The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT from the perspective of the IT team.

A thesis submitted to Charles Sturt University for the degree of

Doctor of Information Technology

Karen Holt

MInfoSysSec MBA(Technology)

Submitted March 2017

Table of Contents

Certificate of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Charles Sturt University or any other educational institution, except where due acknowledgment is made in the thesis.

I agree that this thesis be accessible for the purpose of study and research in accordance with the normal conditions established by the Executive Director, Library Services or nominee, for the care, loan and reproduction of theses.

……..

Karen Holt

24 March 2017

Acknowledgments

The journey towards the attainment of a Professional Doctorate, especially via distance education, is a long and lonely one and would not be at all possible without the support and encouragement of many people.

I would like to acknowledge Charles Sturt University and the IT Masters for giving me entry to an IT Masters initially then to the Doctor of Information Technology degree and offer my appreciation of the many staff in both organisations who were unfailingly available and helpful.

Sincere gratitude goes towards my supervisors, initially Professor John Weckert who took me on as a doctoral student then my principal supervisor, Oliver Burmeister and assistant supervisor, Ken Eustace. Their continual support and encouragement during the significant bumps on the way to submission have meant an enormous amount and allowed me to keep faith in achieving my goal.

My love always and gratitude goes to my husband, my family and good friends who have been unflagging in their support and unshakeable belief in me and urged me always onwards.

Intellectual Property Rights

If there is material in the thesis that could or does have implications for the intellectual property rights of the candidate, the University, a sponsor of the research or some other person or body, those implications shall be stated.

Ethics Approval

The proposal to do this research was approved by the Charles Sturt University's Ethics in Human Research Committee on 4th April 2014 with approval number 215/2013/22.

Abstract

Information technology (IT) has become ubiquitous over the last three decades, underpinning every aspect of daily activity. In parallel, the provision of information technology has become increasingly more service-oriented, necessitating the managed delivery of cost-effective services. During that time, one information technology service management (ITSM) framework, the Information Technology Infrastructure Library (ITIL), has emerged to become widely accepted as the predominant best practice framework. This includes within the education sector where there has been a significant and sustained investment in technology since the mid-1990s. Despite this investment and the increasing adoption of best practice frameworks such as ITIL, national assessment of information and communication technology literacy (ICTL) over the last decade has not demonstrated a marked improvement. Whilst there is research into the acceptance and use of technology by teachers in schools, little academic research has been conducted into ITIL implementations in small and medium enterprises (SME), particularly in the education sector. The literature on the perceptions of users and IT staff regarding ITIL as a mode of IT support, along with any effect this has on the use of technology, is another area of paucity. Both these areas are addressed by this study, the objective of which is to investigate ITIL Service Desk implementations in independent schools in NSW with a focus on IT staff and user perceptions and acceptance of the Service Desk function and processes. Also explored are any effects on technology usage frequency in the classroom and whether any correlation exists

between this and the mode of IT support. The de facto status of ITIL as the common framework for delivery of IT services, with the Service Desk as the primary entry point, is confirmed by the findings, which also reveal an endemic avoidance of the Service Desk processes along with a preference for personal interaction for IT support. The positive and negative effects of perceptions are highlighted and while the effect on technology usage frequency is not quantifiable, perceptions of its increase predominate, despite the finding that this opinion is more prevalent in organisations that state no means of measuring this. This study makes practical contributions for IT support professionals by offering insights into everyday issues and has the potential to stimulate discussion on alternate modes of IT support.

Terminology used in this thesis

Acronyms

Specific terminology related to technology, including acronyms, is used throughout this thesis. These are summarised in Table 0.1 and placed here as a reference for readers. The full term is used in its first instance and then, as is the conventional approach, the acronym is used thereafter except where, for clarity, the full term may be used instead.

Table 0.1 Terminology, including acronyms, used in the thesis is below.

Acronym	**Definition**
ACARA	Australian Curriculum, Assessment and Reporting Authority
ACT	Australian Capital Territory
AIS	Association of Independent Schools
AISNSW	Association of Independent Schools New South Wales
AS	Australian Standards
BECTA	British Educational Communications and Technology Agency
BS	British Standards
CAPEX	Capital Expense
CCTA	Central Computer and Telecommunications Agency
CI	Configuration Items
CMDB	Configuration Manager Database
CSF	critical success factors
CSU	Charles Sturt University
DEEWR	Australian Department of Education, Employment and Workplace Relations

DER	Digital Education Revolution
DET	NSW Department of Education
E-LEARNING	Electronic Learning
FITS	Framework for ICT Technical Support
GITIMM	Government Information Technology Infrastructure Management Method
ICT	Information and communication technology
IS	Information Systems
ISO	International Organisation for Standardisation
ISO/IEC	International Organisation for Standardisation/International Electrotechnical Commission
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITSM	Information Technology Service Management
ITSMF	IT Service Management Forum
IWB	Interactive White Board
K-12	Kindergarten to Year Twelve
KPI	Key performance indicators
LMS	Learning Management System
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
MITIE	Managers of Information Technology in Education
MOF	Microsoft Operations Framework
NAP	National Assessment Program
NAPLAN	National Assessment Program Literacy and numeracy
NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
OGC	Office of Government Commerce
OPEX	Operating Expense
PRM-IT	IBM Process Reference Model for IT
QCF	Qualifications and Credit Framework
QLD	Queensland
ROI	Return on Investment

SA	South Australia
SD	Service Desk
SME	Small and Medium Enterprise
SPSS	Statistical Package for Social Sciences
SQA	Scottish Qualifications Authority
TAS	Tasmania
URL	Universal Resource Locator
VIP	Very Important Person
WA	Western Australia
WHD	Web Help Desk

Table 0.1 Table of Acronyms

Chapter 1: Introduction

Information and communication technology (ICT) has revolutionised virtually every aspect of our life and work in the last decades, therefore anyone unable to navigate through a complex digital landscape will no longer be able to participate fully in the economic, social and cultural life around them. As technology has permeated every aspect of life over the last thirty to forty years and moved from the realm of white-coated scientists to every home and business, the need to ensure efficient and cost-effective delivery of the services necessary and expected has resulted in an accepted best practice standard, ITIL. A procedural, process driven non-prescriptive set of guidelines or framework, ITIL has been adopted worldwide as the basis of IT service delivery and support. Over the course of the last twenty-five years or so ITIL has grown from a collection of best practice processes promulgated to gain efficiencies in government spending on technology in Britain to the globally accepted best practice framework for IT Service delivery and the basis for worldwide standards such as BS 15000, AS 8018 and ISO/IEC 20000.

