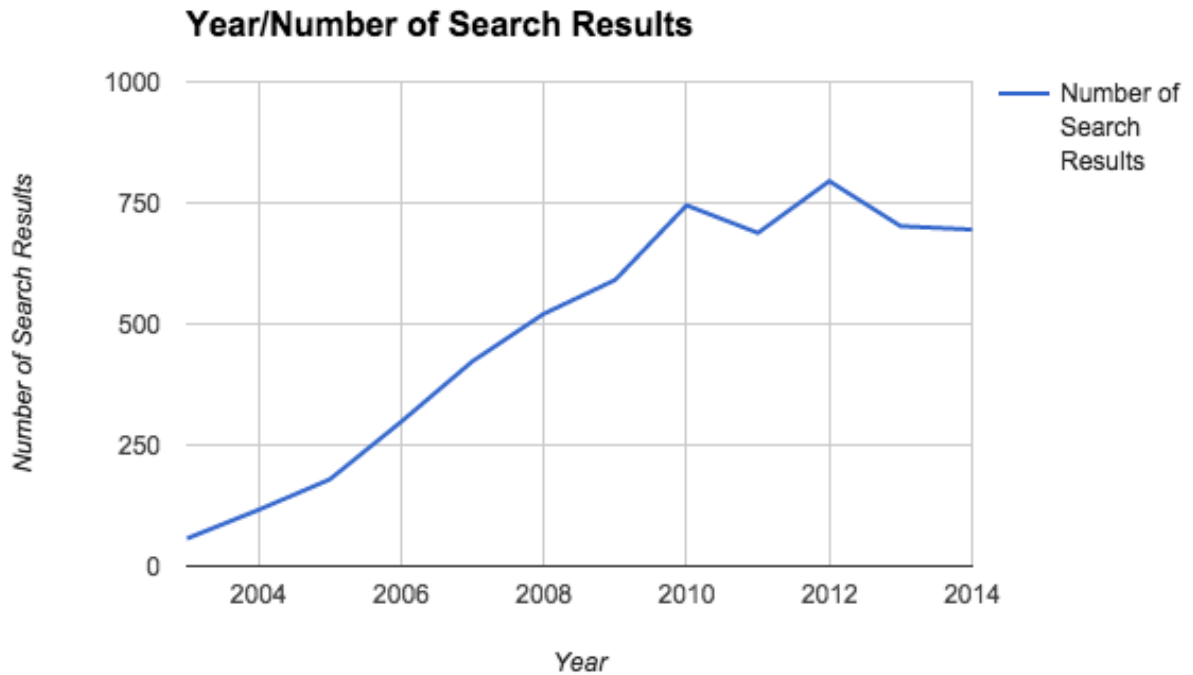


Figure 2 - Search Results by Year for "ITSM and Healthcare"

Information Sources

Studies were identified by searching electronic databases, scanning reference lists of articles and looking for related articles from authors. The following electronic databases were searched:

- ScienceDirect;
- Web of Science;
- PubMed;
- IEEE Xplorer; and
- Google Scholar (selective searching only).

The last search was run on September 4, 2015 and search results should be considered current to August 21, 2015 (the date of initial searching).

Search Methods

A comprehensive set of search strings were developed through an iterative process. The key concepts identified in the initial research proposal were:

- Concept 1: “Computer Systems”
- Concept 2: “Healthcare”
- Concept 3: “ITSM, including ITIL as the most predominate framework”

Through analysis of the initial search results it was determined that concept 1 was not required, as concept 3 (ITSM) always implies the use of computer systems. The initial search results also illustrated the inconsistent terminology used to reference concept 2 and concept 3. As a result, a series of search string were required to adequately cover the two concepts. After the second round of searching, it was identified that the terms “IT Governance” and “IT Management” appeared to be closely related to ITSM and were often used interchangeably in some contexts. Jantti et. al. (2014) also noted the mixed use of the terminology surrounding ITSM, IT Governance, and IT Management. The complete set of search strings is provided in table 1.

Search String
healthcare "Information Technology Service Management"
hospital "Information Technology Service Management"
medical "Information Technology Service Management"
eHealth "Information Technology Service Management"
healthcare "IT Service Management"
hospital "IT Service Management"
medical "IT Service Management"
eHealth "IT Service Management"
healthcare "Information Technology Infrastructure Library"
hospital "Information Technology Infrastructure Library"
medical "Information Technology Infrastructure Library"
eHealth "Information Technology Infrastructure Library"
healthcare "IT Infrastructure Library"
hospital "IT Infrastructure Library"
medical "IT Infrastructure Library"
eHealth "IT Infrastructure Library"
healthcare "Information Technology Management"
hospital "Information Technology Management"
medical "Information Technology Management"
eHealth "Information Technology Management"
healthcare "IT Management"
hospital "IT Management"
medical "IT Management"
eHealth "IT Management"
healthcare "Information Technology Governance"
hospital "Information Technology Governance"
medical "Information Technology Governance"
eHealth "Information Technology Governance"
healthcare "IT Governance"
hospital "IT Governance"
medical "IT Governance"
eHealth "IT Governance"

Table 1 - Search Strings Used in Systematic Review

The complete set of search strings were queried using ScienceDirect, Web of Science, and IEEE Xplorer. As PubMed only contains articles related to the medical field, only concept 3 (eight unique search strings in total) was used for querying PubMed. No corresponding PubMed Medical Subject Headings (MeSH terms) were applicable to this search, so MeSH searching was not used. Google Scholar was only used for selective

searching (i.e. looking for related articles by authors and locating work cited materials) due to the large number of non-applicable search results produce during the queries. Any search string that produced more than 100 results was not included (12 out of the 102 searches conducted), as it was not feasible to review all the results. Appendix C contains a table documenting the searching process.

Study Selection Methods

The eligibility assessment and study selection was performed by a single investigator (the author). Studies were screened using the title and abstract. Eligibility criteria was applied in the following manner:

1. Research publication date > 2004;
2. Written in English;
3. Peer-reviewed as part of a journal, conference proceeding, or book chapter;
4. Not opinion pieces, editorials, letters or posters;
5. Related to the implementation, adoption or use of ITSM (including IT management and governance) in healthcare; and
6. Contained an evaluation of results.

Figure 3 provides the PRISMA flow diagram summarizing the research selection process.

Data Collection Process and Methods

Organization of the review and data synthesis was managed using the Nvivo software tool, which is a tool for managing qualitative and mixed methods research data (QSR International, 2015). Zotero, a software tool for gathering, organizing, and analyzing sources (Zotero, n.d.) was used for managing bibliographic information. Results were coded using existing concepts presented in ITSM literature, specifically ITIL key

concepts such as “Incident Management”. In addition, study characteristics were coded, such as the environment in which the research took place. Finally, additional codes and categories were derived from the studies to create a common ‘bank’ of codes (Thomas & Harden, 2008). This process involved coding key words or concepts iteratively until equivalent words and concepts were coded consistently. For example, between papers one author may have referred to challenges with strategic decision-making and another author may have cited challenges with organizational governance. Since strategic decision making and governance represent similar concepts a single code would be created which would be applied to both papers. This process required multiple iterations of encoding to ensure consistency amongst studies and codes. Numerical data was coded using the “Outcomes” category code for further analysis.

Synthesis of Results

A three-stage approach to data synthesis, as described by Thomas & Harden (2008) was used. First, the sections of the studies related to the evaluation of results (i.e. the result, findings, discussion or conclusion) were coded; next, categories were developed to organize coded concepts; and finally analysis of association and correlation was conducted.

During the first phase, relevant sections of each of the studies were coded using the data collection processes described above. Iteratively, existing codes were refined and new codes were developed. The resulting coded studies were used to develop categories and higher-level concepts across studies. Finally, by querying the coded data and categories, relationship of individual codes and groups of codes began to emerge through analysis (Thomas & Harden, 2008), which will be reported on in the results section.

Additional synthesis was done to understand the characteristics of the studies, such as environment, data collection methods or publication date distribution. A thematic analysis of outcome data and rationale for ITSM was also conducted.

Using the methods described above, a set of 26 codes was developed to encode relevant portions of the studies. Six categories were also created and relevant codes were grouped together under the categories. Two of the categories, “Outcomes” and “Rationale for ITSM” were used to capture specific data or quotes, and did not contain any codes. Table 2 provides a list of the codes along with the assigned category.

Code	Description	Category
Organizational Attributes	Attributes of an organization, including organizational change readiness.	Factors of Adoption and Use
Knowledge, Skills and Abilities	The knowledge skills and abilities to implement or use an ITSM solution.	Factors of Adoption and Use
Service Level Agreements	Service Level Agreements between the supporting organization and the business area, including key vendors.	Factors of Adoption and Use
Participation	Participation from all key stakeholders impacted by the ITSM change.	Factors of Adoption and Use
Resource Constraints	Availability of resources, including human resource, money, or technology.	Factors of Adoption and Use
Terminology	Shared understanding of the terminology for ITSM and the business unit (in the case of healthcare, this is often medical terminology).	Factors of Adoption and Use
Clinical Workflows	The processes and actions involved in the provision of clinical services.	Factors of Adoption and Use
Reporting and Metrics	The reporting and metrics associated with either ITSM or clinical services.	Factors of Adoption and Use
Scope	The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions (“Scope (project management),” 2015).	Factors of Adoption and Use

Business Continuity and Risk Management	Concepts related to an organization's critical business functions and their continuity of service and the management of other organizational risks.	Factors of Adoption and Use
Tools	The tools or systems used in the provision of ITSM.	Factors of Adoption and Use
Knowledge Sharing	The ability to share information between ITSM users, including those who provide services and those who receive service.	Factors of Adoption and Use
Training and Usability	The ability to train or use an ITSM system.	Factors of Adoption and Use
Incident Management	A process to ensure that normal service operation is restored as quickly as possible and the business impact is minimized (“Incident management,” 2015).	ITSM and ITIL
Problem Management	“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, to eliminate recurring incidents, and to minimize the impact of incidents that cannot be prevented” (“Problem management,” 2015).	ITSM and ITIL
ITIL	ITIL is a set of practices for ITSM that focuses on aligning IT services with the needs of the organization (“ITIL,” 2015).	ITSM and ITIL
Case Study	“A case study involves an up-close, in-depth, and detailed examination of a subject (the case), as well as its related contextual conditions” (“Case study,” 2015).	Study Design
Delphi	“Delphi method in the [Information Systems] IS field, involves a set of linked questionnaires and aims to elicit the opinion of a panel of experts through iterative controlled feedback” (Jaana, Tamim, Paré, & Teitelbaum, 2011).	Study Design
Survey	In survey research, the researcher selects a sample of respondents from a population and administers a standardized questionnaire to them (“Writing@CSU,” n.d.).	Study Design
Hospital	A study location classified as a hospital.	Environment
Health Authority / Ministry	A study location classified as a health authority or ministry.	Environment
Vendor	A study location classified as a vendor.	Environment

Interviews	A structured face-to-face meeting with participants.	Data Collection Methods
Documentation or Artefact Review	A review of any kind of documentation or an artefact, such as a tool or system.	Data Collection Methods
Survey or Questionnaire	A set of printed or written questions for the purposes of a survey or statistical study.	Data Collection Methods
Observation	The direct observation of phenomena in their natural setting.	Data Collection Methods
-	Used to capture key outcome data that was presented numerically.	Outcomes
-	Used to capture rationales for the implementation, adoption or use of ITSM.	Rationale for ITSM

Table 2 - Codes and Categories Used For Analysis

Systematic Review Results

Study Selection Results

The search of ScienceDirect, Web of Science, IEEE Xplorer, PubMed and Google Scholar databases provided a total of 1689 results. After adjusting for duplicates 1392 studies remained. Of these, 1342 studies were discarded after reviewing the title or abstract, as these papers clearly did not meet the inclusion criteria. Three additional studies were discarded because full text of the study was not available or the paper could not be accurately translated into English. The full text of the remaining 40 studies was examined in detail. After the full text review 24 studies did not meet the inclusion criteria as described above. The remaining 16 studies were included in the systematic review. No unpublished relevant studies were obtained. Figure 3 provides the PRISMA flow diagram for study selection.

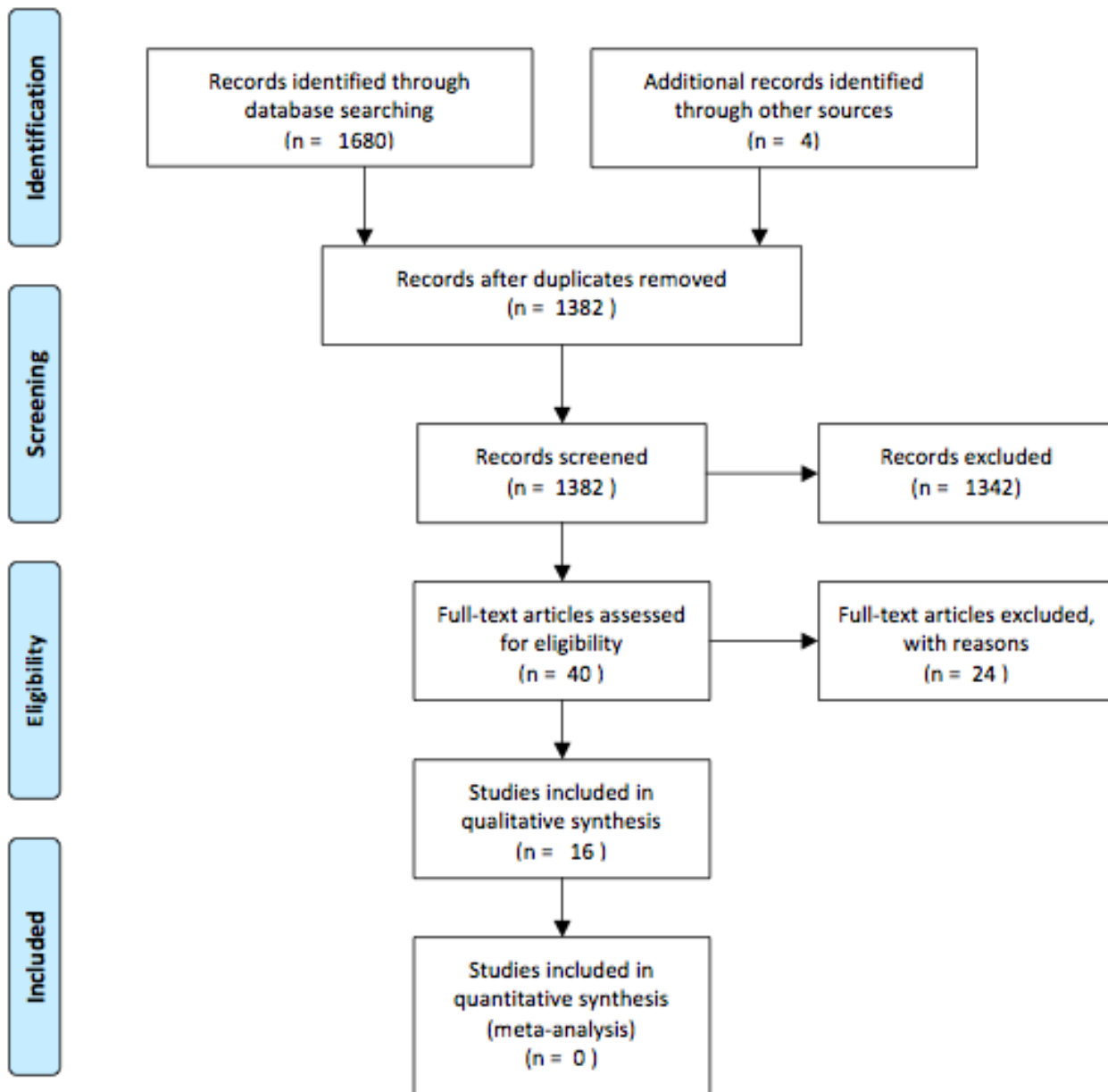


Figure 3 - PRISMA Flow Diagram for Study Selection

Study Characteristics Results

Publication Date Distribution Results

Figure 4 provides a bar chart of studies published by year. The majority of publication activity happened between 2009 and 2011 (13 of the 16 studies published).