Research into ITIL has been relatively sparse and has primarily addressed descriptions of ITIL process or implementations; critical success factors for successful implementation or adoption of ITIL; challenges and benefits of ITIL implementations; effect on organisational performance and whether success or failure can be related to organisational maturity levels. The majority of research has been carried out in large organisations, often technology or service

organisations or tertiary institutions and ones sourced through membership of ITSM groups where clearly IT Service Management has a pre-eminent focus. Little attention has been directed to perceptions; of the effectiveness of an ITIL Service Desk, or to the perceptions of IT support following the implementation of an ITIL Service Desk as the process for requesting support. Likewise, there has been minimal research into ITIL as a support framework in small and medium professional enterprises (SMEs) where it has also effectively become the expected standard (Cruz-Hinojosa & Gutiérrez-de-Mesa, 2016).

This is true also, of the teaching profession, where resistance to technology in pedagogical practice still exists. Many factors contribute to this resistance, but amongst them, support, whether organisational, professional or purely technical, stands out as a universally cited cause. The juxtaposition of the technology investment of the Digital Education Revolution and the reported frequency of use of computers at school by Year 10 students in the NAP ICT Literacy Reports from 2005 to 2014 exposes an extant barrier to technology use in teaching and learning in which the mode of delivery of technical support could be a contributing factor. In view of the significant investment in technology over a long period of time in schools in NSW, at both state and federal levels, along with the focus at a national level since the Adelaide Declaration on National Goals for Schooling in the Twenty-First Century in 1999 on embedding technology in education, independent schools in NSW can provide an information-rich source for an enquiry into technical support grounded in the ITIL framework and its impact on professional practice and

intended outcomes. This sustained investment and the resources generally enjoyed by private schools in the NSW educational sector have eliminated or at least minimised a number of the well-researched barriers to the use of technology by teachers in the classroom. Greatly enhanced individual computer access, growth and maturity of supporting infrastructure; ongoing technology-based pedagogical and practical professional development and organisational recognition of the importance of technology have countered those previously valid impediments to technology adoption and integration in this school sector. However, NSW schools are among the lowest users of technology in the classroom as reported by ACARA in all its NAP ICT Literacy Reports so clearly some issues to integration remain. Mirroring this the latest OECD report (OECD, 2015) finds that despite both the pervasiveness of and considerable investment in technology in education ICT has not yet been as widely adopted in formal education as expected and even when used in the classroom its impact on student performance shows no appreciable improvements in reading, mathematics or science achievement. While there has also been investment in support, both technology infrastructure and those who use it, this barrier is not as easily empirically measured as the others and therefore its effectiveness not as easy to judge.

Although there has been some research into ITIL implementations little attention has been paid to the perceptions of IT staff and users involved in an implementation of ITIL and their acceptance of an ITIL based mode of service delivery and support. Independent schools in NSW have provided technology

and training resources for a considerable period of time and groups such as the Managers of Information Technology in Education (MITIE) have helped IT management and support in education become a recognized profession with the majority of members knowledgeable and supportive of ITIL thus mitigating many of the factors that can affect teachers' use of and attitudes towards technology thereby making this group eminently suited as research participants. By situating the research in an environment where a number of confounding factors have been minimised and end users (teachers), as noted by Hu, Clark and Ma (2003), as a group differ from business users in that they have more independence and autonomy over their use of technology, the intention is that the results would contribute to furthering an understanding of how well the ITIL process for service support, the Service Desk, is received by IT staff and the users they support. This thereby enabling the research to more accurately reflect the perceptions of the participants in relation to the particular model of support, its acceptance or avoidance and its effect on technology use. This was gauged via an online survey tool comprising both closed and open-ended questions evaluating the effect an ITIL Service Desk implementation had on the perceptions of IT and the IT support staff by participants. Whether the Service Desk function, as support delivery process, facilitated the use of technology in an SME professional environment was also assessed.

The following research questions were posed.

RQ1: Does the implementation of an ITIL based service desk affect users' perceptions of IT service and their use of ICT?

RQ2: What are user and ICT staff perceptions of the process and outcomes?

RQ3: To what extent do users and ICT staff step outside the formal request system?

RQ4: Is there any correlation between the implementation of an ITIL based service desk and the frequency of use of technology?

Chapter 2: Literature Review

2.1 Introduction

The Information Technology Infrastructure Library, commonly referred to as ITIL, is a set of published guides describing a cohesive best practice framework for Information Technology (IT) service delivery, support and management. It is not intended to be a prescriptive step by step methodology rather a guiding framework able to be adapted to each organisation's needs to assist them in optimising their own IT service management practices. The framework primarily uses a procedural, top-down approach designed to ensure the quality delivery of IT services aligned with business goals in order to generate strategic value and help drive innovation (OGC, 2009). Since its inception just over thirty years ago, ITIL has become the most widely accepted and the worldwide de facto standard for IT service management (Beachboard et al., 2007; Johnson, Hately, Miller, & Orr, 2007; Mohamed, Ribiere, O'Sullivan, & Mohamed, 2008; Scheeruhn, Reinboth, & Habel, 2006; Verghis, 2006). As it has matured through its three versions plus updates the penetration of ITIL has not been confined to just large organisations in the public and private sectors but has likewise been embraced by the government, health and educational sectors.