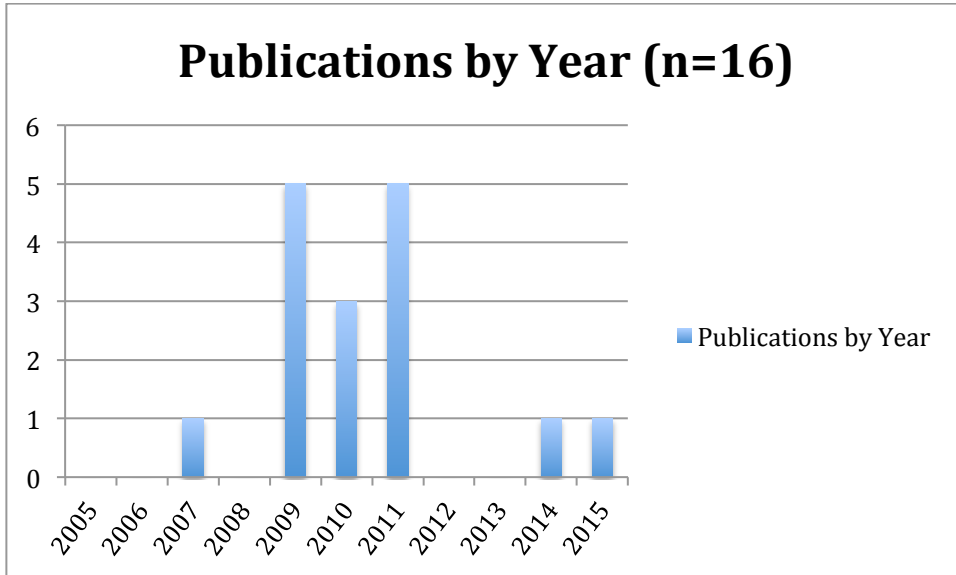


Figure 4 - Publications by Year

Publication Type Results

Of the studies selected for inclusion in the review, 56% (n=9) were journal articles, 25% (n=4) were conference proceedings, and 19% (n=3) were book sections.

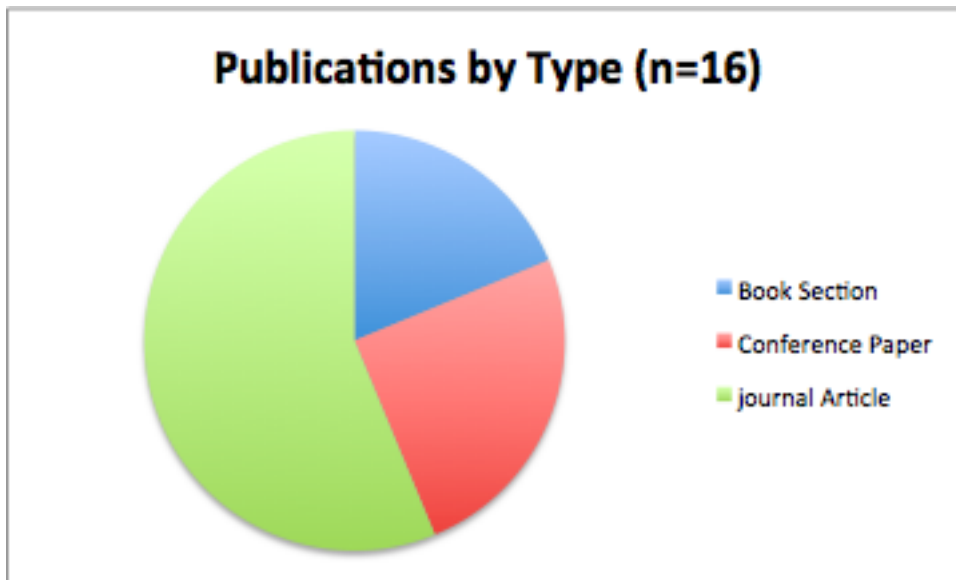


Figure 5 - Publications by Type

Research Methods Results

Of the studies included, only three distinct research methods were used. 69% (n=11) of the studies used a case study methodology. 25% (n=4) used a survey research method and the remaining 6% (n=1) used a Delphi method.

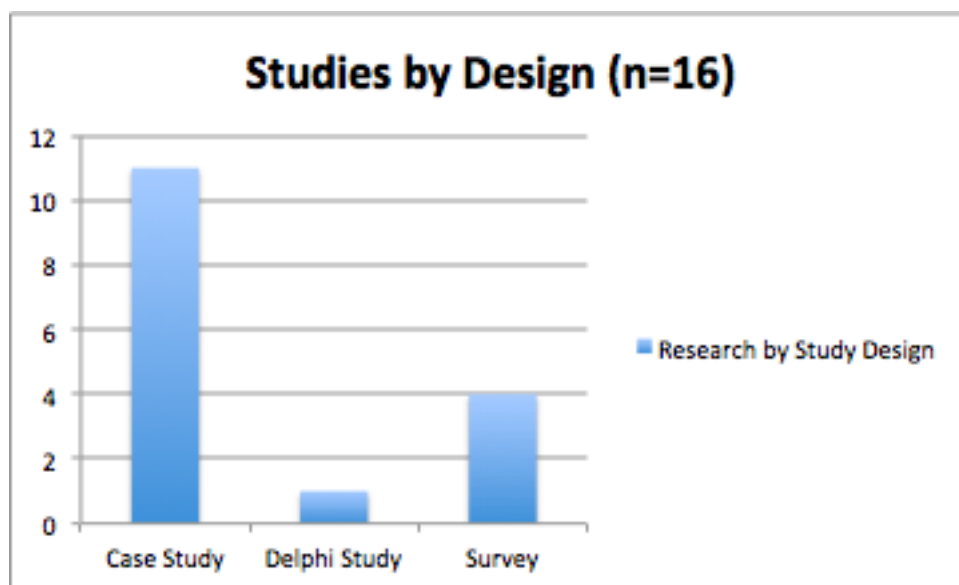


Figure 6 - Studies by Research Design

Data Collection Methods Results

A variety of data collection methods were used. Participant interviews were the most commonly used form of the data collection, being performed in 13 of the studies. A review of documentation or artefacts was done in nine of the studies. A questionnaire or survey was used for data collection in seven of the studies. Participant observation was completed in four of the studies. Table 3 shows the studies, along with the number of data collection methods used.

Study	Number of Data Collection Methods Used
Organizational Challenges and Barriers to Implementing IT Governance in a Hospital (Lapão, 2011)	4
Exploring the role of IT service management and IT service governance within IT governance (Jantti, Virkanen, Mykkaunen, & Hotti, 2014)	3
Implementing IT Service Management - A Case Study Focussing On Critical Success Factors (Tan, Cater-Steel, & Toleman, 2009)	3
Improving Incident Management Processes in Two IT Service Provider Companies (Jantti, 2011)	3
Improving the Deployment of IT Service Management Processes - A Case Study (Jantti & Jarvinen, 2011)	3
Information Technology Governance, Risk and Compliance in Health Care – a Management Approach (Krey, 2010)	3
Defining Requirements for an Incident Management System - A Case Study (Jantti, 2009)	2
Exploring service issues within the IT organisation - Four mini-case studies (McBride, 2009)	2
IT Governance and Types of IT Decision Makers in German Hospitals (Koebler, Faehling, Krcmar, & Leimeister, 2010)	2
Lessons Learnt from the Improvement of Customer Support Processes - A Case Study on Incident Management (Jantti, 2009)	2
IT Management and Governance Systems and Their Emergence in Healthcare (Mohrmann & Kropf, 2007)	1
ITIL Assessment in a healthcare environment - the role of IT governance at Hospital Sao Sebastiao (Lapao, Rebuge, Silva, & Gomes, 2009)	1
Key IT management issues in hospitals - Results of a Delphi study in Canada (Jaana, Tamim, Paré, & Teitelbaum, 2011)	1
Significance and Current Status of integrated IT GRC in Health Care - An Explorative Study in Swiss Hospitals (Krey, 2015)	1
The status of IT service management in health care - ITIL in selected European countries (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011)	1
Utilizing Business Service Management Concepts to Improve Healthcare Information Services (Hernandez, Janicki, & Reinicke, 2010)	1

Table 3 - Selected Studies and the Number of Data Collection Methods Used

Study Environment Results

The majority of studies (69%, n=11) took place in a hospital setting. Three (19%) took place at vendor offices, where the vendor provided products or services to healthcare organizations. The remaining two studies (12%) examined ITSM at health authority or health ministry.

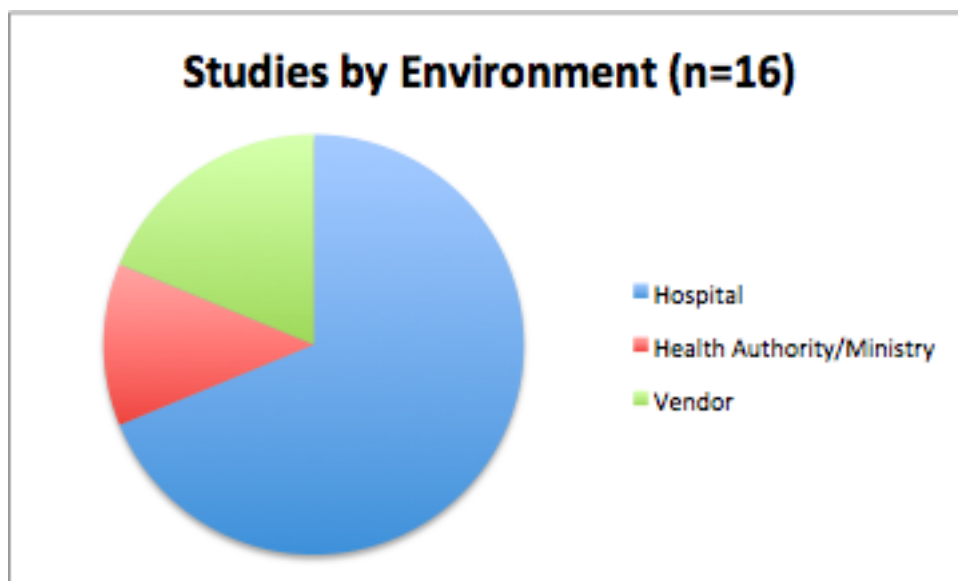


Figure 7 - Studies by Environment

Study Location

The majority of studies (75%, n=12) were done in Europe. Only one study was conducted in a Canada. Table 4 provides an overview of the studies by location.

Study	Location
Defining Requirements for an Incident Management System - A Case Study (Jantti, 2009)	Finland
Exploring service issues within the IT organisation - Four mini-case studies (McBride, 2009)	England
Exploring the role of IT service management and IT service governance within IT governance (Jantti et al., 2014)	Finland
Implementing IT Service Management - A Case Study Focussing On Critical Success Factors (Tan et al., 2009)	Australia
Improving Incident Management Processes in Two IT Service Provider Companies (Jantti, 2011)	Finland
Improving the Deployment of IT Service Management Processes - A Case Study (Jantti & Jarvinen, 2011)	Finland

Information Technology Governance, Risk and Compliance in Health Care – a Management Approach (Krey, 2010)	Switzerland
IT Governance and Types of IT Decision Makers in German Hospitals (Koebler et al., 2010)	Germany
IT Management and Governance Systems and Their Emergence in Healthcare (Mohrmann & Kropf, 2007)	America
ITIL Assessment in a healthcare environment - the role of IT governance at Hospital Sao Sebastiao (Lapao et al., 2009)	Portugal
Key IT management issues in hospitals - Results of a Delphi study in Canada (Jaana et al., 2011)	Canada
Lessons Learnt from the Improvement of Customer Support Processes - A Case Study on Incident Management (Jantti, 2009)	Finland
Organizational Challenges and Barriers to Implementing IT Governance in a Hospital (Lapao, 2011)	Portugal
Significance and Current Status of integrated IT GRC in Health Care - An Explorative Study in Swiss Hospitals (Krey, 2015)	Switzerland
The status of IT service management in health care - ITIL in selected European countries (Hoerbst et al., 2011)	Austria, Germany, Switzerland, Italy
Utilizing Business Service Management Concepts to Improve Healthcare Information Services (Hernandez et al., 2010)	America

Table 4 - Location Where Studies Were Conducted

“Rationale for ITSM” Results

To facilitate analysis, a “Rationale for ITSM” category code was created, and applicable sections of the studies were coded with this category. Seven of the 16 studies contained some form of rationale for the implementation, adoption or use of ITSM in healthcare.

Rationale across six of the papers were heterogeneous, however two studies (Lapao, 2011; Lapao, Rebuge, Silva, & Gomes, 2009) had matching rationales. Table 5 provides an overview of the rationale identified.

Study	Rationale for ITSM
Information Technology Governance, Risk and Compliance in Health Care - A Management Approach (Krey, 2010)	<ul style="list-style-type: none"> • Complex / unsuitable organizational structures • Legal restraints • Heterogenous nature of IT in healthcare
IT Governance and Types of IT Decision Makers in German Hospitals An Empirical Study Among IT Decision Makers (Koebler, Faehling, Krcmar, & Leimeister, 2010)	<ul style="list-style-type: none"> • Criticality of IT and eHealth systems in the delivery of healthcare • Complex / unsuitable organizational structures
IT management and governance systems and their emergence in healthcare (Mohrmann & Kropf, 2007)	<ul style="list-style-type: none"> • Lack of rigour or systematic approach surrounding implementation and operations of IT and eHealth systems • Large volume of service provided • Misalignment between IT and overall organizational strategy
<p>ITIL Assessment in a Healthcare Environment: The Role of IT Governance at Hospital Sao Sebastiao (Lapao, Rebuge, Silva, & Gomes, 2009)</p> <p>Organizational Challenges and Barriers to Implementing “IT Governance” in a Hospital (Lapao, 2011)</p>	<ul style="list-style-type: none"> • Low level of managerial maturity • Lack of skilled personnel • Lack of rigour or systematic approach surrounding implementation and operations • Resource constraints • Fragile IT operational management • Lack of data protection and security management • Misalignment between IT and overall organizational strategy
Significance and Current Status of Integrated IT GRC in Health Care: An Explorative Study in Swiss Hospitals (Krey, 2015)	<ul style="list-style-type: none"> • Criticality of IT and eHealth systems in the delivery of healthcare
The status of IT service management in health care - ITIL (R) in selected European countries (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011)	<ul style="list-style-type: none"> • Increase of the quality of IT services • Increase in productivity

Table 5 - Rationale for ITSM

Complex or unsuitable organizational structures were identified as rationale for introducing ITSM in two of the studies (Koebler, Faehling, Krcmar, & Leimeister, 2010; Krey, 2010). In addition, the related concept of low levels of managerial maturity was identified by Lapao, Rebuge, Silva, & Gomes (2009) and Lapao (2011). The criticality of

IT systems and services was also identified as a common driver for ITSM in two of the studies (Koebler, Faehling, Krcmar, & Leimeister, 2010; Krey, 2015). Lack of rigour or systematic approach surrounding implementation and operations of IT systems was stated by both Lapão (2011) and Mohrmann & Kropf (2007) and in Lapao, Rebuge, Silva, & Gomes (2009).

Coding Frequency Results

As discussed in the methods section, coding of results was distributed across three categories:

- ITSM and ITIL;
- Factors of Adoption and Use; and
- Outcomes.

Analysis of the portions of the studies categorized as “Outcomes” will be presented in a further section. For the remaining two results categories, figure 8 shows the frequency distribution of codes across all studies. Both the frequency that each code is referenced and the number of studies containing a referenced section with that particular code are included in figure 8.

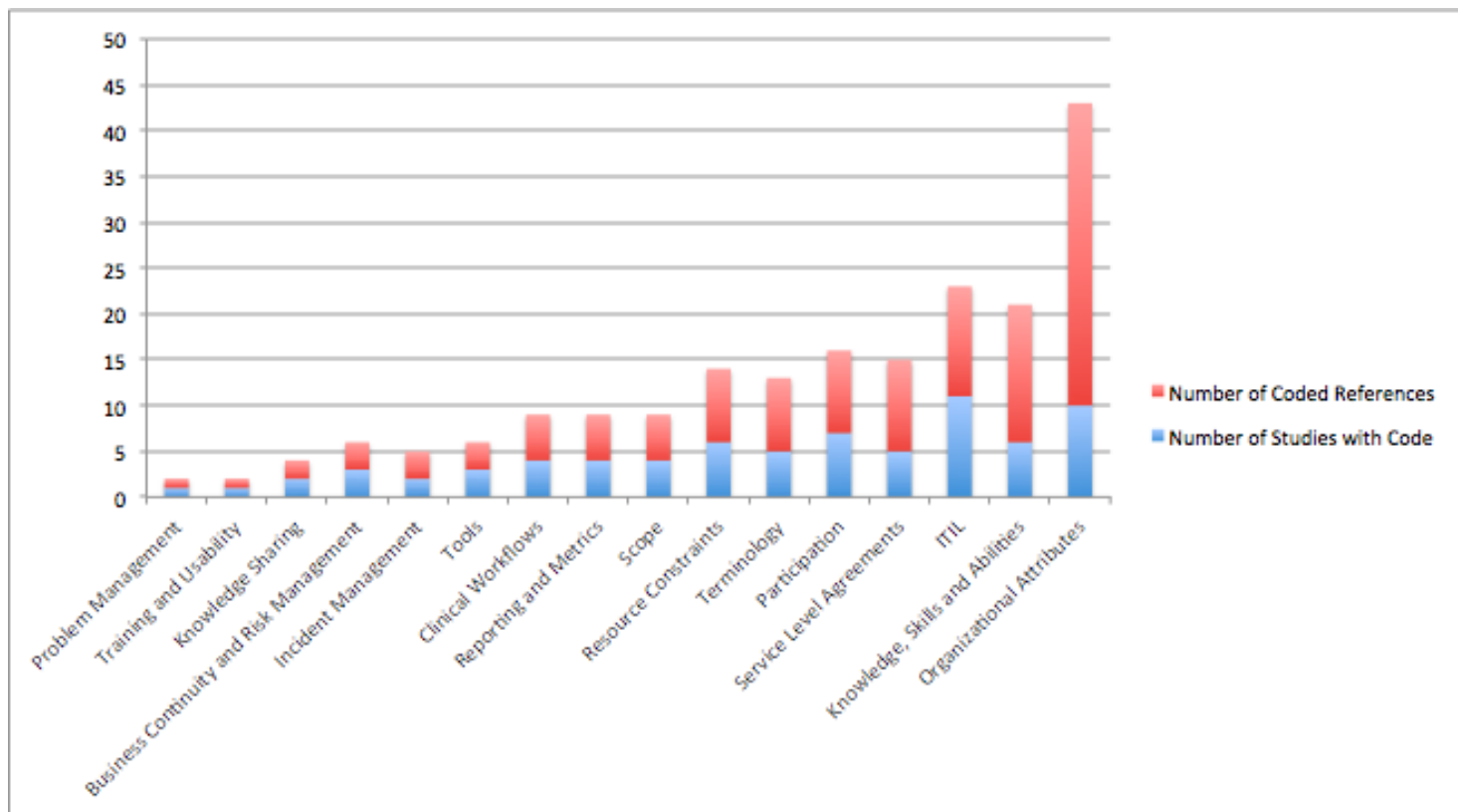


Figure 8 - Frequency Distribution of Codes

The distribution shows that Organizational Attributes was the most commonly referenced code in 67% (n=10) of the publications with a total of 33 unique references.