2.2 Evolution of the ITIL Framework

The Central Computer and Telecommunications Agency (CCTA), which later became the Office of Government Commerce (OGC) in 2000, then moving into the Efficiency and Reform Group of the Cabinet Office in 2010, before being closed in 2011, initially developed a framework known as the Government Information Technology Infrastructure Management Method (GITIMM) centred around the concept of shared standards and practices for use by IT professionals. By using the application of a consistent set of standards it was deemed possible to increase efficiency and reduce costs even across projects of very different natures. Further consultation with many private sector companies expanded this initial framework to develop and include components that are now known as service support and service delivery. At first, this approach, GITIMM, which was very technically focussed, was not applied to the private sector, though their input had gone into its creation. Later, when private sector interest began to be shown, the terms 'government' and 'method' were deemed inappropriate, the latter as this approach was not a method but a collection of guidance literature. The GITIMM was thus renamed the Information Technology Infrastructure Library (ITIL). After its initial publication in 1989, the number of books within ITIL version 1 quickly grew to more than 30 volumes which was somewhat daunting and unwieldy. So, by the year 2000, to make ITIL more accessible and more affordable to a wider range of organisations, ITIL version 2 consolidated these into nine categories or volumes that grouped related processes offering guidelines suitable for various

aspects of IT management, IT applications and IT services. This version was very IT-centric and process-based, taking into account the rapid changes in technology and providing a more uniform and usable structure for service support and delivery with the focus on IT as a service provider. The ITIL version 2 Service Support and Service Delivery processes and functions are shown below. (Table 2.1)

Service Support	**Service Delivery**
Incident Management	Service Level Management
Problem Management	Financial Management
Change Management	Capacity Management
Configuration Management	Availability Management
Release Management	Continuity Management

Table 2.1 ITIL v2 Service Support and Delivery functions (Verghis, 2006)

Version 2 of ITIL became widely known and accepted globally and is still in use in many organisations. As the use of ITIL spread it brought a common vocabulary across organisations with even those who had not implemented ITIL using and understanding its particular terminology. The Service Management volumes - Service Support and Service Delivery - were and still are by far the most widely used, circulated, and understood of the ITIL v2 and later version publications. In May 2007 version 3 of ITIL consisting of 26 processes and 4 functions, now grouped into 5 core volumes or sets was released.

This version's focus was a greater emphasis on integrating IT and business and using service management, along with automated operations and a continuous improvement strategy to help create business value (ITIL Central, 2005). The concept of an IT Service Lifecycle which was based on a Plan-Do-Check-Act cycle was introduced with this version. The greater focus on continual improvement placed more emphasis on ICT producing value for the business rather than being just a service provider to the business. Overall, however, the underlying principles of ITIL as catalogued in version 2 were largely unchanged. The core differences between version 2 and version 3 are listed in the table below. (Table 2.2)

ITIL V2	ITIL V3
Focused on product, process and people.	Focused on product, process, people and partners.
Process oriented approach	Lifecycle based approach.
Security management is part of evaluation	Security management is a separate process
Emphasis on service design and service strategy	Equal attention to all processes
10 processes and 2 functions	26 processes and 4 functions

Table 2.2 Comparison of ITIL versions 2 and 3 ("ITIL Quick Guide," 2017)

In response to feedback from review of the Change Control Log, ITIL trainers and certifiers and the wider practitioner community, as well as to changes in ITSM practices, version 3 of ITIL was updated and renamed ("OGC Mandate for Change Project requirements for an update to the ITIL® core publications," 2009). The last and current release was July 2011, providing an update to the version published in 2007. This publication is called the 2011 version of ITIL and version 3 is now known as the ITIL 2007 Edition. In line with the 2007 edition, the 2011 edition still consists of five core publications and 26 processes – Service Strategy, Service Design, Service Transition, Service Operation, and Continual Service Improvement. However, the ITIL 2011 update addresses significant additions to ITIL 2007 including the definition of formal processes which were previously implied but not identified, as well as correction of errors and inconsistencies and clarification across all five volumes while expanding on more recently developed areas such as cloud computing (The Cabinet Office, 2011). In addition, the 2011 release aimed to correct the following: remediation of inconsistencies between the content and layout of the publications; address some of the criticisms of the core publications raised by the training community; simplify the Service Strategy publication so that concepts are more easily understood and content is more accessible to a greater number of users ("OGC Mandate for Change Project requirements for an update to the ITIL® core publications," 2009; The Cabinet Office, 2011). The graphic below (Pultorak) illustrates the components of and relationships between the 26 processes and 4 functions of the still current ITIL 2011 release.

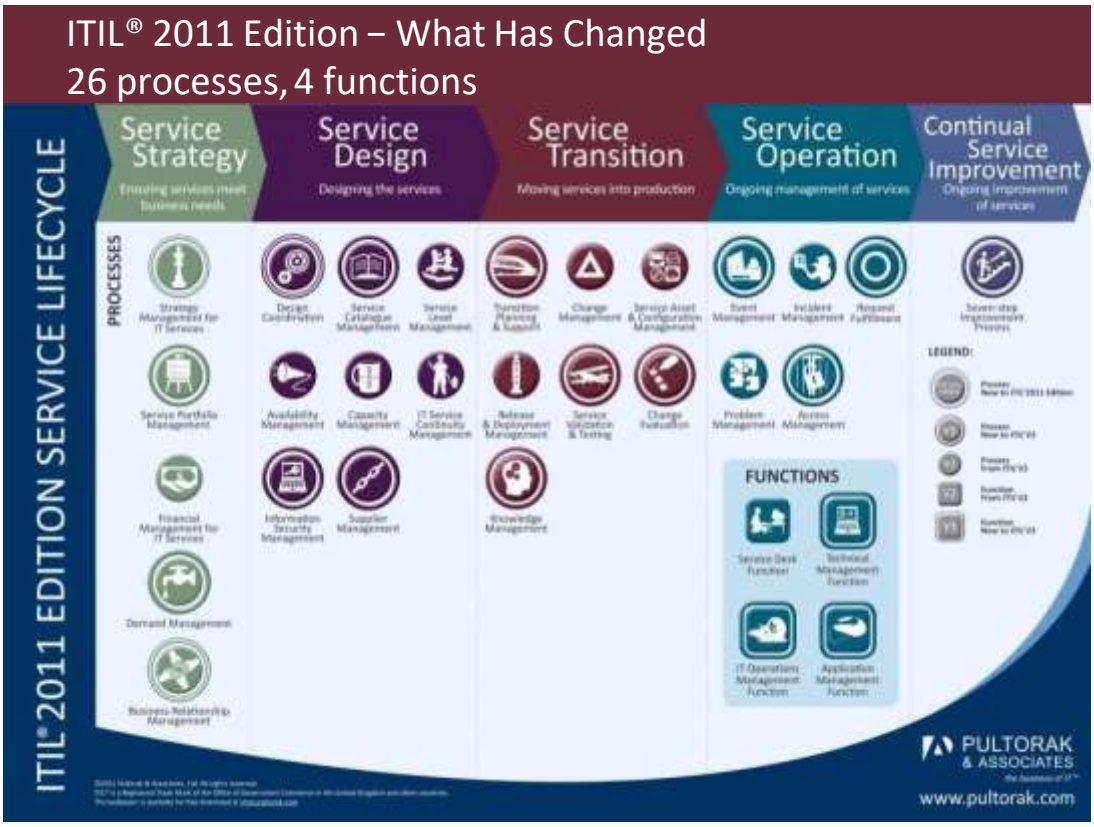


Figure 2.1 ITIL 2011 Edition (Pultorak)