Cluster Results

Beyond providing insight into commonly referenced codes, the frequency of codes provides little explanation of the relative importance of each code or how these codes are grouped to show association. This is especially true for variable codes in the “Factors of Adoption and Use” category as these codes are descriptive in nature (Thomas & Harden, 2008). A cluster analysis of the coded variables was conducted using the tools available in Nvivo (QSR International, 2015). Figure 9 is the dendrogram produced from the cluster analysis of codes.

Nodes clustered by coding similarity



Figure 9 - Cluster Analysis Dendrogram

Five distinct groups appear from the cluster analysis. Table 6 provides the groupings.

Group	Description
Participation; Resource Constraints	Participation from all key stakeholders impacted by the ITSM change; Availability of resources, including human resource, money, or technology.
Knowledge, skills and abilities; Organizational Attributes	The knowledge skills and abilities to implement or use an ITSM solution; Attributes of an organization, including organizational change readiness.
Business Continuity and Risk Management; Service Level Agreements	Concepts related to an organization's critical business functions and their continuity of service and the management of other organizational risks; Service Level Agreements between the supporting organization and the business area, including key vendors.
Knowledge Sharing; Report and Metrics	The ability to share information between ITSM users, including those who provide services and those who receive services; The reporting and metrics associated with either ITSM or clinical services.

Terminology; Tools	Shared understanding of the terminology for ITSM and the business unit (in the case of healthcare, this is often medical terminology); The tools or systems used in the provision of ITSM.
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Table 6 - Groups Derived From Clusters

Outcome Results

Numerical outcomes were codified across four different studies. Table 7 provides a summary of each of the studies and their key outcome measures.

Study	Overview of Study	Summary of Key Outcome Measures
Information Technology Governance, Risk and Compliance in Health Care – a Management Approach (Krey, 2010)	A survey of 23 Swiss hospital chief information officers (CIOs) / IT managers. The study provided an overview of the common IT governance models and discussed the requirements of the healthcare sector as a complex and heterogeneous sector.	<ul style="list-style-type: none"> • “All private hospitals and the majority (60%) of public/subsidized private hospitals are using ITIL • “No one thought their ITIL approach is ‘fully optimized’ and the processes have been refined to a level of good practice” • “Seventy-three percent of hospitals did not have SLAs in place between IT and the business”
Organizational Challenges and Barriers to Implementing IT Governance in a Hospital (Lapao, 2011)	A case study that provided an assessment on the use of ITIL and ITSM at the São Sebastião Hospital, one of the most mature Portuguese hospitals.	<ul style="list-style-type: none"> • Low levels of maturity were found in most of the measures for ITSM • “IT Service Management processes are ad-hoc, show random approaches and actually few are defined”
Significance and Current Status of integrated IT GRC [Governance, Risk Management and Compliance] in Health Care - An Explorative Study in Swiss Hospitals (Krey, 2015)	Follow-up survey to work previously conducted by Krey (2010) - See above. Standardised questionnaires and face-to-face interviews with CIOs and IT executives of 15 Swiss hospitals were conducted.	<ul style="list-style-type: none"> • “The majority of the CIOs asserted (n=12) that the health care sector is a complex and heterogeneous economic sector and cannot be compared to other industry sectors...” • “ITIL is used by two-third of all hospitals as an approach to IT service management (n=10).

		<p>However, only one out of the three [a third of] implementations has been classified as a standardised and documented process, whilst no one confirmed their ITIL approach as managed in terms that processes have been refined to a level of good practice”</p>
<p>The status of IT service management in health care - ITIL in selected European countries (Hoerbst, Hackl, Blomer, & AmTmenwerth, 2011)</p>	<p>“Exploring knowledge about and acceptance of IT service management (especially ITIL) in hospitals in Austria and its neighboring regions Bavaria (Germany), Slovakia, South Tyrol (Italy) and Switzerland.”</p>	<ul style="list-style-type: none"> • “55% (n = 41) of respondents claimed to be familiar with IT-Service Management methods.” • “In most of the countries, more than two thirds of the respondents claim to be familiar with ITIL” • “Out of the 43 institutions where the respondent felt familiar with ITIL, only 7 (18%) already have ITIL certified employees in their organizations” • Only 12% (n=5) of surveyed hospitals had implemented some portion of ITIL, with another 19% (n=8) planning to do so in the next two years. • 51% (n=22) of surveyed hospitals do not plan on implementing ITIL in the next two years • 42% (n=18) of respondents (that claimed to be familiar with ITIL) felt that ITIL could not be used as a domain-wide approach for ITSM in healthcare

Table 7 - Summary of Key Outcome Measures

Interpretation of Results

Interpretation of Study Characteristics

Examination of study characteristics provides insight into the current status of ITSM in healthcare, as well as the level of research interest in the topic (Liberati et al., 2009). Using the study publication date distribution data listed in the results section, a Pearson Correlation Coefficient value (R value) was calculated to determine the level of correlation between date and the number of studies being published. This was done to determine if research interest is increasing or decreasing on the subject. 2015 was not included in the calculation, as the material for this review was gathered in August 2015. The calculated value of R is 0.1508, meaning that there is a moderate positive correlation towards research growth and time, although the relationship is weak. This is further supported by several of the studies, which made reference to need for further research into ITSM in the healthcare environment (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Jantti, 2009; Koebler, Faehling, Krcmar, & Leimeister, 2010). This finding is also consistent with another systematic review done in by Iden and Eikebrokk in 2013 examining implementations of ITSM in all domains. However, because of the small number of papers applicable to this review (n=16), the growth trend analysis may not be statistically significant.

Only three research methods were used by the studies: case study, survey, and Delphi. A case study methodology is primarily used to understand a complex social phenomenon (Yin, 2009), which suggests that the majority of studies focused on understanding the social complexity of ITSM in healthcare (i.e. how ITSM is implemented or used in a healthcare environment). Both a Delphi method and survey approach are used to gain

better understanding of a problem and its reasons by quantifying certain aspects of a phenomenon (Groves, 2004). The Delphi method is used specifically for surfacing new issues in exploratory studies (Jaana, Tamim, Paré, & Teitelbaum, 2011). This suggests that the remaining studies took a data-driven approach to understanding the phenomenon related to ITSM in healthcare.

Overall, the quality of data collection techniques used by the studies were adequate, with 63% (n=10) of the papers using one or more data collection methods. The use of multiple data collection methods can increase the validity of findings through the use of triangulation (Tan, Cater-Steel, & Toleman, 2009).

With respect to the geographic region in which the studies took place three quarters of studies took place in Europe, with only one paper published examining ITSM in Canada. Although there are similarities between the Canadian and European healthcare systems, specifically the prevalence of universal healthcare coverage of European countries, there are significant differences in the structures, financing and service delivery models between different European countries and Canada (Blomqvist & Busby, 2012). These differences can have an impact on the support requirements, as technology may be utilized differently to meet unique service delivery requirements. This presents a challenge when trying to determine the applicability of findings for a Canadian context.

Interpretation of Rationale for ITSM

Understanding the rationale for ITSM for supporting healthcare systems and technologies is important to gain understanding into the fundamental requirements for an ITSM framework (Iden & Eikebrokk, 2013). Seven of the studies provided insight into

rationales for ITSM, with a mixed set of responses. Three of the rationales were presented in multiple studies (in all instances only presented twice):

- Complex or unsuitable organizational structures (Koebler, Faehling, Krcmar, & Leimeister, 2010; Krey, 2010);
- The criticality of IT and eHealth systems (Koebler, Faehling, Krcmar, & Leimeister, 2010; Krey, 2015); and
- Lack of rigour or systematic approach surrounding implementation and operations of IT and eHealth systems (Lapao, 2011; Mohrmann & Kropf, 2007).

Simply being present in multiple studies does not suggest their relative importance as a driver for ITSM. Unfortunately none of the studies provided rationales with weighted importance, making further analysis difficult.

In their review of ITSM in the general domain, Iden & Eikebrokk (2013) identified four main motivators for adopting ITSM:

- Improve operational efficiency and reduce IT spending;
- Improve service orientation and focus on service delivery;
- Improve alignment, both externally with customers and internally between IT functions; and
- Improve service quality and thereby improve customer satisfaction.

Although not necessarily stated in the same manner, all of these motivators were identified within this systematic review as well (see table 5). The additional rationale identified in table 5 (legal compliance, increasing management maturity, increasing staffs knowledge, skills and abilities, and improving data management and security practices) provides insight into the requirements for ITSM in a healthcare environment.

Interpretation of Coding Frequency

With regards to the factors that impact adoption and use of ITSM in healthcare, “Organizational Attributes” was the most commonly referenced code in 67% (n=10) of the publications with a total of 33 unique references. Since a case study methodology was the most popular research method used, many of the references were related to impacts of the organization in terms of adoption, use and change readiness. For example, in examining the case of implementing ITIL for Queensland Health Information Directorate (QHID), Tan, Cater-Steel, & Toleman (2009) explain that, “the roll-out of new ITIL processes proved to be particularly challenging amidst the job uncertainty and sporadic redeployment of QHID staff, including senior members in the project team” (p. 6). In addition, a number of references were made to the critical need for management and senior management support and its impact on the successful implementation of ITSM in healthcare (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Jantti & Jarvinen, 2011; Krey, 2015; Mohrmann & Kropf, 2007; Tan, Cater-Steel, & Toleman, 2009). This is not a surprising finding though, given that the implementation of ITSM is a large organizational change and change management best-practice literature refers to management support as the single most important factor in project success (Creasey & Taylor, 2014).

Other common factors identified in this review include:

- Appropriate knowledge skills and abilities to implement or use an ITSM solution;
- Service Level Agreements (SLAs) in place between the supporting organization and the business area and key vendors;
- Participation from all key stakeholders impacted by the ITSM change;

- Shared understanding between all stakeholders of the terminology for ITSM and the business unit (in the case of healthcare, this is often medical terminology); and
- Availability of resources, including human resources, money, or technology.

Iden & Eikebrokk (2013) explore critical success factors to the implementation of ITSM, a topic very related to factors of adoption of use. They were able to develop a ranked list of 10 critical success factors:

1. Top management support;
2. A project champion;
3. Staff expertise;
4. Broad involvement;
5. Ongoing information;
6. ITSM-aligned culture;
7. Willingness to change;
8. External consultant;
9. ITSM software; and
10. Firm size.

Although there is overlap with the results presented in this review, factors such as the lack of SLAs, terminology considerations, and availability of resources appears to be key considerations for healthcare that are not reflected in the general ITSM literature (see figure 8 for details).

The only ITSM framework referenced by any of the studies was ITIL. In fact, according to Hoerbst, Hackl, Blomer, & Ammenwerth (2011), there appears to be more awareness of ITIL than the general concept of ITSM. Based on this finding, it appears that none of

the other common ITSM frameworks, such as COBIT, MOF, HP ITSM and IBM ITSM (Iden & Eikebrokk, 2013), have seen adoption or use in the healthcare environment. This suggested that a focus on adapting ITIL would be the most practical approach for ITSM in healthcare.

Interpretation of Clusters

A cluster analysis was completed on the codes related to factors of adoption and use. Five distinct groups appeared from the cluster analysis. Those were:

- Participation; Resource Constraints;
- Knowledge, skills and abilities; Organizational Attributes;
- Business Continuity and Risk Management; Service Level Agreements;
- Knowledge Sharing; Report and Metrics; and
- Terminology; Tools.

Relationships between the codes suggest the potential for classification areas. This can be useful in the creation of an ITSM framework specific for the healthcare domain, because it provides a grouping that could be used as a structure for the framework. For example, ITIL currently has a section detailing Service Level Agreements (Conger, Winniford, & Erickson-Harris, 2008). For a healthcare specific ITSM framework this section could be expanded to include business continuity and risk management processes, which would be logical based on the grouping shown in the review.

Interpretation of Outcomes

A meta-analysis of the outcome measures was not possible because there were no common statistical measures shared among the four studies that presented numerical outcomes. Nonetheless, analysis of the findings thematically can still be completed.

Of particular interest were the two studies conducted by Krey in 2010 and 2015. Both studies surveyed CIOs and IT Managers in Swiss hospitals, with the 2015 survey done as a follow-up to the 2010. A slight increase in adoption was shown, however very similar levels of maturity and use was reported in both surveys, suggesting that limited progress has been made in the past five years towards the meaningful use of ITSM in healthcare. Overall levels of adoption were presented in three of the four papers. Krey (2010; 2015) presented approximately two thirds (~67%) of hospitals using at least some components of ITIL. In contrast, Hoerbst, Hackl, Blomer, & Ammenwerth (2011) only 12% of the hospitals surveyed had implemented at least one component of ITIL. A possible explanation for the disparity of results is the scope of the two studies, with Hoerbst, Hackl, Blomer, & Ammenwerth (2011) focusing on a number of European countries and Krey (2010; 2015) only including participants from Switzerland. Surprisingly, no outcome assessments were done on organizations within North America.

Another interesting finding that emerged was the low level of maturity in organizations that had implemented ITSM. Three out of the four studies reported low levels of maturity in their ITSM processes (using the ITIL framework). This was illustrated by Krey (2015), who reported that none of the survey respondents that had implemented ITIL felt they had reached an adequate level of maturity. Similar findings were reported in the other studies (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Krey, 2010; Lapão, 2011).

Although only reported in one of the papers, Hoerbst, Hackl, Blomer, & Ammenwerth (2011) examined the suitability of ITIL as an ITSM framework in the healthcare environment. According to the study, 42% (n=18) of respondents (that claimed to be familiar with ITIL) felt that ITIL could not be used as a domain-wide approach for ITSM

in healthcare (2011). No further explanation of the result was provided. This suggests the need for a specific ITSM framework for the healthcare domain, although further research is required to confirm.

Systematic Review Limitations

This systematic review has reported on ITSM in the healthcare environment. To the author's knowledge, this is the first systematic review that has exclusively considered the topic of ITSM in healthcare. The review has only included studies that were published in peer-reviewed journals, book chapters and conference proceedings published between 2005 and 2015. The consideration of information from additional sources, for example technical reports, grey literature and non peer-reviewed websites might lead to additional insights.

As a result of the limited types of research available on the topic (only case studies, surveys, and Delphi reports), the methods of analysis used for conducting the review present a limitation to the validity of the study. Dixon-Woods & Fitzpatrick (2001) suggest that meta-synthesis of qualitative research may have limited validity, as the results are based on a third level of interpretation, far removed from the original event.

As a result, the analysis on the factors impacting adoption and use of ITSM in healthcare would need to be validated by further research to improve the reliability and validity of the findings.

To improve transparency and clarity of reporting, the PRISMA guidelines were used; however, because PRISMA primarily focuses on meta-analysis and systematic reviews of randomized clinical control trials, not all aspects of the guidelines were applicable (Moher, Liberati, Tetzlaff, & Altman, 2009). The following sections of the guidelines

were not included in the review because they report on statistical measures associated with meta-analysis:

- Risk of bias in individual studies;
- Summary measures;
- Risk bias across studies;
- Additional analyses; and
- Results of Individual Studies.

In addition, some of the section titles were modified from the guideline to fit the overall format and layout of the thesis.

The systematic review was conducted by a single reviewer only and therefore presents a potential limitation to the validity of the findings, as an independent second reviewer did not confirm the applicability of selected studies or the appropriateness of the coding.