While a recent cross-national study of ITIL adoption found that the number of organisations adopting version 3 (including the 2011 release) was almost equal with those still using version 2 (Marrone, Gacenga, Cater-Steel, & Kolbe, 2014) the differences between these versions in the area this research focussed upon is minimal. Version 2's Service Support and Service Delivery have been combined into Service Operation, which introduces three new processes and three new functions, but the Service Desk function remains the same with no major differences between versions. The Service Desk function is the locus of interest for this research project and is one of the best-described ITIL features. The Service Desk is designed to be the single point of contact for users and the only interface for all communications with the IT support personnel, team,

department or organisation and primarily handles Incident Management, Request Fulfillment and Event Management, the latter two being new processes in ITIL version 3/2011. Some of the daily tasks handled by the Service Desk staff include handling incidents and requests, keeping users informed of the progress of their requests and advising on workarounds in order to restore service or access as quickly as possible. Some service desk implementations, particularly in smaller organisations, may also deal with change requests, problem resolution, maintenance contracts, software licenses, configuration management including updates and software installations and IT services continuity management. The Service Desk function can have one of three main configurations; a local service desk that is part of the organisation whose business technology needs it services; a central service desk that supports multiple locations or as experienced when IT support is outsourced to an external provider and; a virtual service desk for global support as in multi-national organisations or those offering service or product support such as Microsoft or IBM ("Information Technology Infrastructure Library (ITIL) Guide," 2017) . This thesis concentrated upon the first configuration of the Service Desk function, namely a local Service Desk that is internal to the organisation it supports and whose staff form part of the employee base of that organisation.

With the closure of what had been known as the OGC its role as sponsor for best practice in project, programme, risk and service management covering many well-known frameworks and certification standards including ITIL along

with those such as PRINCE2 are now owned jointly by the United Kingdom Government and Capita an international business process outsourcing and professional services company headquartered in London. These are managed however by a company called Axelos, a joint venture set up in 2014 by the Government of the United Kingdom and Capita, to develop, manage and operate qualifications in these best practice frameworks (Axelos Global Best Practice, 2013). ITIL processes are supported by the British Standards Institute's BS 15000 Standard for IT Service Management which underpins other standards such as the Australian Standard AS 8018 ICT service management (2004), and ISO/IEC 20000 (2005) (Cater-Steel, Toleman, & Tan, 2006).

2.3 Adoption of the ITIL Framework

As ITIL evolved, its relevance outside of government agencies became more evident and its expansion to countries outside the United Kingdom was primarily due to corporate interest (Northern California ITSMF). The number of organisations who have implemented, are implementing or planning to implement ITIL has steadily risen since its first release, spreading very quickly across Britain and Europe, in both the public and private sector, and in Australia, ITIL has seen rapid adoption since the mid-1990s (Cater-Steel et al., 2006). Large companies and government agencies in Europe adopted the framework very quickly in the early 1990s and in 2000 Microsoft used ITIL as

the basis to develop their proprietary Microsoft Operations Framework (MOF). However, in the USA the adoption was slower, apart from major organisations such as Microsoft, IBM, Procter & Gamble, Yahoo and General Motors (OGC, 2009; Thibodeau, 2007). Nonetheless the rate in the USA steadily grew with estimated adoption of organisations following the ITIL guidelines, implementing or considering implementing ITIL, ranging anywhere from eighty to ninety percent (Axios Systems, 2008; Beachboard et al., 2007; Galup, Dattero, Quan, & Conger, 2007; Galup, Dattero, Quan, & Conger, 2009; Hubbert, O'Donnell, Kane, & Yates, 2008; Shackleton & Bentley, 2008). ITIL adoption is now ubiquitous within organisations and governments worldwide, (OGC, 2009; Thibodeau, 2007) and the framework became the most widely accepted de facto standard for IT service management as it provides a universal, public and non-proprietary framework (Beachboard et al., 2007; Dorfman, 2008; Fronheiser, 2006; Mohamed et al., 2008; Scheeruhn et al., 2006; Verghis, 2006). Moreover, during the past twenty years two standards and two prominent vendor frameworks have emerged based on ITIL:

- Standards - British Standards 15000 and ISO/IEC 20000
- Vendor Frameworks - IBM's Process Reference Model for IT (PRM-IT) and
- Microsoft's Operating Framework - MOF (Galup et al., 2007);

and certification as an ITIL trained practitioner became increasingly popular and often required or desired by employers.

Whilst people can become ITIL certified, organisations cannot, nevertheless the current standard for organisations, ISO20000-1:2005, the International Standard that specifies best practice for IT service management, and is the specification for IT service management against which an organisation's actual practices can be certified, is often known as the ITIL standard and the already close alignment between it and ITIL has been even further enhanced in version 3 and later updates (Dugmore & Taylor, 2008).

The dissemination of ITIL has not been confined to large organisations in the public and private sectors or levels of government but has been embraced by the educational sector similarly, particularly in Great Britain, Australia and New Zealand. This was largely due to the influence of BECTA (British Educational Communications and Technology Agency) who, after being tasked by the Department for Education and Skills with setting up an advisory service to improve the quality of technical support provision in schools in 2002, released a modified version of ITIL v2, called FITS (Framework for ICT Technical Support), in 2003 following consultation and program development (APM Group Ltd, 2007). FITS is based on the industry best practice standard – IT Infrastructure Library (ITIL Central, 2005) – and is a toolkit of advice, checklists and downloads relevant for schools of any size or ICT proficiency (BECTA, 2006). FITS stressed primarily the most extensively disseminated known ITIL process, the Service Desk function, as the place to start implementing managed ICT services in schools. Consequently, rather than the integration of this function with the Service Delivery process under the

umbrella of overall Service Management the implementation of the Service Desk function is often seen as an end in itself particularly in the area of secondary education. In Australia, The Better Practice Guide (DEEWR, 2008b) published as part of the Digital Education Revolution to offer advice to schools receiving funding through the National Secondary School computer fund, also directs readers to BECTA's support framework, FITS, as an appropriate infrastructure and support model to follow. Prior to BECTA going into liquidation in April 2011 following its funding from government ceasing in March 2011, responsibility for the dissemination of FITS had been assumed by another not-for-profit organisation, the FITS Foundation, whose aim is to develop and support the framework and become self-funding (FITS Foundation, 2011). The foundation designed and registered (with the Qualifications and Credit Framework in the United Kingdom) two levels of accreditation in FITS; the SQA Level 3 Certificate In ICT Support in Education for Practitioners (QCF) and SQA Level 4 Certificate In ICT Support in Education for Managers (QCF) and runs through training partners training courses to support these accreditations. The FITS Foundation reports (Greenfield, 2016) that currently over 900 staff in schools and colleges, both in the UK and overseas, have passed the FITS Level 3 certificate in ICT Support in Education: Practitioner and states that institutions implementing the FITS framework are finding significant benefits including providing a structured approach to the use of technology and having a positive impact on teaching and learning experiences. This rather broad statement, however, is seemingly only

supported by four marketing style case studies rather than objective enquiry and comparative research.

2.4 Research into ITIL

In 2006 Cater-Steel and Toleman (2007) queried the 20,400 IT jobs at it.seek.com.au, one of Australia's most popular job sites, and found 550 Australian job ads requesting ITIL skills posted within that month (2.69%). Repeating that query in August 2011 found 3,272 Information & Communication Technology jobs containing ITIL out of 20,234 Information & Communication Technology jobs in Australia (16.2%) and repeating that yet again in mid-2016 returned 922 out of 14,021 jobs specifically containing the word 'ITIL' (6.6%). Notwithstanding ITIL developing into the de facto standard for IT service management and by becoming 'institutionalised' (Cater-Steel, Tan, & Toleman, 2009), an increasingly expected knowledge and skill domain for ICT professionals in the public, private and educational sectors, there is only relatively limited academic research into ITSM in general and ITIL in particular (Beachboard et al., 2007; Cater-Steel et al., 2006; Galup et al., 2007; Potgieter, 2004). Since Hochstein et al (2005b) observed the paucity of analytical discussion around ITIL amongst the overall scantiness of scientific research on the subject, which predominantly was descriptive and generalised, and identified critical success factors (CSF) in ITIL implementations as an area overlooked in existing studies, a still somewhat narrow amount of academic research into ITIL implementations, success factors, metrics and tangible

benefits has been conducted. A later synthesis of relevant research (Marrone & Kolbe, 2011a) reveals a focus on critical success factors (CSF) for successful implementation or adoption of ITIL (Cater-Steel & Tan, 2005; Cater-Steel et al., 2006; Iden & Langeland , 2010; Pollard & Cater-Steel, 2009), the challenges and benefits of implementation (Cater-Steel & Tan, 2005; Cater-Steel et al., 2006; Cervone, 2008; Hochstein, Zarnekow, & Brenner, 2005a; Iden & Langeland , 2010; Marrone & Kolbe, 2010a; Pollard & Cater-Steel, 2009), or provides descriptions of ITIL process or implementations (Cater-Steel & Tan, 2005; Cater-Steel et al., 2006; Galup et al., 2007; Galup et al., 2009; Marrone, 2009; Spremic, Zmirak, & Kraljevic, 2008). Most recently, attention has been directed towards determining if ITIL implementations have an effect on organisational performance, whether success or failure can be related to organisational maturity levels as well as ITIL maturity levels and developing key performance indicators (KPI) along with a suggested performance management framework (Gacenga, Cater-Steel, & Tan, 2011; Gacenga, Cater-Steel, & Toleman, 2010; Lahtela & Jäntti, 2010; Marrone, 2010; Marrone & Kolbe, 2010a, 2010b, 2011a; McNaughton, Ray, & Lewis, 2010). A few have investigated service quality (Cervone, 2008; Hochstein et al., 2005a; Hochstein, Zarnekow, & Brenner, 2004; Marrone & Kolbe, 2010b; Potgieter, Lew, & Botha, 2005; Praeg & Schnabel, 2006) but only Potgieter et al (2005) looked at whether there was any correlation between implementing ITIL and customer satisfaction. Whilst a positive correlation was reported, the study was limited to a single ICT service organisation, whose customers were external clients, not internal staff members and the authors acknowledge that converting subjective

data to an integer for analysis may have resulted in an unusually high correlation (Potgieter et al., 2005). Additionally, the majority of research has been conducted in larger organisations sourced through membership in ITSM interest groups (Cater-Steel & Tan, 2005; Cater-Steel et al., 2006; Gacenga et al., 2010; Marrone, 2009; Marrone & Kolbe, 2010a, 2010b, 2011a; Pollard & Cater-Steel, 2009) predicating a certain level of investment and training in ITSM. The literature on ITIL implementations in business reveals some common themes; incident management, problem management and change management are the three most common processes implemented and the service desk function is the most common entry point into ITIL (Fronheiser, 2006; Johnson et al., 2007; Keel, Orr, Hernandez, Patrocinio, & Bouchard, 2007; Scheeruhn et al., 2006), and some common conclusions:

- ITIL is a very process driven procedural approach to best practice that is not prescriptive at all and, as such, does not offer a methodology or clear-cut techniques or tools but is open to interpretation and often the difficulty lies in determining best practice and adhering to it (Baer, 2008; Cervone, 2008; Fronheiser, 2006; Johnson et al., 2007; Keel et al., 2007; Mohamed et al., 2008; Neal, 2008; Ratcliffe, 2004; Scheeruhn et al., 2006; Verghis, 2006).

- It offers a systemic approach to IT service delivery and a common vocabulary across a wide range of businesses (Baer, 2008; Cervone, 2008; Galup et al., 2007; Verghis, 2006).

- The positive aims and aspects of implementing ITIL include; reduced costs, less system downtime, a safe choice for IT governance, improved performance and efficiency, increased customer satisfaction, security and quality of services (Beachboard et al., 2007; Cater-Steel et al., 2006; Cervone, 2008; Dorfman, 2008; Galup et al., 2007; Johnson et al., 2007; Neal, 2008; Scheeruhn et al., 2006).