Chapter Summary

The goal of this systematic review was to examine the current state of ITSM in healthcare, and provide insights into the gaps and challenges associated with ITSM in the healthcare environment. According to the research, there appears to be growing adoption of ITSM, particularly the use of ITIL. Despite this continued growth, maturity of ITSM still remains low. In part, this may be due to the unique requirements of the healthcare domain. A number of gaps and challenges were identified, including factors of adoption and use of ITSM that appear to not be identified by research in the general ITSM domain. Although many of the factors identified in this study were presented in the general ITSM literature, factors such as terminology considerations, and availability of resources are not specifically address by existing frameworks. Given the widespread recognition of ITIL,

an adaptation of ITIL to address some of the specific healthcare requirements may be the most practical approach in developing a healthcare specific ITSM framework. The code groups developed as part of this review (see table 6) could be useful in the creation of a framework because they provide an association grouping that could be used as a logical structure for a healthcare specific framework. This systematic review contributes to the current knowledge of ITSM in healthcare by consolidating the research done to date to draw new conclusions. Due to limitations with meta-synthesis, further validation of the results should be undertaken. The need for further research of ITSM in the healthcare domain was suggested by a number of the studies reviewed. Specifically when trying to assess healthcare ITSM in a Canadian context, there is very limited research available. The author recommends a survey be conducted to further validate the findings identified by this review.

Chapter 4 - Survey

Introduction

Chapter three provided a systematic review outlining the use of ITSM in the healthcare environment. Based on the results of the systematic review, the need for further research was identified to validate the findings, especially within a Canadian context, as only one of the studies included in the systematic review examined the support and management of healthcare technology in Canada. According to a recent study conducted by COACH, Canada's Health Informatics Association, there are approximately 39,900 health informatics professionals in Canada, in a broad range of roles ("Emerging Challenges," 2015). In addition, there are approximately 78,000 physicians in Canada (CMA, 2015), representing just one clinical stakeholder group for ITSM. Given the breadth and depth of potential ITSM stakeholders in healthcare, a full validation study of ITSM in Canada is outside the scope of this research. Instead, a proof of concept survey with a limited number of participants will be conducted to both develop a survey instrument and provide the information required to answer the research question listed in chapter one. A survey approach is an appropriate tool for this type of investigation, as a survey is used to gain better understanding of a problem and its reasons by quantifying certain aspects of a phenomenon (Groves, 2004). Both system support and clinical users will be surveyed to ensure representation from the two primary stakeholders of ITSM in healthcare.

Survey Methods

Survey Design

According to the research conducted as part of the systematic review, there were no published survey instruments specifically covering ITSM in the healthcare domain. As a result, a survey tool was created specifically for this research. The concepts and questions of the survey were based on the results of the systematic review and the research question and objectives outlined in chapter one. Findings from the systematic review were translated into either a single question or a set of questions related to the finding. Characteristics about the participants were also captured to allow for stratification of the results. The survey covers 10 concepts related to ITSM in healthcare, which are listed below in table 8 along with a brief description. Each concept has one or more questions associated with it.

Survey Concept	Description
Participant Characteristics	Questions related to characteristics of survey participants, including their role and level of experience.
Knowledge, Skills and Abilities	Questions related to the knowledge, skills and abilities of survey participants, including their knowledge of ITSM key concepts and certifications.
Support Characteristics	Questions related to the support of healthcare IT systems and services, including frequency, methods, and factors impacting support.
ITSM Maturity	Questions related to the maturity of ITSM in participants organization.
Organizational Attributes	Questions related to the organizational attributes that impact ITSM, such as resource availability.
Terminology	Questions related to terminology with respect to ITSM in healthcare, including technical and medical terminology.
Patient Safety	Questions about support requests that are related to patient safety.
Privacy, Security and Confidentiality	Questions about support requests that are related to privacy, security or confidentiality.
Service Level Agreements	Questions related to the use of service level agreements.
Use of ITSM and Satisfaction	Questions related to participants overall experience with ITSM and their satisfaction with healthcare technology support.

Table 8 - Survey Concepts

The majority of questions were closed response to allow for easier completion by participants (Groves, 2004). Where possible, a standard response scales were used for each of the questions, either as a yes/no format or as a Likert item, to ensure that each item was both balanced and symmetrical in the response construction (2004). A limited number of opened-ended questions were also included to allow participants the ability to further expand on key concepts. Internal consistency of the survey was achieved by ensuring that key concepts were measured using two or three different questions (Sullivan, 2011). For example, there are three different questions related to overall maturity of IT services throughout the survey. To ensure overall usability of the survey

instrument, the survey was piloted with two participants. The results from the pilot were not included in the research.

Sample Selection and Sample Size

Two primary groups were targeted in the research: healthcare providers and health informatics professionals. Each group provided insight from individuals that have experience with the real-world challenges associated with ITSM in the healthcare environment. To improve the validity of the findings, a minimum of two years' experience was required for both participant groups. This restriction was included to ensure that participants have a basic familiarity with technology support in healthcare. As a result, the inclusion criteria for the survey was:

- Provided technical support services related to healthcare technology for at least two years;

Or

- Used healthcare technology in clinical practice for at least two years.

The desired number of participants from each group was seven, for a total of 14 participants. Since this is a proof of concept or exploratory study, Marshall (1999) suggests that seven is an adequate number for each participant group.

Recruitment of Participants

Participants from each group were recruited in a variety of ways. For both groups of participants, personal and professional contacts were used to request participation in the survey. No individuals that the researcher had a potential power relationship or a perceived power relationship, such as employees or contractors, were contacted to

participate in the survey. In addition to professional contacts, participants were recruited using both the Health Information Science graduate student e-mail distribution group and the Health Information Science alumni Facebook page. The Health Information Science graduate student e-mail distribution group allowed for the recruitment of both target groups, as the graduate program accepts both healthcare professionals and IT professionals working in the healthcare sector (UVic, n.d.). An invitation to participate was used for both mediums, providing participants with details of survey and contact information. Participants were requested to contact the researcher privately using the information provided in the advertisement rather than posting a reply directly to Facebook. In all cases the researcher was the only person contacting potential participants. See Appendix D for recruitment material.

It is believed that completing the survey presented no risk or impact to participants. Participants were not identified so any opinions they express while participating are confidential and therefore should have no negative impacts. Information regarding implied consent was presented using the standard UVic template (UVic, 2007). The letter of implied consent was provided prior to commencing the anonymous web-based survey. Participants were required to view and agree to the information before being allowed to continue with the survey. Participants were able to halt the survey at any time and their information was not included. See Appendix D for the letter of implied consistent.

Data Collection

Data was collected using an anonymous web-based survey tool, UVic's FluidSurvey (UVic, 2015). The tool provides the ability to create custom online surveys with branching logic, which was utilized by this survey. Branching logic allows questions to

appear or be removed based on the answer to previous questions. For example, if a respondent answers no to the questions, “have you ever submitted or responded to a support request related to patient safety?” no further questions related to patient safety will appear. If the respondent answers yes they will be prompted with further questions. This allows for quicker and more accurate completion of the survey. The tool also allows for analysis of response data using the online tools and provides the ability to export data to Microsoft Excel. It was anticipated that the survey would take approximately 20-30 minutes to complete. The actual average time to complete was 20.1 minutes. Data was collected and stored online using the UVic FluidSurvey tool. The servers hosting the tool are physically located in Canada to ensure Canadian laws are applied to the storage of the data (2015).

Data Analysis

The collected data from the survey was analyzed using Microsoft Excel for Mac 2011 and the UVic FluidSurvey built-in tools. The built-in UVic FluidSurvey reporting tool allows for frequency analysis, graphing of results and cross tabulation. Microsoft Excel was used for further grouping and multi-variable analysis of the data. Survey results were both analyzed as a complete set (both role groups – healthcare providers and system support), as well as specific to each group. Respondents that identified as both a clinical users and system support (n=2) were included in both groups for any role specific analysis, however, were only counted once when doing analysis on the complete data set.

Survey Results

The following section outlines the key findings of the survey. For a complete list of survey responses refer to Appendix E.

Participant Characteristics

The survey had 18 fully completed responses. Of those, 10 identified as system support, six as clinical users and two as both system support and a clinical user. Respondents were asked to provide their primary duty with respect to health technology. Six unique answers were provided by respondents, with clinician / healthcare provider being the most common (aligning with the six respondents that identified their primary role as clinical user). Figure 10 shows the full list of responses and their frequency.

Response	Chart	Percentage	Count
Application Administration		11.1%	2
Clinician / Healthcare Provider		33.3%	6
Data Integrity		0.0%	0
Manager / Supervisor		22.2%	4
Network Administration		0.0%	0
Server Administration		0.0%	0
Technical or IT Support		22.2%	4
Training		0.0%	0
User On-boarding		0.0%	0
Other - please indicate		11.1%	2
Total Responses			18

Other – please indicate:

#	Response
1.	Supporting the governance of a Regional health information solution
2.	Device integration and management

Figure 10 - Primary Duty With Respect to Health IT

Eight respondents (44%) reported that a hospital was the primary environment in which they either used or support healthcare technologies. Both clinic / primary care facility and health ministry / central agency were the second most common environments with four respondents each. Two indicated other locations.

78% (n=14) of respondents had been either using or support health technology for five or more years and 83% (n=15) indicated either an advanced or expert level of understanding of healthcare technology.

Knowledge, Skills and Abilities

A number of the survey questions related to participants knowledge, skills and abilities of ITSM in healthcare. Approximately 44% (n=8) of respondents indicated that they were aware of the concept of ITSM. Figure 11 shows responses based on role.

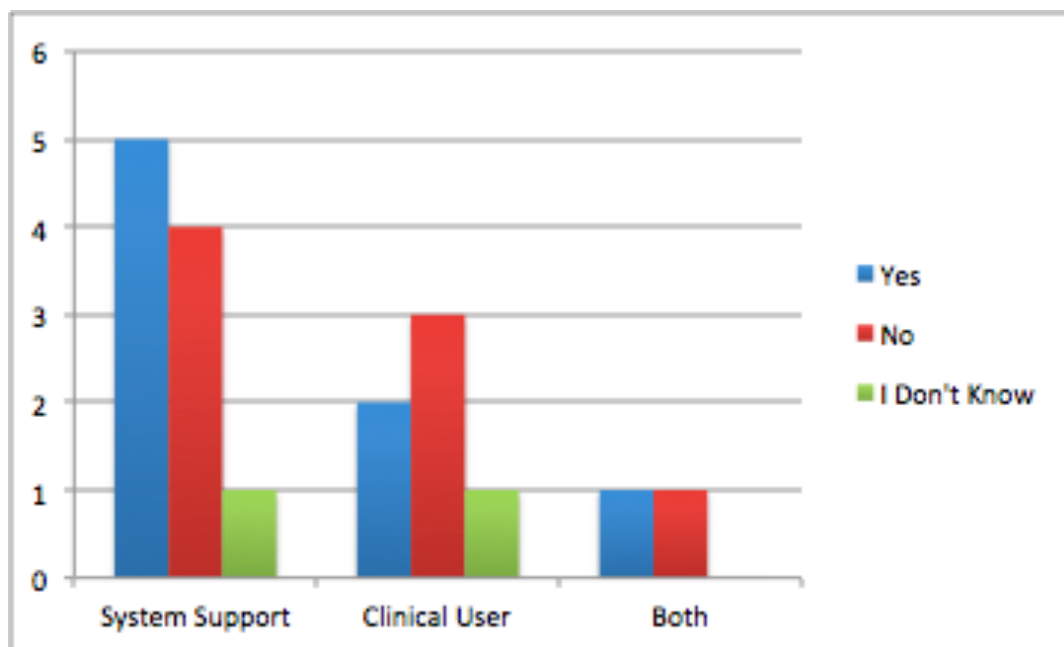


Figure 11 - Familiarity with ITSM Based on Role

As figure 11 shows, system support respondents had a higher awareness of ITSM (50%) compared to clinical users (33%). The majority (78%, n=7) of respondents that were familiar with ITSM did feel it was important to their role. Slightly less participants (39%, n=7) were familiar with ITIL. Only two participants were familiar with ITIL who were not familiar with the concept of ITSM. Of the participants that were familiar with ITIL, only two had obtained basic certification. Two of the participants plan on doing ITSM training within the next year.

Support Characteristics

The majority of clinical users (75%, n=6), including those who also provide system support, reported an average of 1-25 support requests per month. In contrast, 67% (n=8) of system support users responded to 26 or more support requests per month, with 42% (n=5) stating they responded to more than 50 requests per month. E-mail was the most

common method for reporting of issues, followed by ticketing systems and face-to-face.

Figure 12 provides an overview of the methods used for issue reporting.

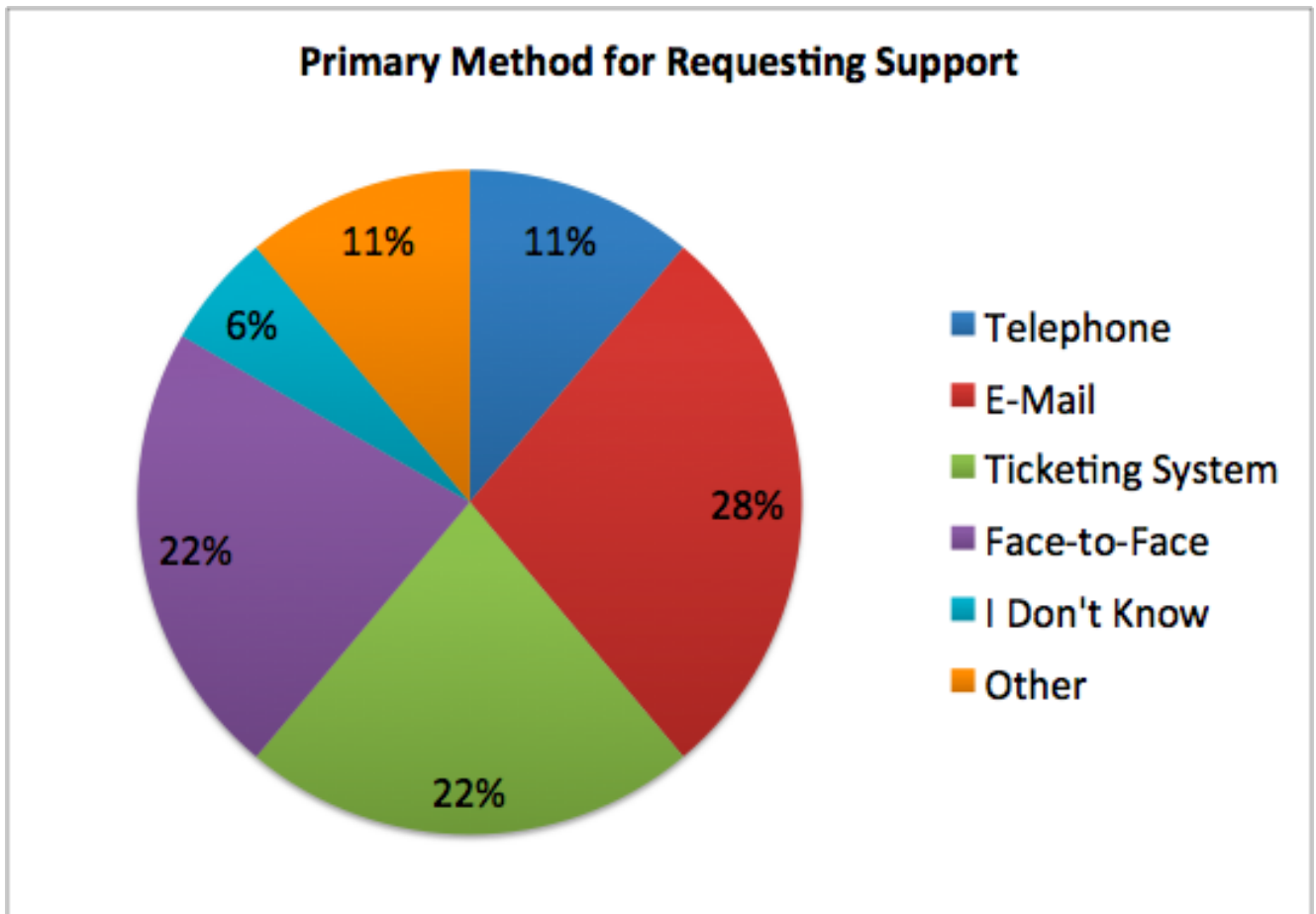


Figure 12 - Primary Method for Requesting Support

Three questions related to people, tools and processes were asked in relation to support requests. The results are summarized in table 9. Green boxes indicate the most common response to the question.

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	I Don't Know
There are adequate human resources to support Health IT in your organization.	0	9	0	3	6	0
There are adequate technologies to support Health IT in your organization (i.e. knowledge management databases, ticketing tools).	2	6	3	4	2	1
There are adequate processes and procedures to support Health IT in your organization (i.e. change management processes, standard operating procedures).	2	5	2	5	4	0

Table 9 - People, Processes and Tools Summary

ITSM Maturity

Responses were mixed in regards to documentation of services, which is a key indicator of ITSM maturity (Marrone, Gacenga, Cater-Steel, & Kolbe, 2014). Figure 13 shows the breakdown of response related to documentation of health IT services in the respondent's organization.




Response	Chart	Percentage	Count
Yes		33.3%	6
No		27.8%	5
I Don't Know		38.9%	7
Total Responses			18

Figure 13 - Documentation of Health IT services

Of those that responded yes, 83% (n=4) indicated that more than 50% of services were documented.

Tools to support ITSM is another component of overall ITSM maturity. Figure 14 provides a breakdown of the most common tools used. Respondents were able to choose more than one response.

Response	Chart	Percentage	Count
Ticket System		66.7%	12
Standard Operating Procedures		44.4%	8
Operations Guides		44.4%	8
Knowledge Management System (i.e. Wiki)		44.4%	8
Help Files		44.4%	8
No Tools Are Used		5.6%	1
I Don't Know		16.7%	3
Other(s) - please indicate		11.1%	2

Other(s) - please indicate:

#	Response
1.	24/7 Telephone support
2.	call and leave a message with the help desk and hope they return the call

Figure 14 – Tools Used for Health IT Support

The survey asked respondents to identify their organization's level of maturity with respect to healthcare technologies. The majority of respondents identify an average level of maturity.

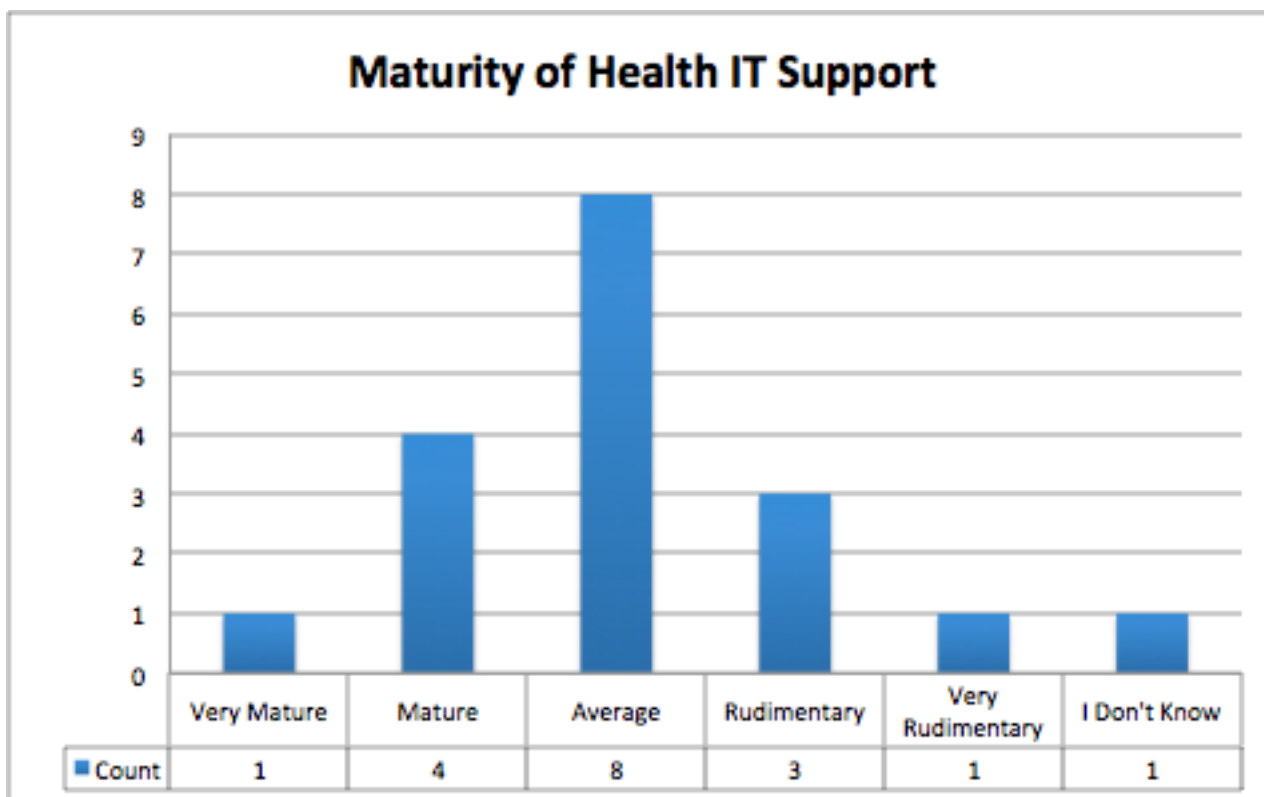


Figure 15 - Level of Health IT Maturity

Organizational Attributes

Three areas related to organizational attributes were examined: change management, participation and inclusion of technology in strategic planning. These three areas were identified as part of the systematic review as critical to ITSM in healthcare (Lapão, 2011; Lapão, Rebugue, Silva, & Gomes, 2009; Mohrmann & Kropf, 2007). Table 10 provides an overview of the responses related to change management and participation.

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	I Don't Know
Changes to Health IT systems or services are managed well in my organization.	0	6	1	8	3	0
All relevant stakeholders participate in Health IT changes in my organization.	0	3	4	9	2	1

Table 10 - Change Management and Participation Summary

Related to participation and change management, respondents were also asked if there is committees related to the management or oversight of healthcare IT in their organization. 67% (n=12) indicated there are committees for the management or oversight of healthcare technology.

Participants were also asked if healthcare technology is mentioned in the organization's strategic plan. The majority of respondents (72%, n=13) answered yes, with only one respondent answering no and the remaining indicating they did not know.

Participants were asked to identify organizational factors that have an impact on support of healthcare technologies. Resources constraints and strategic priorities were the most common response. Figure 16 provides the full set of responses. Participants were able to choose more than one response.

Response	Chart	Percentage	Count
Complex or Unstable Organizational Structures		52.9%	9
Criticality of Health IT Systems		58.8%	10
Heterogeneous Systems		29.4%	5
Lack of Standardized Processes and Procedures		41.2%	7
Legal Restraints		23.5%	4
Resource Constraints		76.5%	13
Security Practices and Data Management		58.8%	10
Strategic Priorities		76.5%	13
Other(s) - please indicate		11.8%	2

Other(s) - please indicate:

#	Response
1.	Concurrent implementation of EHR CPOE UDMD BCM and organization restructuring
2.	Privacy concerns.

Figure 16 - Organizational Factors Impacting Health IT

Terminology

Consistency in terminology and the importance of medical terminology were both identified in the systematic review as critical to ITSM in the healthcare domain (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Jantti, 2009). Responses were mixed to the question: is consistent terminology used to describe Health IT systems and services in your organization? Five responded yes (28%), seven responded no (39%) and six did not know (33%). With respect to respondents knowledge of medical terminology 16 out of the 18 participants indicated an average knowledge or above. The majority of respondents (83%) indicated that knowledge of medical terminology was either important (n=5) or very important (n=10) to the provision of Health IT support.

Patient Safety

Patient safety considerations related to healthcare technology support were identified by a two of the studies included in the systematic review (Koebler, Faehling, Krcmar, & Leimeister, 2010; Krey, 2015). Patient safety considerations were captured under the

concept of criticality of healthcare technology in the systematic review findings. In the survey, 11 participants (61%) had either submitted or responded to a support request related to a patient safety issues. Eight respondents stated that there are specific processes and procedures related to patient safety issues associated with healthcare technology, although one of the respondents stated that those processes are not being following in a free text comment box. Six of the respondents indicated the need for additional processes with responses that included the need for more clearly defined processes, enforcement and oversight, use of third parties for evaluation of response appropriateness, and additional functionality in clinical documentation systems to report patient safety issues.

Privacy, Security and Confidentiality

Privacy, security and confidentiality considerations were identified as being an important rationale for introducing ITSM in the systematic review (Lapão, 2011; Lapão, Rebuge, Silva, & Gomes, 2009). In the survey, 11 participants (61%) had either submitted or responded to a support request related to a privacy, security or confidentiality issue. 11 respondents also indicated that there are specific processes and procedures related to privacy, security or confidentiality in their organization. Nine respondents expressed the need for additional processes with responses that included the need for more clearly defined processes, enforcement and oversight, and education on privacy legislation.

Service Level Agreements

SLAs are a critical component of all ITSM frameworks (Winniford, Conger, & Erickson-Harris, 2009), however, the systematic review identified the lack of appropriate SLAs as a major challenge to the support healthcare technology (Tan, Cater-Steel, & Toleman, 2009). 50% of survey respondents (n=9) access or provide services that are documented

in an SLA. Of those respondents, 78% (n=7) felt that having appropriate SLAs are either important or very important to the services they receive or provide. Figure 17 shows the percentages of services that are captured by SLAs.

Response	Chart	Percentage	Count
Less than 25%		18.2%	2
25-49%		18.2%	2
50-74%		36.4%	4
75-99%		27.3%	3
100%		0.0%	0
Total Responses			11

Figure 17 - Percentage of Services Captured by an SLA

Use of ITSM and Satisfaction

The final section of the survey examines the use of ITSM frameworks and the overall satisfaction of health IT support. Only three of the respondents have experience with an ITSM framework (only ITIL). In addition, only respondents that identified themselves as system support have experience with ITSM. Three respondents indicated that there was a planned implementation of an ITSM framework, such as ITIL, in the next year in their organization. When asked about their overall satisfaction of health IT support, the most frequent response (n=7, 39%) was neutral. Figure 18 provides the full list of responses.

Response	Chart	Percentage	Count
Very Satisfied		5.6%	1
Satisfied		33.3%	6
Neutral		38.9%	7
Unsatisfied		11.1%	2
Very Unsatisfied		11.1%	2
N/A		0.0%	0
Total Responses			18

Figure 18 - Satisfaction with Health IT Support

When asked about the strengths of current health IT support, respondents listed a variety of answers including promptness of support and clinical input into support processes.

Respondents were also asked to discuss the limitations of current health IT support.

Limitations include lack of resources, lack of clinical input, issues with prioritization, large complex organization with numerous applications, stakeholder buy-in and lack of available catalogue of services. See Appendix E for a complete list of responses.

Interpretation of Survey Results

Despite the majority of participants reporting more than five years' experience and advanced levels of knowledge, responses indicated low levels of familiarity with ITSM and ITIL. Not surprisingly, more system support participants were familiar with ITSM in comparison to clinical users. Only a limited number of participants obtained certification in ITIL and, those that did only completed the initial course, suggesting an overall lack of knowledge, skills and abilities related to ITSM. Participants' planning on doing further education was low as well.

The surveys showed that system support respondents handle more tickets on average compared to clinical users. E-mail was identified as the most common method used for issues, which suggest a lower level of incident management maturity since e-mail does not allow for tracking, service level management, and metrics that most ticket systems provide (Marrone, Gacenga, Cater-Steel, & Kolbe, 2014). Unexpectedly, face-to-face and ticketing systems were more common than telephone, which is contrary to the author's personal experiences. The questions related to adequate people, process, and tools, were split between agreement and disagreement. Overall the responses appeared to favour more positive viewpoints, suggesting that respondents are satisfied with the level of resources related to people (i.e. human resources), processes (i.e. standard operating procedures, and tools (i.e. knowledge management systems); however, if the strongly

disagree and disagree response are combined, equal numbers strongly agree and agree. In fact, six people strongly disagreed that there were adequate human resources, whereas no one answered that they strongly agreed to this statement.

With respect to the maturity of health IT support, responses were consistent in indicating an average level of maturity. This was seen from both the responses to questions related to documentation of services and the tools used to support ITSM, as well as the respondents overall impression of their organization's maturity. The majority of respondents (67%, n=12) indicated that their organization uses some form of ticketing system, which is consistent with other questions in the survey.

Based on the results, there appears to be issues related to change management and participation in healthcare technologies. The majority of participants indicated that changes were not well managed and not all relevant stakeholders were involved in changes despite the fact that 67% said there were committees related to the management or oversight of technology. This suggests that the committees do not have broad enough representation from stakeholders, a finding that was also identified by other researchers (Tan, Cater-Steel, & Toleman, 2009). In contrast to the findings reported in the systematic review (Krey, 2010), the majority (72%, n=13) said that health IT was mentioned in their organizations strategic plan. This suggests an awareness of the importance of health IT as a key enabler for organizations and thus the need for emphasis on robust support models, as supported through ITSM.

Consistency of terminology for health IT systems and service showed mixed results. The majority of respondents (n=7) indicated that there were inconsistencies with how health IT systems and services were described. This question had the highest portion of "I Don't

Know” responses (n=6), suggesting that the construction of the question may have led to some confusion. Knowledge of medical terminology was seen as an important factor to the support of healthcare technology, providing further evidence that a health ITSM framework needs to include requirements for medical terminology. The level of knowledge of medical terminology appeared to be strong with most participants indicating an average or higher knowledge level. This suggests there already exists the ability to ensure consistent terminology with respect to healthcare IT services using the terminology of the healthcare domain. The gap is a lack of framework to formalize the IT services into service offerings, which could be addressed through ITSM.

The majority of participants have responded to health IT issues that have patient safety considerations. Although some standard process and procedures existed, a number of participants identified the need for additional measures. Those included clearly defined processes, increasing monitoring and enforcement, and additional reporting abilities directly from clinical tools. These responses suggest a need for inclusion of specific processes related to patient safety within an ITSM framework for healthcare.

As with patient safety, the majority of participants also have responded to privacy, security or confidentiality concerns related to healthcare technology. Once again, participants expressed the need for additional processes and procedures. Based on the results, privacy, security and confidentiality concerns specific to healthcare should also be included in a healthcare ITSM framework.

The survey responses show the importance of SLAs to the provision of healthcare technology support. This is common theme in all ITSM frameworks and needs to be present in a healthcare specific ITSM framework as well. Ensuring consistency in

terminology and using appropriate nomenclature is a key requirements for healthcare SLAs, as shown by survey responses not only in the SLA section but also to the terminology related questions.

Overall, when asked about their satisfaction of healthcare IT support, the most selected response was neutral (n=7, 39%). There were more agree or strongly agree responses than disagree and strongly disagree, however, more limitations were mentioned than strengths when participants were asked to expand through free text comment boxes. The use of ITSM appears to be limited based on the response, with only three respondents (17%) indicating they had used an ITSM framework. This is on the lower end of adoption levels reported on in the systematic review, which ranged from 12% to 67% (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Krey, 2010; Krey, 2015). Since the survey had both clinical users and system support respondents, this may explain the lower levels of ITSM familiarity. Only system support respondents indicated having experience with ITSM. Stratifying the responses to system support roles increases the use of ITSM frameworks to 25%. ITIL was the only framework that had been implemented, which is not surprising given that ITIL is the most common ITSM framework (Winniford, Conger, & Erickson-Harris, 2009).

Survey Limitations

According to the systematic review, there are no published standardized survey instruments related to ITSM in the healthcare domain. As a result, this research was conducted as a proof of concept survey to gain a better understanding into findings related to ITSM in healthcare and to pilot the survey instrument. Since the survey was

done anonymously there is no ability for the researcher to contact participants after completion to perform an assessment on the survey instrument itself.

Chapter Summary

This portion of the research was intended to provide further insight into the use of ITSM in the healthcare domain and trial the use of a new survey instrument through a proof of concept approach. The survey provided insight into the use of ITSM specifically in the Canadian healthcare environment, which has had limited research to-date. The survey was able to gather information on participants' experience, knowledge levels, and feelings towards healthcare IT support through a mix of open and closed questions. By surveying both system support and clinical users, the survey was able to target the two primary stakeholders of ITSM. In a number of key areas the survey responses were consistent with the findings of the systematic review, however, there was some minor disagreement, which will be discussed further in chapter five. The responses indicated that participants had a high degree of knowledge and experience. Despite this, knowledge and experience of ITSM was relatively low, with few participants having worked in an organization that has implemented an ITSM framework. Many of the rationale for ITSM presented in the systematic review were also reflected in the responses to the survey, which suggested a need for formalized ITSM that has not been addressed. Chapter five will provide a more in-depth analysis of the results compared to the systematic review to determine the challenges and requirements associated with ITSM in healthcare, as well as provide a conceptual ITSM framework for the healthcare domain.

The survey instrument itself appeared to be well formed and valid, which was illustrated by the limited number of ambiguous responses and consistency in the consistency in the overall time it took participants to complete the survey. In addition, the agreement between the survey and the systematic review findings further suggests validity of the survey instrument. Unfortunately, to ensure confidentiality the survey itself was anonymous, making it impossible to perform an assessment of the survey instrument with participants after the completion of the survey. Despite this, based on the other factors listed above, the survey instrument does appear to be valid and can support further research into the topic.

Chapter 5 – Discussion

Introduction

The discussion chapter will examine the results found in the previous chapters to answer the research question: *what are the challenges and requirements associated with providing support services for healthcare technologies, specifically through the use of standardized Information Technology Service Management (ITSM) frameworks?*

Using the findings, a conceptual model for a Health ITSM (HITSM) framework will be presented. The overall strengths and limitations of the research will also be discussed and potential future research areas will be identified.

Requirements and Challenges of ITSM in Healthcare

Both the systematic review and the survey identified key challenges and requirements for the use of ITSM in the healthcare domain. Nine concepts related to the implementation, adoption and use of ITSM in healthcare were identified by the systematic review and survey:

- Knowledge, skills and abilities;
- Support characteristics;
- Maturity of technology support;
- Organizational attributes;
- Terminology;
- Patient safety considerations;
- Privacy, security and confidentiality considerations;

- Service level agreements; and
- User satisfaction with technology support.