ITIL itself is not concerned at all with how the IT services are used, how easy and intuitive they are to use or even if they are used at all, only that they are available, managed and cost efficient (McBride, 2009). This perspective and the cultural, organisational and people management issues surrounding any ITIL or ITSM implementation, particularly in regard to the most often implemented ITIL processes, Service Desk and Incident Management, are factors to be considered in relation to the delivery, support and use of technology. Implementing ITIL is not an easy process, indeed it is a huge task and criticisms and pitfalls exist. Probably the most significant is the impact on the human side of technology: modifying existing systems and processes; getting people to use the system instead of their preferred ad-hoc processes; the effect on the internal IT organisation and the knowledge, expertise and experience of the IT staff; the amount of procedure and documentation required; the changes in roles, responsibilities and day to day tasks; the amount of time spent managing organisational and staff issues and finally, the fit or otherwise with the organisational culture (Anthes, 2008; Jia, Reich, & Pearson, 2008; Keel et

al., 2007; Neal, 2008; Thibodeau, 2007; Verghis, 2006). What seems to have been thus far neglected is any detailed exploration of ITIL implementations in small and medium enterprises (SME) where ITIL is the expected and accepted standard for IT service management but few or no resources are available to invest in training or consultation (Cruz-Hinojosa & Gutiérrez-de-Mesa, 2016). Furthermore, no investigation has been carried into the perceptions of both end users and IT staff involved, whether users and IT staff accept the new ITIL processes or try to by-pass them and whether this model of ICT service delivery and support produces quantifiable increases in the use of technology.

2.5 Technology in Education evolution

Generally, the word technology is commonly associated with the plethora of computerised devices and systems to be found in all aspects of everyday life. Semantically, however, the Greek root techné, means belonging to the arts, crafts or skill and is related to the know-how of doing things (Rooney, 1996). One could then describe technology as a body of human knowledge that can be passed from one place to another and one generation to the next (Joslyn, 2000) and is the way by which human societies interact with and adapt to the environment (Moss). Similarly, education can be described as the process by which knowledge, facts and skills are imparted from one generation to the next or from skilled practitioners to novices, while teaching refers to any means of imparting skills or knowledge so that others may learn (Merriam-Webster, 2005). Thus, a natural synergy between technology and education could be

extrapolated yet there is ample and continuing evidence that this is far from the reality to be found in most schools (Ainley & Searle, 2005; John, 2003; MCEETYA, 2005b, 2007). Further, a more recent meta-analysis of the impact of technology in education finds little if any agreement surrounding the effect on educational outcomes and though the authors report generally positive findings they are largely subjective and limited to intensive one-to-one laptop programs (Zheng, Warschauer, Lin, & Chang, 2016).

In a comparable manner to the gradual evolution of ITIL, computer-based technology, which has been present in classrooms for nearly forty years, has undergone an analogous progression from the mid-1980s when Apple Inc commenced a ten-year longitudinal study in creating classroom environments where *"technology was used as routinely as paper and books"* (Dwyer, 1995) to now, where this statement rings true for the majority of students in schools.

During the late 1980s and early 1990s computers in Australian schools were usually found singly in classrooms, libraries and the school office but by 1995 the desire to ensure that students and teachers had more access to technology lead to the establishment of the NSW Department of Education (DET) Computers in Schools programme, an initiative of a newly elected State Government. Over the course of twelve years, along with Technology in Learning and Teaching (Murray & Phillips, 2000) and the Technology for Learning Programs, approximately $807.4 million was allocated to providing seventy seven thousand computers for schools, training fifteen thousand

teachers in the rudiments of computer literacy, maintaining hardware less than four years old, providing Internet and Intranet access to schools and reducing the computer to student ratio to around one to six or slightly less (Achterstraat, 2007; Murray & Phillips, 2000; NSW Audit Office, 2000; NSW DET, 2002).

When Labour won the 2007 Federal election, information and communication technology in schools, particularly secondary schools, rose to national focus as a key element of the Digital Education Revolution. As a major part of the Australian Government Education Revolution, the Digital Education Revolution (DER), was seen as a vital step towards creating a world-class education system for Australia, one that prepared students for living and working in a digital world (DEEWR, 2008a). To achieve this goal, the Federal Government committed funding of over $2.4 billion to support the effective integration of information and communication technology (ICT) in Australian schools and have supplied more than 911,000 computers; related network and support infrastructure funding; significant investments in online curriculum development; ICT training and development for teachers; and increased as well as faster Internet access (DEEWR, 2008a, 2011a, 2011b, 2011c, 2012). As a result, by mid-2009, almost 2,700 secondary schools across Australia had been approved for funding to purchase approximately 290,000 new computers and all secondary schools in Australia provided the financial wherewithal to bring them to a 1 to 2 computer to student ratio, including extra infrastructure funding to address on-costs associated with deployment of additional computers. This sustained and considerable investment in technology for education was

mirrored in many other countries around the world. Building Schools for the Future, a government initiative in England committed over £2.2 billion initially and in 2007 £21.9 billion to transform education through high quality facilities and integrated information technology (Gov.UK), while Singapore's Masterplan I and II saw an investment over five years of around $US 1.26 billion aiming to achieve ICT pervasively and effectively used to enhance educational processes and structures (Krueger, 2006). Central to this considerable expenditure on technology in education is the belief it is the key to unlocking the potential for collaboration and preparedness for a digital life in a global knowledge economy. Without doubt, technology has altered the way we live and work, slowly at first and in response to business or societal needs, then with increasing pace until now technology is driving business and creating needs. Just as the new technology-driven Industrial Age in the mid-seventeen hundreds had a profound effect on every aspect of socioeconomic and cultural life, its successor, the information age and the knowledge economy, typified by globalisation and knowledge-intensive services in an online world, are a reflection of current technology and are changing our beliefs and assumptions in every aspect of our lives just as profoundly (Harcourt, 2000; Hough, 2007). There is a growing awareness globally, that what is needed to live a successful life in this global village (Zhao, 2008) and sustain a successful and growing economy and society, is having a well-educated, multicultural, highly skilled workforce (Harcourt, 2000). In responding to this, Australian governments, in keeping with those of many other countries, have been issuing directives and disseminating a vision and strategy for technology in education since the

Adelaide Declaration on National Goals for Schooling in the Twenty-First Century in 1999. Point 1.6 of the declaration states that when students leave school they should be *"confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society"* (MCEETYA, 1999). Building a Knowledge Culture (MCEETYA, 2005a) expanded upon that statement by producing an education and training action plan and policy for what it termed the information economy, in support of the national vision of educational improvement for all Australians through the *"ubiquitous use"* of ICT. In 2008 this was followed by a Joint Ministerial Statement on Information and Communications Technologies in Australian Education and Training: 2008 - 2011 which confirmed the view of ICT as being integral to contemporary society. This statement considered technology a powerful tool for learning and led with the statement that Australia would have technology-enriched learning environments to enable students to achieve high-quality learning outcomes from world-class education and training enabling citizens to become productive and contributing members of society and the economy (MCEETYA, 2008b). A draft framework titled *Digital education – making change happen* (MCEETYA, 2008a) was also released in 2008 to assist interested schools to identify their stage of progression from a 'developing school' to a 'leading school'.