Both challenges and requirements for ITSM in healthcare are outlined within the findings for each of these nine concepts. Some findings overlap between concepts, however, for clearer presentation of the results, findings will be discussed based on their primary concept.

Knowledge, Skills and Abilities

Challenges with appropriate knowledge, skills and abilities related to ITSM were noted in both the systematic review and the survey. Specifically, lack of training in standardized ITSM practices was identified as a major challenge to implementation of ITSM in healthcare by Hoerbst, Hackl, Blomer, & Ammenwerth (2011) and Jaana, Tamim, Paré, & Teitelbaum (2011). This lack of training included challenges around employee knowledge, issues arising from unprepared staff and failure of implementation resulting from lack of knowledge. The survey results provided further evidence of this challenge showing that less than half of participants were familiar with ITSM and only two (11%) were certified in an ITSM framework despite the majority of participants indicating advanced or expert knowledge in healthcare technologies. Both the systematic review and survey provided evidence that lack of knowledge, skills and abilities specifically related to ITSM concepts and frameworks are a major challenge for standardizing health technology support through the use of ITSM. As a result, knowledge management processes and processes related to skills and abilities for ITSM should be included in an HITSM framework.

Support Characteristics

The support characteristics related to the healthcare domain were identified as a challenge in the systematic review. These include:

- The complexity of the medical field and the need for healthcare IT systems to ensure they do not impede decision making by clinical users but, rather, support and enhance that ability (Krey, 2015);
- The criticality of healthcare technologies to the provision of patient care and safety (Koebler, Faehling, Krcmar, & Leimeister, 2010);
- Constant change and evolution of healthcare technologies (Jaana, Tamim, Paré, & Teitelbaum, 2011); and
- Heterogeneous environment with respect to healthcare IT systems. (Krey, 2010).

These same characteristics were also identified in the survey as factors impacting healthcare technology in participants' organizations. Specifically, constant change in the technology environment (as a result of strategic priorities and competing projects) and the criticality of healthcare technologies were reported as core challenges in healthcare domain. These challenges outline key requirements for a HITSM to address these specific support characteristics. Based on the findings from the systematic review and survey, a HITSM framework needs to contain processes to deal with business continuity with respect to critical healthcare technology, prioritization and change management processes to deal with changing priorities and technologies, and tools to cope with heterogeneous and complex application environments. As discussed in chapter two, some of these processes are within standard ITSM frameworks, however, this research indicates the need for further emphasis in these areas, specifically within a HITSM framework.

Maturity of Technology Support

The overall maturity of technology support within healthcare organizations was identified as a challenge. Low levels of support maturity, even within organizations that had implemented ITSM, was found in all four of the systematic review studies that investigated maturity levels (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Lapão, 2011; Krey, 2010; Krey, 2015). The responses to the survey partially contradict this finding, with the respondents most frequently indicating an “average” level of maturity and only four out of 18 participants (22%) indicating either a rudimentary or very rudimentary level of maturity. However, maturity of support was also measured in the survey through other responses, including questions about common tools and processes used. Taking into consideration these responses, such as the indicated lack of stakeholder involvement with technology changes, overall, the survey also indicates low levels of maturity when it comes to technology support. A simple and easy to use HITSM framework is a requirement derived from these findings. This could allow for successful adoption in organizations that do not have maturity or experience in standardized support processes.

Organizational Attributes

The systematic review reported that challenges related to organizational attributes were commonly referenced as a source of concern with respect to ITSM in healthcare. These included complex or unstable organizational structures, resource constraints, and legal restraints (Jantti & Jarvinen, 2011; Lapao, 2011; Tan, Cater-Steel, & Toleman, 2009). The survey results validated these findings, identifying similar concerns related to organizational attributes. Although the organizational challenges stated above do present

a challenge within healthcare organizations, the author would argue that these types of challenges are common to most organizations and not applicable only to the healthcare domain. In addition, these finds are consistent with ITSM research in the general domain (Iden & Eikebrokk, 2013). As a result, the organizational challenges identified in the systematic review and survey should be addressed by existing ITSM frameworks.

Terminology

The importance of medical terminology and consistency in the definitions of healthcare technology services and systems was identified as a challenge in the systematic review (Hoerbst, Hackl, Blomer, & Ammenwerth, 2011; Jantti, 2009; Jantti, 2011). The survey also indicated the importance of terminology, with most respondents indicating that knowledge of medical terminology was important to healthcare IT support. Like the systematic review, the survey also found that describing healthcare IT systems and services using consistent terminology was a challenge. Two requirements for a HITSM can be derived from the findings of the systematic review and survey. First, ensuring that processes and procedures are written to incorporate medical terminology where appropriate will prompt system support resources to ensure they are communicating and resolving issues in a manner that is understandable to the clinical users. Secondly, service catalogues should be developed using common terminology that is reflective of the organization's nomenclature. As mentioned in chapter two, the use of organizational terminology to describe service offerings is an underlying principle of all ITSM frameworks and using the concepts presented in existing frameworks should be adequate to satisfy this requirement.

Patient Safety Considerations

Patient safety considerations with respect to healthcare technology support were identified by Krey (2015) as a driver for the use of ITSM. The survey further explored this theme by asking participants if they had responded to a support request related to patient safety, with a follow-up questions asking about the processes and procedures related to patient safety issues. The majority (61%) had submitted or responded to a request that had patient safety considerations, suggesting that including processes and procedures specifically to address patient safety considerations is a requirement for an HITSM framework. Participants indicated that these processes and procedures currently exist today but there is a need for additional processes and procedures. Two participants also identified enforcement of existing standardized processes and procedures as an issue. As a result, ensuring adequate processes and procedures for patient safety is a requirement for a HITSM and a quality assurance mechanism to ensure they are being followed should also be included.

Privacy, Security and Confidentiality Considerations

Like patient safety considerations, privacy, security and confidentiality considerations were identified in the systematic review as a driver for the use of ITSM (Lapao, 2011). The survey further explored this concept by asking participants if they had responded to a support request related to privacy, security or confidentiality of healthcare technology and the related processes and procedures. The majority (61%) had submitted or responded to such a request suggesting that including processes and procedures specifically to address privacy, security and confidentiality considerations is a requirement for a HITSM framework. Like patient safety considerations, participants

indicated that processes and procedures currently exist today but there is a requirement for additional processes and procedures. Participants also identified enforcement of those standardized processes and procedures as an issue. As a result, ensuring adequate processes and procedures for privacy, security and confidentiality is a requirement for a HITSM and a quality assurance mechanism to ensure they are being followed should also be included.

Service Level Agreements

Services levels and SLAs were discussed in a number of studies from the systematic review. McBride (2009) and Tan, Cater-Steel, & Toleman (2009) specifically refer to the criticality of SLAs in the healthcare environment. The use of SLAs was also explored in the survey. Half of the respondents indicated that at least some services were covered by SLAs, however, the percentage of services covered ranged widely. As discussed in chapter two, SLAs are a key component of ITSM frameworks. ITIL in particular has an in-depth processes related to service level management that covers identification of service requirements, defining service levels, the creation and management of SLAs, and the reporting of service levels (Long, 2008). Although both the systematic review and survey identified the criticality of SLAs, based on the completeness of existing ITSM frameworks with respect to SLAs no unique requirements are required for an HITSM framework.

User Satisfaction with Current Technology Support

The concept of satisfaction with healthcare technology support was covered by a number of areas within the systematic review. Jantti, Virkanen, Mykkaunen, & Hotti (2014) specifically discuss user satisfaction with respect to ITSM in healthcare. In general,

users' satisfaction levels appeared to be low to moderate based on the findings of the systematic review. In addition, a lack of defined service levels presented a challenge in measuring satisfaction. This concept was also explored within the survey, with similar results. Overall, respondents appeared to have neutral feelings of satisfaction with respect to healthcare technology support. Given the mixed findings in the systematic review and survey, an HITSM should put an emphasis on ensuring user satisfaction.

Conceptual HITSM Framework

The section above provides an overview of the key requirements and challenges associated with ITSM in the healthcare domain, which can be translated in a conceptual HITSM framework. The conceptual HITSM framework is intended to provide a guide on how to develop an HITSM framework, as opposed to something that could be implemented as a solution. Table 11 provides an overview of the requirements for the conceptual framework based on the findings above.

Concept	Requirements
Knowledge, Skills and Abilities	<ul style="list-style-type: none"> • Ensuring skilled and knowledgeable system support staff with respect to ITSM
Support Characteristics	<ul style="list-style-type: none"> • Processes to deal with business continuity challenges • Prioritization processes to handle changing priorities and technologies • Utilize existing ITSM concepts with respect to change management • Utilize existing ITSM knowledge management concepts to cope with heterogeneous and complex application environments
Maturity of Technology Support	<ul style="list-style-type: none"> • Simple and easy to use framework to promote adoption and use of ITSM in the healthcare domain
Organizational Attributes	<ul style="list-style-type: none"> • Use existing ITSM concepts to ensure organizational attribute requirements are met
Terminology	<ul style="list-style-type: none"> • Incorporate medical terminology where appropriate to facilitate communication with users • Utilize existing ITSM concepts to ensure consistency in terminology with respect to systems and services
Patient Safety Considerations	<ul style="list-style-type: none"> • Include specific processes and procedures for patient safety • Incorporate quality assurance mechanism to ensure process and procedures are being used
Privacy, Security and Confidentiality	<ul style="list-style-type: none"> • Include specific processes and procedures for privacy, security and confidentiality • Incorporate quality assurance mechanism to ensure process and procedures are being used
Service Level Agreements	<ul style="list-style-type: none"> • Use existing ITSM concepts to ensure appropriate use of SLA
User Satisfaction with Current Technology Support	<ul style="list-style-type: none"> • Emphasis on user satisfaction

Table 11 - Overview of Requirements and Challenges

Using the table above a HITSM conceptual framework can be created. Both the systematic review and survey suggested ITIL is the primary ITSM framework used by healthcare organizations, therefore the conceptual HITSM framework will be based on the key concepts of ITIL V3 (see chapter two). Figure 19 shows the conceptual HITSM framework. Items in green indicate additional areas not contemplated in ITIL V3, which would be specific to the HITSM framework. Blue and grey items represent the ITIL V3 items (Conger, Winniford, & Erickson-Harris, 2008). Bold items indicate priority items based on the research findings.

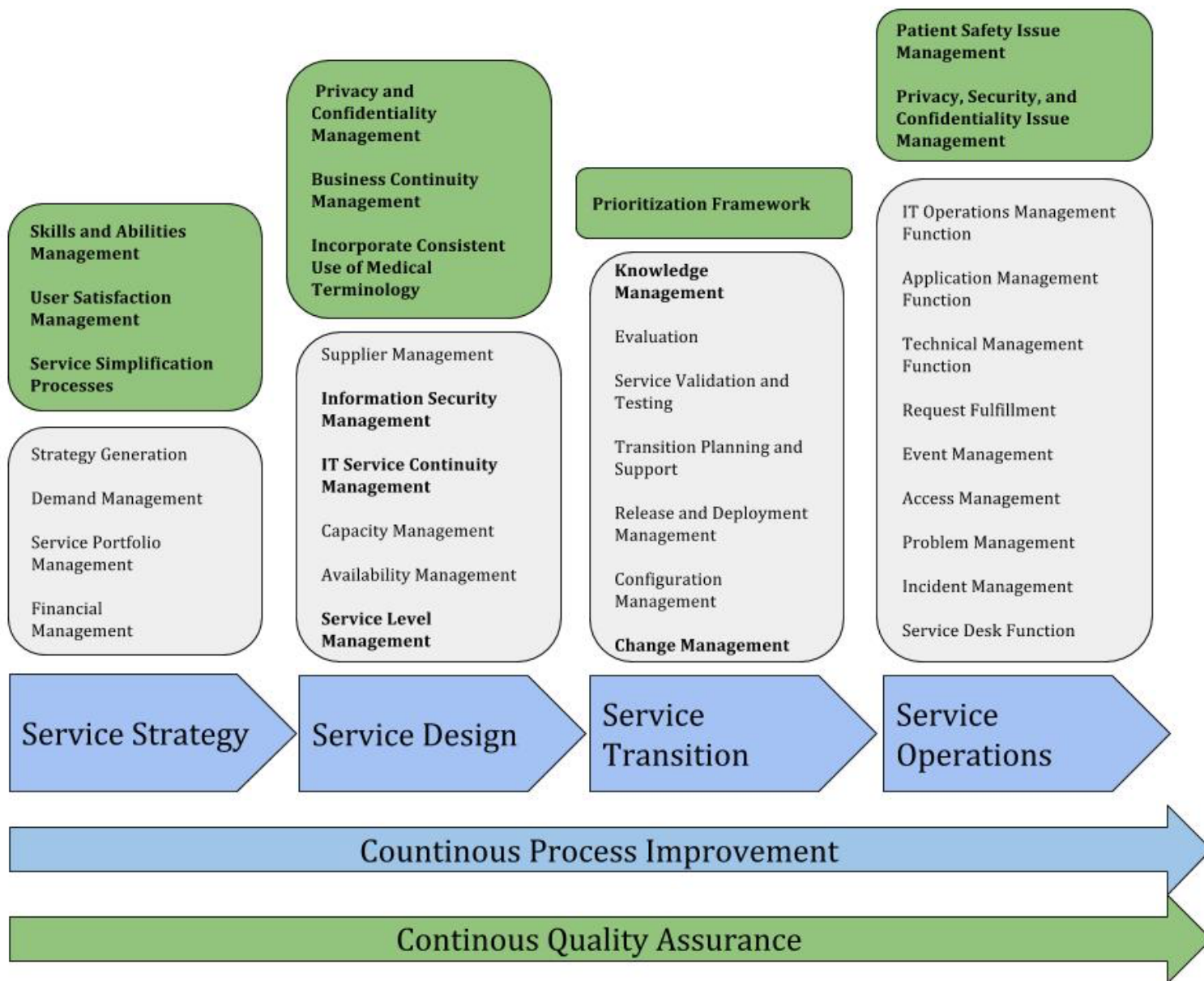


Figure 19 - Conceptual HITSM Framework

Research Strengths

To the author's knowledge, this thesis contains the first systematic review conducted exclusively on the topic of ITSM in healthcare. In addition, the thesis contains the first documented survey to examine ITSM in healthcare in the Canadian context. The survey

tool also provides the first step towards developing a validated survey instrument to assess ITSM in healthcare. This research contributes to the knowledge of ITSM in healthcare by consolidating the research done to-date, documenting new findings from a Canadian survey, determining the challenges and requirements of ITSM in the healthcare domain, and proposing a novel HITSM conceptual framework. The conceptual HITSM framework and associated research adds to the existing body of knowledge in healthcare technology support and will provide a basis for further research in the area, which has been limited to date.

Research Limitations

One of the main limitations of the research is that it did not examine the use of ITSM in other industries that may have similar requirements and challenges as the healthcare domain, such as safety critical industries. For example, the nuclear power industry could have specific safety critical ITSM requirements that are also applicable to the healthcare domain. The results found in this research are specific to the healthcare domain, however, it cannot be determined if these are unique to the healthcare domain or have been satisfied by research done in other industries. Examining other industries was outside the scope of this research project but could potentially yield additional insights into the field of ITSM in healthcare.

Both the systematic review and survey chapters also presented limitations. As mentioned in chapter 3, the systematic review was conducted by a single reviewer, thus limiting the validity of the results. The lack of a standardized survey instrument, as discussed in chapter 4, also presented a limitation to the validity of the survey research.

Potential Areas for Further Research

As mentioned in the limitations section, doing a comparison study of other safety critical industries for similar ITSM requirements is a potential area for further research. In addition, doing a larger follow-up survey is another potential area of research in the area. Finally, creating a HITSM framework using the conceptual framework proposed by this thesis and evaluating its use in a healthcare organization would provide additional insight into ITSM in healthcare.

Chapter Summary

The discussion section of the research presented the challenges and requirements for ITSM in the healthcare domain. A domain specific HITSM framework was also developed, which is based off of the existing ITIL V3 framework and incorporates the requirements identified in the systematic review and survey. The overall research strengths and limitations were discussed, along with potential areas for future research.