While the DER program required institutions to report details of expenditure no qualitative or quantitative reporting on the impact of technology on educational outcomes or of the frequency of use in class was requested or collected. However, in 2005, the National Sample Assessment for Information and

Communication Technology Literacy (ICT Literacy) commenced with the stated aim of assessing Year Six and Year Ten students on their ability to use technology to *"appropriately access, manage, integrate and evaluate information, develop new understandings and communicate with others in order to participate effectively in society"* (ACARA, 2011). Part of a rolling three-year program, further ICT Literacy assessments have been conducted in 2008, 2011 and 2014. Amongst the many domains of assessment covered by the testing, two are particularly relevant to this discussion. The first looks at the use of computers at school filtered by state and territory in 2005 and 2008 and by the addition of further demographic criteria in 2011. The reported mean number of days students in Year 10 used a computer was fairly low for all states in both 2005 and 2008 with NSW having the lowest frequency of all states with 7 and 9.7 days per month respectively (MCEECDYA, 2010; MCEETYA, 2007). The 2011 assessment changed the way these statistics were reported to show an overall calculated increase of 24 percent in Year 10 students who used a computer almost every day from 27 percent in 2005 to 51 percent, however, NSW still reported the lowest frequency of use in Year 10 at 47 percent (ACARA, 2012). The most recent round of reporting, the 2014 NAPLAN ICT Literacy tests, the results of which were released in 2015, shows very little change. The number of students in both Year 6 and Year 10 using computers at school every day is still marginal at 8 and 18 percent respectively but by summarising the results into a category of 'almost every day or more' the report shows that the use in school has increased by 7 percent for Year 6 and 14 percent for Year 10 Australia wide (ACARA, 2015). The report goes on

to speculate that the corresponding slight drop in reported home use may be due to the increasing use of mobile technology which may also go some way to explaining the slightly increased reported use at school. Notwithstanding it could hardly be asserted that computers are used as routinely in schools as textbooks, pen and paper. The final, relevant statistic from this most recent round of testing is the use percentage of Year 6 and Year 10 students using computers at school almost every day or more by State. Once again, NSW has the lowest representation in Year 6 at just 31 percent and the second lowest representation for Year 10 after WA at 59 percent (ACARA, 2015). Despite the slight change in frequency of use from 2011 to 2014 home use of computers still, exceeds use at school.

Furthermore, the ICT literacy of Year 6 and 10 students has decreased significantly, particularly in NSW, for both year levels with the overall average Year 10 performance lower than in 2005 and 2008 and a drop in both year levels in the number attaining the Proficiency Standard (ACARA, 2015). Whether this is due to the skills being tested not being relevant to students and their use of technology or to these skills no longer being taught to students it is interesting nevertheless to note that students from home backgrounds of higher parental income and higher levels of parental education had much higher scores than students from other home environments. So, despite the very significant investment in infrastructure, hardware, software and professional development in education and the ongoing entrenchment of technology into the minutiae of day to day activities, it would seem that ICT literacy and frequency of computer

use by school students, particularly in NSW, is dependent upon their home experience, not their school environment. These findings reflect the more global findings of the relatively recent OECD report, *Students, Computers and Learning Making the Connections* (OECD, 2015) which finds that 96% of 15-year-old students have a computer at home but only 72% use one at school (Australian school use was one third less than home use on average) and whilst moderate use of a computer confers a slight advantage over students who rarely, more extensive use both at school and at home lead to poorer outcomes and results.

2.6 Barriers

Assuming that students' use of computers in class is generally at the teacher's instigation or with their permission it would seem that investigating the barriers to the use and integration of technology in education is merited. A great deal has been proposed, researched, and written about why technology has had only a minimal impact upon educational classroom practice, which remains largely teacher-led rather than student centred in approach. The factors affecting teachers' acceptance and use of technology in their teaching practice are grouped together under the classification of 'barriers' and in general, terms are sorted into the following categories:

- Organisational culture of schools and teachers
- Attitudes and Beliefs

- First-order barriers which include but are not limited to;
    - Access including numbers and locations
    - Resources including time
    - Support of infrastructure, devices, and user support

Organisational Culture of Schools and Teachers

This category encompasses both the role and expectation of school education in society overall along with the organisational structure, culture and leadership of individual schools. At a macro level, Hodas (1993) views schools as efficient and entrenched technologies that have perfected their specialist role in passing on to succeeding generations a predominantly static set of information and values and consequently resist any change which may threaten their continuity or structure. This largely unaltered institution has created a commonality across socioeconomic and cultural demography whereby schooling is a collective experience by which means it leads to unquestioning acceptance of its time-honoured practices. Further he (Hodas, 1993) makes salient points which refute those with fervent beliefs in technology as means of transformation in education, seeing the introduction of technology having the potential to alter the status of power between teachers and students, and causing resentment amongst teachers because they fear any implication they can be replaced by a computer. Written in the same year, Cuban's (1993) treatise on computers in the

classroom, explains the slower infiltration of technology in education as dependent upon two main factors; cultural beliefs centred on the meaning of teaching and learning in sympathy with Hodas' viewpoint and the idea that schools accept technologies that support prevailing practices.