Chapter 6 - Conclusion

The purpose of this thesis was to determine the challenges and requirements associated with providing support services for healthcare technologies, specifically through the use of a standardized ITSM framework. The previous five chapters explore this purpose by using two research methods: a systematic review and survey. Chapter one identified the research question and objectives. Chapter two provided the reader with insight into service management concepts, the ITSM domain model and existing common ITSM frameworks. With the basic ITSM concepts covered, chapter three evaluated the implementation, adoption and use of ITSM in healthcare through a systematic review. Findings related to study characteristics, factors of ITSM adoption and use, rationale for ITSM in healthcare and measurable outcomes were all examined as part of the systematic review. Next, chapter four described the results of the survey conducted to assess the use of ITSM in healthcare. Finally, chapter five presented a discussion of the challenges and requirements for ITSM in the healthcare domain using the findings from the previous chapters. Using the requirements a conceptual ITSM framework for the healthcare domain, or HITSM, was proposed. Through the findings listed above, this thesis was able to expand the body of knowledge of healthcare technology support by answering the question: *what are the challenges and requirements associated with providing support services for healthcare technologies, specifically through the use of a standardized ITSM framework?*

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Appendix A

Certificate of Ethical Approval



Office of Research Services | Human Research Ethics Board
 Administrative Services Building Rm B202 PO Box 1700 STN CSC Victoria BC V8W 2Y2 Canada
 T 250-472-4545 | F 250-721-8960 | uvic.ca/research | ethics@uvic.ca

Certificate of Approval

PRINCIPAL INVESTIGATOR: Paul Payne	ETHICS PROTOCOL NUMBER 15-303
UVic STATUS: Master's Student	Minimal Risk Review - Board members
UVic DEPARTMENT: HEIS	ORIGINAL APPROVAL DATE: 01-Oct-15
SUPERVISOR: Dr. Abdul Roudsari	APPROVED ON: 01-Oct-15
	APPROVAL EXPIRY DATE: 30-Sep-16
PROJECT TITLE: Determining the requirements and challenges in developing a Health Information Technology Service Management framework to support eHealth systems	
RESEARCH TEAM MEMBER None	
DECLARED PROJECT FUNDING: None	
CONDITIONS OF APPROVAL	
This Certificate of Approval is valid for the above term provided there is no change in the protocol.	
<p>Modifications To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.</p> <p>Renewals Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.</p> <p>Project Closures When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.</p>	
Certification	
This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.	
 Dr. Rachael Scarth Acting Associate Vice-President, Research	

Certificate Issued On: 01-Oct-15

15-303
Payne, Paul

Appendix B

Systematic Review Abstract

Context

While there has been significant research on Information Technology Service Management (ITSM) in the Information Technology (IT) domain, including a systematic review on ITSM implementation, adoption and use, there has been limited research to date related to ITSM specifically in the healthcare environment.

Objective

Provide an overview of the current state of ITSM in healthcare and provide insights into the challenges and requirements of ITSM in the healthcare domain.

Data Sources

A systematic review of English articles published between 2005 and August 2015 using ScienceDirect, Web of Science, PubMed; IEEE Xplorer; and Google Scholar databases.

Study Selection

Studies were screened using the title and abstract. Eligibility criteria was applied in the following manner:

1. Research publication date > 2004;
2. Written in English;
3. Peer-reviewed as part of a journal, conference proceeding, or book chapter;
4. Not opinion pieces, editorials, letters or poster;
5. Related to the implementation, adoption or use of ITSM (including IT management and governance) in healthcare; and
6. Contained an evaluation of results.

A full text screening was then conducted to determine suitability for inclusion in the review.

Data Extraction

Results were coded using existing concepts presented in ITSM literature. Additional codes and categories were derived from the studies to create a common ‘bank’ of codes. In addition, study characteristics and numerical outcomes were coded.

Data Synthesis

Sections of the studies related to the evaluation of results (i.e. the result, findings, discussion or conclusion) were inductively coded; Next, categories of codes were developed; and finally analysis was completed. Study characteristics were also analyzed and reported on.

Conclusions

According to the research findings, there appears to be growing adoption and use of ITSM, particularly the Information Technology Infrastructure Library (ITIL) framework, in the healthcare environment. Despite this continued growth, maturity of ITSM still remains low. In part, this may be due to the unique requirements of a healthcare environment. A number of gaps and challenges were identified, including factors of adoption and use of ITSM that are not currently addressed by existing frameworks.

Appendix C Systematic Review Search Log

Web Of Science

Search String	Results	Duplicates	Not Related	Not Accepted	Accepted	Notes
healthcare "information technology service management"	0					
hospital "information technology service management"	0					
medical "information technology service management"	0					
eHealth "information technology service management"	0					
healthcare "IT service management"	3	0			3	
hospital "IT service management"	6	3	0	1	2	1 related paper excluded based on abstract review - opinion piece "The future of medical informatics. Some perspectives of intra- and inter-institutional information systems."
medical "IT service management"	3	1	1		1	
eHealth "IT service management"	0					
healthcare "Information Technology Infrastructure Library"	0					
hospital "Information Technology Infrastructure Library"	0					
medical "Information Technology Infrastructure Library"	1	1				

eHealth "Information Technology Infrastructure Library"	0					
healthcare "IT Infrastructure Library"	2	0	1		1	
hospital "IT Infrastructure Library"	1	1				
medical "IT Infrastructure Library"	1	1				
eHealth "IT Infrastructure Library"	0					
healthcare "Information Technology management"	4		2	1	1	
hospital "Information Technology management"	3	2	1			
medical "Information Technology management"	2		2			
eHealth "Information Technology management"	0					
healthcare "IT management"	8	2	5		1	
hospital "IT management"	16	4	8	1	3	1 outside date range – “Aligning business and information technology domains – strategic planning in hospitals”
medical "IT management"	4	3	1			
eHealth "IT management"	0					
healthcare "Information Technology governance"	1	1				"IT governance challenges in a large not-for-profit healthcare organization: The role of intranets" specifically on management structures

hospital "Information Technology governance"	2		1		1	"Information technology governance in information technology investment decision processes: The impact of investment characteristics, external environment, and internal context" - related specifically to investment
medical "Information Technology governance"	1		1			"Electronic health information system at an opioid treatment programme: roadblocks to implementation" related to EHR adoption only
eHealth "Information Technology governance"	0					
healthcare "IT governance"	14	5	6		3	
hospital "IT governance"	18	9	6	1	2	IT Governance Characteristics, Electronic Medical Records Sophistication, and Financial Performance in US Hospitals: An Empirical Investigation - specific to organizational design and EMRs An empirical examination of antecedents and consequences of IT governance in US hospitals - Not retrievable so adding to not accepted
medical "IT governance"	6	6				
eHealth "IT governance"	0					

IEEE Explorer

Search String	Results	Duplicates	Not Related	Not Accepted	Accepted	Notes
healthcare "information technology service management"	1		1			
hospital "information technology service management"	4	1	3			
medical "information technology service management"	13	1	11		1	
eHealth "information technology service management"	0					
healthcare "IT service management"	63	15	47	1		"Implementing an ITIL-Based IT Service Management Measurement System" reference to health but not specific to the domain, excluded
hospital "IT service management"	40	21	19			
medical "IT service management"	85	9	69	2	5	"Organizational issues and its impact on the performance of service desk staff members in providing quality service" did a quick full text review to determine if case studies had health components. Did not, so did not include. IT Services Reference Catalog - assess one health service catalog - for reference
eHealth "IT service management"	3	1			2	
healthcare "Information Technology Infrastructure Library"	21	6	15			

hospital "Information Technology Infrastructure Library"	12	3	9			
medical "Information Technology Infrastructure Library"	25	7	18			
eHealth "Information Technology Infrastructure Library"	1		1			
healthcare "IT Infrastructure Library"	19	12	6		1	
hospital "IT Infrastructure Library"	14	7	7			
medical "IT Infrastructure Library"	20	14	6			
eHealth "IT Infrastructure Library"	1	1				
healthcare "Information Technology management"	126					To many results to review
hospital "Information Technology management"	902					To many results to review
medical "Information Technology management"	155					To many results to review
eHealth "Information Technology management"	7		7			
healthcare "IT management"	208				1	To many results to review
hospital "IT management"	165					To many results to review
medical "IT management"	252					To many results to review
eHealth "IT management"	21	6	13	1	1	eHealth key issues in Portuguese Public Hospitals mentioned challenges with IT management as a key issue but not further discussion or analysis
healthcare "Information Technology governance"	39	8	30		1	

hospital "Information Technology governance"	36	26	10			
medical "Information Technology governance"	39	12	27			
eHealth "Information Technology governance"	2	1	1			
healthcare "IT governance"	175					To many results to review
hospital "IT governance"	106					To many results to review
medical "IT governance"	162					To many results to review

PubMed

Search String	Results	Duplicates	Not Related	Not Accepted	Accepted	Notes
"information technology service management"	0					
"IT service management"	0					
"Information Technology Infrastructure Library"	0					
"IT Infrastructure Library"	0					
"Information Technology management"	35	3	32			
"IT management"	43	2	39		2	
"Information Technology governance"	4	1	3			"Information technology governance domains in hospitals: a case study in Iran." specifically about organizational design
"IT governance"	0					

Science Direct

Search String	Results	Duplicates	Not Related	Not Accepted	Accepted	Notes
healthcare "information technology service management"	5		4	1		"Designing an evaluation framework for IT service management" - very applicable to overall background in ITSM but not included because no specific health context
hospital "information technology service management"	7	1	5	1		Implementing IT Service Management: A systematic literature review - very applicable but not specific to health
medical "information technology service management"	9	5	4			
eHealth "information technology service management"	1	1				
healthcare "IT service management"	35	2	32		1	
hospital "IT service management"	19	3	16			
medical "IT service management"	39	2	37			"Using process mining to identify coordination patterns in IT service management" not health specific
eHealth "IT service management"	6		5	1		"Identifying common problems in the acquisition and deployment of large-scale, safety-critical, software projects in the US and UK healthcare systems" - only identifies lack of ITSM as a potential issue

healthcare "Information Technology Infrastructure Library"	24	2	22			Service Level Agreement of Information and Communication Technologies in Portuguese Hospitals - disregarded only covers a very specific component of ITSM
hospital "Information Technology Infrastructure Library"	11	4	7			
medical "Information Technology Infrastructure Library"	27	4	23			
eHealth "Information Technology Infrastructure Library"	1	1				
healthcare "IT Infrastructure Library"	9	1	8			
hospital "IT Infrastructure Library"	8	3	5			
medical "IT Infrastructure Library"	15	6	8		1	A Knowledge Integration Approach of Safety-critical Software Development and Operation based on the Method Architecture - don't think it will fully screen-in during full review
eHealth "IT Infrastructure Library"	1	1				
healthcare "Information Technology management"	58	1	57			Pushing the contextual envelope: developing and diffusing IS theory for health information systems research - not accepted due to date
hospital "Information Technology management"	58	7	50		1	
medical "Information Technology management"	104	12	91		1	

eHealth "Information Technology management"	9	2	7			
healthcare "IT management"	1590					To many results to review
hospital "IT management"	5040					To many results to review
medical "IT management"	5583					To many results to review
eHealth "IT management"	52	2	50			
healthcare "Information Technology governance"	2	1	1			
hospital "Information Technology governance"	0					
medical "Information Technology governance"	3	1	2			
eHealth "Information Technology governance"	0					
healthcare "IT governance"	141	10	131			
hospital "IT governance"	148	7	141			
medical "IT governance"	219	15	204			
eHealth "IT governance"	18	5	13			

Targeted Search – All Databases Including Google Scholar

Search String	Accepted
Search for related articles by Jantti	2
Search for related articles by Lapao	0
Search for related articles by Krey	2
Search for related articles by Mohrmann	0

Appendix D Recruitment and Consent Material

Invitation To Participate



University of Victoria
Human & Social
Development

Invitation to Participate

Have you used or supported healthcare technology for at least two years?

You are invited to participate in a study entitled “**Determining the Requirements and Challenges of Health Information Technology Service Management**” that is being conducted by Paul Payne.

The purpose of this research project is to determine the requirements and challenges associated with providing support services for Information Technology (IT) in the healthcare domain, specifically looking at the use of IT Service Management.

To be eligible to participate you must have either:

- **Provided technical support services related to healthcare technology for at least 2 years;**

Or

- **Used healthcare technology in clinical practice for at least 2 years.**

The anonymous web based survey will take approximately 20-30 minutes to complete.

To participate please click on the link to read the consent information online, after which you will be taken to the survey:

<http://uvic.fluidsurveys.com/s/HITSM/>

Questions?

For any questions please contact the researcher: Paul Payne – (XXX) XXX-XXXX – xx@xx.com
Or the research supervisor: Dr. Abdul Roudsari - (XXX) XXX-XXXX – xx@xx.com

In addition, you may verify the ethical approval of this study (protocol # 15-303), or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria ((XXX) XXX-XXXX – xx@xx.com).

E-Mail Script

Hello,

My name is Paul Payne, and I am a graduate student in the Faculty of Human and Social Development, School of Health Information Science at the University of Victoria. As a graduate student, I am required to conduct research as part of the requirements for a degree of Masters in Health Informatics. This study is being conducted under the supervision of Dr. Abdul Roudsari. You may contact my supervisor by e-mail (xx@xx.com) or by phone (xxx) xxx-xxxx.

The purpose of my research project, *Determining the Requirements and Challenges of Health Information Technology Service Managements*, is to determine the requirements and challenges associated with providing support services for Information Technology (IT) in the healthcare domain. If you have:

- Provided technical support services related to healthcare technology for at least 2 years
- Or
- Used healthcare technology in clinical practice for at least 2 years

I would like to invite you to participate in a short survey. To participate in the web based anonymous survey please click on the following link to read the consent information online, after which you will be taken to the survey:

<http://uvic.fluidsurveys.com/s/HITSM/>

Or see attached poster for additional information. If you have any questions about the survey or the research project please contact me via e-mail (xx@xx.com) or by phone (xxx) xxx-xxxx.

This study has received ethical approval (protocol # 15-303) and you may verify theethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria by e-mail (xx@xx.com) or by phone (xxx) xxx-xxxx.

Thank you for your support.

Regards,
Paul Payne

Letter of Implied Consent

You are invited to participate in a study entitled “Determining the Requirements and Challenges of Health Information Technology Service Management” that is being conducted by Paul Payne.

Paul Payne is a graduate student in the department of Human and Social Development, School of Health Information Science at the University of Victoria and you may contact him if you have further questions by phone at (xxx) xxx-xxxx or e-mail at xx@xx.com.

As a graduate student, Paul is required to conduct research as part of the requirements for a Masters of Science degree in Health Informatics. It is being conducted under the supervision of Dr. Abdul Roudsari. You may contact his supervisor by phone at (xxx) xxx-xxxx or e-mail at xx@xx.com.

Purpose and Objectives

The purpose of this research project is to determine the requirements and challenges associated with providing support services for Information Technology (IT) in the healthcare domain. Existing Information Technology Service Management (ITSM) frameworks, such as the widely used Information Technology Infrastructure Library (ITIL), will be examined for their applicability to healthcare. The goal of the research will be to identify key components required to develop a successful Health Information Technology Service Management (HITSM) framework.

Importance of this Research

Research of this type is important because to-date there has been limited research covering ITSM or ITIL in the healthcare domain. This lack of research presents a major challenge for those trying to implement or use an ITSM framework, as it is unclear if the support requirements associated with healthcare IT systems and services are met by existing frameworks.

Participants Selection

You are being asked to participate in this study because you have either:

- Provided technical support services related to healthcare technology for at least 2 years;

Or

- Used healthcare technology in clinical practice for at least 2 years.

What is involved

If you consent to voluntarily participate in this research your participation will include the completion of an anonymous web-based survey, which is expected to take approximately 20-30 minutes to complete.

Inconvenience

Participation in this study may cause some inconvenience to you, including the time you spend on the survey.

Risks

There are no known or anticipated risks to you by participating in this research.

Benefits

The potential benefits of your participation in this research include helping to further the

body of knowledge in healthcare technology support.

Voluntary Participation

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you withdraw from the study prior to submitting your response, no information will be included in the research. Your responses are submitted anonymously, so once they have been submitted you will need to contact the researcher to withdraw participation.

Anonymity

To ensure your anonymity is protected an anonymous web based survey tool is used to administrate the survey.

Confidentiality

Your confidentiality and the confidentiality of the data will be protected by securely storing all responses in a password protected database.

Dissemination of Results

It is anticipated that the results of this study will be shared with others in the following ways: thesis and scholarly publications.

Disposal of Data

Data from this study will be disposed within 1 year of the completion of the survey.

Contacts

Individuals that may be contacted regarding this study include:

Paul Payne – (xxx) xxx-xxxx – xx@xx.com

Dr. Abdul Roudsari - (xxx) xxx-xxxx – xx@xx.com

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria ((xxx) xxx-xxxx or xx@xx.com)

By completing and submitting the survey, YOUR FREE AND INFORMED CONSENT IS IMPLIED and indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.




Appendix E Survey Questions and Raw Data

(Completion rate: 100.0%)






Question 1 - Letter of Information for Implied Consent

Response	Chart	Percentage	Count
I Agree		100.0%	18
Total Responses			18

Question 2 - What is your primary role with respect to Health IT?

Response	Chart	Percentage	Count
System Support		55.6%	10
Clinical User		33.3%	6
Both		11.1%	2
Other - please indicate		0.0%	0
Total Responses			18

Question 3 - What is your primary duty with respect to Health IT?

Response	Chart	Percentage	Count
Application Administration		11.1%	2
Clinician / Healthcare Provider		33.3%	6
Data Integrity		0.0%	0
Manager / Supervisor		22.2%	4
Network Administration		0.0%	0
Server Administration		0.0%	0
Technical or IT Support		22.2%	4
Training		0.0%	0
User On-boarding		0.0%	0
Other - please indicate		11.1%	2
Total Responses			18

Other – please indicate:

#	Response
1.	Supporting the governance of a Regional health information solution
2.	Device integration and management

Question 3 - What is the primary environment that you use or support Health IT?

Response	Chart	Percentage	Count
Hospital		44.4%	8
Clinic / Primary Care		22.2%	4
Vendor Office		0.0%	0
Health Ministry / Central Agency		22.2%	4
Other - please indicate		11.1%	2
Total Responses			18

Other- please indicate:

#	Response
1.	Home and Community Care
2.	Ambulatory mental health services based in a hospital

Question 4 - How many years have you used or supported Health IT?

Response	Chart	Percentage	Count
2-4 years		22.2%	4
5-7 years		38.9%	7
8-10 years		11.1%	2
Greater Than 10 years		27.8%	5
Total Responses			18

Question 5 - How would you assess your ability to use or support Health IT?

Response	Chart	Percentage	Count
Intermediate		16.7%	3
Advanced		38.9%	7
Expert		44.4%	8
I Don't Know		0.0%	0
Total Responses			18

Question 6 - Are you familiar with the concept of IT Service Management (ITSM)?

Response	Chart	Percentage	Count
Yes		44.4%	8
No		44.4%	8
I Don't Know		11.1%	2
Total Responses			18

Question 7 - In your opinion, is knowledge of ITSM important in your role?

Response	Chart	Percentage	Count
Yes		77.8%	7
No		22.2%	2
I Don't Know		0.0%	0
Total Responses			9

Question 8 - Are you familiar with the Information Technology Infrastructure Library (ITIL)?

Response	Chart	Percentage	Count
Yes		38.9%	7
No		55.6%	10
I Don't Know		5.6%	1
Total Responses			18

Question 9 - Are you certified in ITIL?

Response	Chart	Percentage	Count
Yes		28.6%	2
No		71.4%	5
I Don't Know		0.0%	0
Total Responses			7

Question 10 - What is your current level of certification?

Response	Chart	Percentage	Count
Foundation		100.0%	2
Expert		0.0%	0
Master		0.0%	0
Total Responses			2







Question 11 - Do you plan on seeking new or additional training in ITSM in the next year?

Response	Chart	Percentage	Count
Yes		25.0%	2
No		50.0%	4
I Don't Know		25.0%	2
Total Responses			8

Question 12 - How many support requests do you encounter in an average month (either as a clinical user or system support)?

Response	Chart	Percentage	Count
None		0.0%	0
1-25		50.0%	9
26-50		16.7%	3
Greater Than 50		33.3%	6
I Don't Know		0.0%	0
Total Responses			18




Question 13 - What is the primary medium for requesting support in your organization?

Response	Chart	Percentage	Count
Telephone		11.1%	2
E-Mail		27.8%	5
Ticketing System		22.2%	4
Face-to-Face		22.2%	4
I Don't Know		5.6%	1
Other - please indicate		11.1%	2
Total Responses			18







Other - please indicate:

#	Response
1.	Online service requests via specific internal web forms/pages
2.	A combination of e-mail and telephone

Question 14 - There are adequate human resources to support Health IT in your organization.

Response	Chart	Percentage	Count
Strongly Agree		0.0%	0
Agree		50.0%	9
Neutral		0.0%	0
Disagree		16.7%	3
Strongly Disagree		33.3%	6
I Don't Know		0.0%	0
Total Responses			18

Question 15 - There are adequate technologies to support Health IT in your organization (i.e. knowledge management databases, ticketing tools) .

Response	Chart	Percentage	Count
Strongly Agree		11.1%	2
Agree		33.3%	6
Neutral		16.7%	3
Disagree		22.2%	4
Strongly Disagree		11.1%	2
I Don't Know		5.6%	1
Total Responses			18

Question 16 - There are adequate processes and procedures to support Health IT in your organization (i.e. change management processes, standard operating procedures).

Response	Chart	Percentage	Count
Strongly Agree		11.1%	2
Agree		27.8%	5
Neutral		11.1%	2
Disagree		27.8%	5
Strongly Disagree		22.2%	4
I Don't Know		0.0%	0
Total Responses			18

Question 17 - Is there documentation on what Health IT services are offered in your organization (i.e. a catalog of services)?

Response	Chart	Percentage	Count
Yes		33.3%	6
No		27.8%	5
I Don't Know		38.9%	7
Total Responses			18

Question 18 - Approximately what percentage of provided services are documented?

Response	Chart	Percentage	Count
Less than 25%		16.7%	1
25-49%		0.0%	0
50-74%		50.0%	3
75-99%		33.3%	2
100%		0.0%	0
Total Responses			6

Question 19 - Is there consistent terminology used to describe documented services in your organization?

Response	Chart	Percentage	Count
Yes		50.0%	3
No		33.3%	2
I Don't Know		16.7%	1
Total Responses			6

Question 20 - What tools are used for Health IT support in your organization?

Response	Chart	Percentage	Count
Ticket System		66.7%	12
Standard Operating Procedures		44.4%	8
Operations Guides		44.4%	8
Knowledge Management System (i.e. Wiki or Portal)		44.4%	8
Help Files		44.4%	8
No Tools Are Used		5.6%	1
I Don't Know		16.7%	3
Other(s) - please indicate		11.1%	2
Total Responses			18

Other(s) - please indicate:

#	Response
1.	24/7 Telephone support
2.	call and leave a message with the help desk and hope they return the call







Question 21 - Which factors have an impact on Health IT support in your organization?

Response	Chart	Percentage	Count
Complex or Unstable Organizational Structures		52.9%	9
Criticality of Health IT Systems		58.8%	10
Heterogeneous Systems		29.4%	5
Lack of Standardized Processes and Procedures		41.2%	7
Legal Restraints		23.5%	4
Resource Constraints		76.5%	13
Security Practices and Data Management		58.8%	10
Strategic Priorities		76.5%	13
Other(s) - please indicate		11.8%	2
Total Responses			17







Other(s) - please indicate:

#	Response
1.	Concurrent implementation of EHR CPOE UDMD BCM and organization restructuring
2.	Privacy concerns.







Question 22 - Overall, how would you rate the maturity of Health IT support in your organization?

Response	Chart	Percentage	Count
Very Mature		5.6%	1
Mature		22.2%	4
Average		44.4%	8
Rudimentary		16.7%	3
Very Rudimentary		5.6%	1
I Don't Know		5.6%	1
Total Responses			18




Question 23 - Changes to Health IT systems or services are managed well in my organization.

Response	Chart	Percentage	Count
Strongly Agree		0.0%	0
Agree		33.3%	6
Neutral		5.6%	1
Disagree		44.4%	8
Strongly Disagree		16.7%	3
I Don't Know		0.0%	0
Total Responses			18




Question 24 - All relevant stakeholders participate in Health IT changes in my organization.

Response	Chart	Percentage	Count
Strongly Agree		0.0%	0
Agree		16.7%	3
Neutral		22.2%	4
Disagree		50.0%	9
Strongly Disagree		11.1%	2
I Don't Know		0.0%	0
Total Responses			18




Question 25 - Are there committees related to the management or oversight of Health IT in your organization?

Response	Chart	Percentage	Count
Yes		66.7%	12
No		22.2%	4
I Don't Know		11.1%	2
Total Responses			18





Question 26 - Is Health IT mentioned in the organization's strategic plan?

Response	Chart	Percentage	Count
Yes		72.2%	13
No		5.6%	1
I Don't Know		22.2%	4
Total Responses			18



Question 27 - Is consistent terminology used to describe Health IT systems and services in your organization?

Response	Chart	Percentage	Count
Yes		27.8%	5
No		38.9%	7
I Don't Know		33.3%	6
Total Responses			18





Question 28 - Please rate your knowledge of medical terminology:

Response	Chart	Percentage	Count
Very Knowledgeable		33.3%	6
Knowledgeable		27.8%	5
Average		27.8%	5
Unknowledgeable		11.1%	2
Very Unknowledgeable		0.0%	0
I Don't Know		0.0%	0
Total Responses			18

Question 29 - Have you received training in medical terminology?

Response	Chart	Percentage	Count
Yes		61.1%	11
No		38.9%	7
I Don't Know		0.0%	0
Total Responses			18

Question 30 - In your opinion, how important is understanding medical terminology to the provision of Health IT support?

Response	Chart	Percentage	Count
Very Important		55.6%	10
Important		27.8%	5
Neutral		5.6%	1
Somewhat Important		11.1%	2
Not at all Important		0.0%	0
I Don't Know		0.0%	0
Total Responses			18

Question 31 - Have you ever submitted or responded to a support request related to patient safety?

Response	Chart	Percentage	Count
Yes		61.1%	11
No		33.3%	6
I Don't Know		5.6%	1
Total Responses			18

Question 31 - Are there support processes or procedures related specifically to patient safety issues in your organization?

Response	Chart	Percentage	Count
Yes		44.4%	8
No		16.7%	3
I Don't Know		38.9%	7
Total Responses			18

Question 31b - Please indicate those processes or procedures:

#	Response
1.	<p>Patient safety protocols, including reporting processes, forms for reporting PHIPPA training Patient Accommodation Policy</p> <p>The problem is that no one really follows the policies because there is no enforcement or oversight.</p>
2.	many
3.	<p>Responses to requests for patient care are timed on a number of different levels. For example, referrals where physicians request care for a patient must be triaged within 24 hours. Referral priorities are assigned according to the nature of the referral. Abuse or self-neglect referrals get the highest priority.</p> <p>Referrals are subject to multiple points of review to ensure the response is the best one.</p>
4.	<p>On line submission of safety incidents and "near misses". There are received and reviewed by the relevant clinical management and by the quality improvement team(s). These submissions include all patient safety issues i.e. those related to IT and those which are not directly related to IT.</p>

Question 32 - In your opinion, are there additional processes or procedures needed specifically for patient safety issues?

Response	Chart	Percentage	Count
Yes		33.3%	6
No		33.3%	6
I Don't Know		33.3%	6
Total Responses			18

Question 32b - Please indicate those processes or procedures:

#	Response
1.	Enforcement and oversight, including whistleblower opportunities to uninvolved parties (Ministry?)
2.	Managers in the organization tend to manage programs and budgets rather than the teams of people that provide access to services. In many cases the managers are not aware of the processes the teams use to provide the work. In other words, there is no oversight.
3.	clearly defined; actionable (in terms of the support staff being able to raise this to the appropriate individual)
4.	ability to document on the EHR f

Question 33 - Have you ever submitted or responded to a support request related to a security, privacy or confidentiality concern?

Response	Chart	Percentage	Count
Yes		61.1%	11
No		38.9%	7
I Don't Know		0.0%	0
Total Responses			18




Question 34 - Are there specific processes or procedures related to security, privacy or confidentiality in your organization?

Response	Chart	Percentage	Count
Yes		61.1%	11
No		16.7%	3
I Don't Know		22.2%	4
Total Responses			18

Question 34b - Please indicate those processes or procedures:

#	Response
1.	See previous
2.	many
3.	Clear protocols defining a breach and the reporting process. All staff are required to review and sign off on the security and privacy agreement annually.
4.	ATIPP
5.	i have no idea what they are, but I get a message when logging on to the service that security is an issue and that it is followed




Question 35 - In your opinion, are there additional processes or procedures needed specifically for security, privacy or confidentiality issues?

Response	Chart	Percentage	Count
Yes		50.0%	9
No		22.2%	4
I Don't Know		27.8%	5
Total Responses			18

Question 35b - Please indicate those processes or procedures:

#	Response
1.	Again, enforcement and oversight.
2.	many
3.	There are some regulations in place. Words do not provide education or ongoing updates to people.
4.	These processes or procedures should be embedded and should not be viewed as being additional
5.	HIA. Now developed!

Question 36 - Do you currently access or provide services that are described in an SLA?

Response	Chart	Percentage	Count
Yes		50.0%	9
No		27.8%	5
I Don't Know		22.2%	4
Total Responses			18

Question 37 - Approximately what percentage of services that you receive or provide are covered by an SLA?

Response	Chart	Percentage	Count
Less than 25%		18.2%	2
25-49%		18.2%	2
50-74%		36.4%	4
75-99%		27.3%	3
100%		0.0%	0
Total Responses			11

Question 38 - In your opinion, how important are SLAs to the services you receive or provide?

Response	Chart	Percentage	Count
Very Important		55.6%	5
Important		22.2%	2
Neutral		11.1%	1
Somewhat Important		0.0%	0
Not at all Important		0.0%	0
I Don't Know		11.1%	1
Total Responses			9

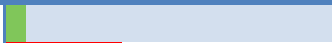
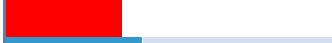


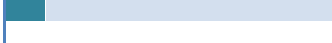
Question 39 - What are the strengths of Health IT support in your organization?

#	Response
1.	HELPDESK Itil tiered support model Clinicians as dbas
2.	I almost always get a prompt response to service requests.
3.	The responses are fairly robust. The timing for replies to requests are good.
4.	There are is both a general contact process for IT and resources related to specific technology. 24/7 contact line helps to navigate the specific resources and will link directly or provide contact information or call back. The support is generally effective but sometimes is lack when there is not an understanding of how the technology is being utilized in our area.
5.	Good paying jobs, HIA developed, focus on eHealth.
6.	Accessibility of support to users.
7.	can't answer as i have not seen any - I still can't get a fob for remote access and I am a physician

Question 40 - What are the limitations of Health IT support in your organization?

#	Response
1.	Lack of skilled clinicians to support systems
2.	Multiple concurrent implementations
3.	Lack of funding for IT in healthcare budgets Knowledgable IT people don't understand healthcare and vice versa IT is not fully utilized in healthcare - resistance to change, difficulties leaning new programs/processes
4.	A recurring problem may be answered in numerous ways depending on the technician answering the question. However, I realize this is partly the result of the wide ranging merging of technologies (there's more than one way to skin a cat).
5.	Resources, and stakeholder buy in
6.	There are numerous technologies acquired and supported by this organization. My experience is that there is not an adequate process for reviewing and advising which technologies are available. Except for the enterprise IT systems the awareness of other IT tends to be more work of mouth or based in individual review of all of the organizations web information. To me it would be important and useful for there to be an opportunity for IT resource teams to periodically (annual?) review all of the available technology with each clinical team or service. Alternatively this could be a IT liasion role where the IT contact is aware of the services, business model, current IT in place etc. They could then provide updates and recommendation regarding additional or alternative IT which would benefit and fit with in that services. Ideally this would include the pros and cons of the technology, the resources (both service based and organization wide) to implement and the possible timelines for decisions and implementation.
7.	large organization and with many Health IT systems
8.	Resources, Capital Project pressures, change in technology, change in market place.
9.	no idea who they are and they don't seem to understand what i do or how sick the patients are and that when I ask for something i kinda need it dealt with

Question 41 - Overall, how satisfied are you with Health IT support services in your organization?

Response	Chart	Percentage	Count
Very Satisfied		5.6%	1
Satisfied		33.3%	6
Neutral		38.9%	7
Unsatisfied		11.1%	2
Very Unsatisfied		11.1%	2
N/A		0.0%	0
Total Responses			18

Question 42 - In any of your past experiences, has Health IT utilized an IT Service Management (ITSM) framework, such as ITIL?

Response	Chart	Percentage	Count
Yes		16.7%	3
No		38.9%	7
I Don't Know		44.4%	8
Total Responses			18

Question 43 - Please indicate the ITSM framework(s) you have experience with:

Response	Chart	Percentage	Count
ITIL		100.0%	3
COBIT		0.0%	0
HP ITSM		0.0%	0
IBM ITPM		0.0%	0
MOF		0.0%	0
Other - please indicate		0.0%	0
Total Responses			3

Question 44 - In your current organization, is Health IT utilizing an ITSM framework, such as ITIL?

Response	Chart	Percentage	Count
Yes		66.7%	2
No		0.0%	0
I Don't Know		33.3%	1
Total Responses			3

Question 45 - Please indicate the ITSM framework(s) currently being used in your organization:

Response	Chart	Percentage	Count
ITIL		100.0%	2
COBIT		0.0%	0
HP ITSM		0.0%	0
IBM ITPM		0.0%	0
MOF		0.0%	0
Other - please indicate		0.0%	0
Total Responses			2

Question 46 - How would you rate the maturity of the ITSM implementation in your organization?

Response	Chart	Percentage	Count
Optimized		0.0%	0
Managed		50.0%	1
Defined		0.0%	0
Repeatable		0.0%	0
Initial		0.0%	0
I Don't Know		50.0%	1
Total Responses			2

Question 47 - In your organization, is there a planned implementation of an ITSM framework, such as ITIL, in the next year?

Response	Chart	Percentage	Count
Yes		16.7%	3
No		33.3%	6
I Don't Know		50.0%	9
Total Responses			18

Question 48 - In your experience, what are the strengths and limitations of ITSM in the healthcare domain?

There are no responses to this question.