Even though this research is now quite old, the validity of their views is shown by the frequent citing of their work in educational research, even as recently as 2016 where the authors of a recent meta-analysis of learning in K – 12 one-to-one laptop environments are in agreement with Cuban's views and other research showing a marginal role for computing in education though they go on to attempt to justify one-to-one laptop programs as being an exception to this widespread conclusion (Zheng et al., 2016). The benefits their research reveals are fairly marginal and could be related to other aspects such as increased use of technology in the home environment and also revealed all the issues listed above under barriers as still relevant today in influencing the use of technology in schools (Harper & Milman, 2016; Zhao & Cziko, 2001; Zhao & Frank, 2003; Zhao, Pugh, Sheldon, & Byers, 2002; Zheng et al., 2016). Zhao, (Zhao & Frank, 2003; 2002), describes schools as organisations that are very resistant to any change in their existing practices and finds an incompatibility between technology and current school culture; stating that there is an inverse relationship between the positive result of teachers' technological innovations in the classroom and the distance from the prevailing culture of the school. The further from the accepted school culture, or indeed from a teacher's prior educational experience, a technology innovation in the classroom is, the more

negative the result. At a micro level, within individual schools, ethos, organisational culture and leadership plays a vital role, being either a barrier to or an enabler of technology-driven change. In a series of reports on research carried out in UK secondary schools, Tearle, (2003, 2004a, 2004b) whilst noting that even in schools where ICT had permeated the curriculum there were few signs of transformative change, concluded that amongst the critical factors for success were an ethos that promotes learning, a collaborative and supportive culture, an open and flexible organisational structure and clear expectations and practical demonstration of belief from the school's leadership. The role of leadership, the nature and structure of the individual organisation, a supportive ethos and culture, a clear and articulated vision for the use of technology in education as success factors, have been identified and confirmed by others (Grainger & Tolhurst, 2005; Hayes, 2006; Hough, 2007; MCEETYA, 2008a; Robertson, 2003; Scrimshaw, 2004). What is clear is the significance of these factors in determining whether ICT in teaching and learning will be met with resistance or acceptance regardless of the pressures of external bodies and the influence unconscious expectations of school education also exert. As Dede (2007) comments, *"The largest challenges in changing schooling are people's emotions and their almost unconscious beliefs, assumptions and values."*.

Attitudes and Beliefs of Teachers

Just as widely held expectations and beliefs about what constitutes schooling influences the delivery of education so do the beliefs and attitudes of teachers,

singly and in groups, often instinctively shape how they use technology in their teaching practice (Lloyd & Albion, 2005). Since technology became a component of every workplace there have been numerous studies into user acceptance of technology, including resistance to change, models of acceptance and even how personality type may predict ease of acceptance or the reverse (Bishop-Clark, Dietz-Uhler, & Fisher, 2007; Dillon & Morris, 1996; Nov & Ye, 2008; Venkatesh, 2000; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003) and though some of these parameters have been applied to teachers (Chambers, Hardy, Smith, & Sienty, 2003; Jebeile & Reeve, 2007; Smith, Munday, & Windham, 1995) they are not specific to educators per se. So, whilst providing insight into human interaction with and reaction to technology and increasing our understanding and thus acceptance of behaviours that we may encounter in response to technology, these instruments do not present a picture of particular traits common to teachers as a profession. Moreover, as noted by Hu, Clark and Ma (2003) as a group teachers differ from business users in that the former have more independence and autonomy over their teaching methods including choice and use of technology or whether to simply close the door and teach as they were taught (Fabry & Higgs, 1997). More illuminating, are those studies that help create an understanding of why teachers even in classrooms with easy access to technology choose to *"adopt, adapt or reject an instructional reform"* (Ertmer, 2005a, 2005b). An indicative example is given by a case study carried out in a Queensland private girls' secondary school (Norton, McRobbie, & Cooper, 2000) in the persona of Peter, whose experience in information technology is extensive and who has easy

access to technology and mathematics software, but who uses none of it in his teaching due to his firm beliefs that mathematical concepts are taught more effectively by teacher explanation and student practice, a subject-specific belief outcome confirmed in additional research (Howard, Chan, & Caputi, 2015; Zuber & Anderson, 2013). Highlighted in the conclusion, Norton et al make the observation that because the non-use of technology was predicated on belief, none of the staff felt that it was necessary to increase their own expertise or arrange access for their students. Zhao and Cziko (2001) reinforce these findings describing humans as control systems who act to keep their perceptions and their internal goals in step with each other, thus teachers will use technology that matches their traditional pedagogy and is perceived to be effective. In order to change their beliefs, Zhao et al maintain that there are three necessary conditions to be met. Teachers must believe that technology can more effectively meet a higher-level goal without causing disturbance to other high-level goals and they must believe they have the ability and resources to use it. Notwithstanding the passage of time and the relentless dissemination of technology the same factors are found in the most recent meta-analysis of perceptions, outcomes and learning achievement in ten studies of one-to-one laptop environments where the authors find that organisational structure and leadership, teachers' beliefs and instructional approaches along with curricular, pedagogical and technical support are still applicable barriers to effective integration of technology in learning environments (Zheng et al., 2016). These findings are supported by Harper and Milman (2016) whose also recent review of the literature pertaining to one-to-one technology across a span of ten years

(2004 -2014) describes technical support, professional development, stakeholder buy-in and teachers' pedagogical style and perceptions about the role of technology as challenges to integration. Further studies spanning the last decade exploring this topic whether as part of technology integration overall, subject-specific use or in the context of a laptop program, reinforce these findings again citing teachers' beliefs and attitudes as a significant factor in the success or otherwise of technology acceptance, use and integration into daily teaching practice (Ertmer, 2005a; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Howard et al., 2015; Inan & Lowther, 2010; Newhouse, 2014; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Sung Hee & Ertmer, 2007; Zuber & Anderson, 2013). Often described as second-order or internal barriers, (Ertmer, 1999, 2005a; Ertmer, Addison, Lane, Ross, & Woods, 1999) teachers' beliefs and attitudes about pedagogy and technology need to be addressed perhaps even separately even before first-order barriers in order that technology achieves a meaningful change in education as envisioned by political and business leaders and educational reformers (Ertmer & Ottenbreit-Leftwich, 2013). However, Ertmer (1999, 2005a; Sung Hee & Ertmer, 2007) also suggests that perception of the criticality of first-order barriers may vary as seen through the filter of second-order barriers. Based on the results of two more recent studies by the authors (Ertmer et al., 2012; Ottenbreit-Leftwich et al., 2010; Sung Hee & Ertmer, 2007), positive teacher attitudes towards technology often assisted them in dealing with any of the first-order barriers typically encountered in schools and classrooms.

First-order barriers are often easier to address as they are generally extrinsic physical factors and whilst their complete removal does not necessarily mean that teachers would embrace technology, their presence provides a distinct hindrance and offers re-enforcement to many second-order attitudes and beliefs particularly among teachers who hold negative attitudes towards technology.

First-order barriers

Beliefs and attitudes are provisional constructions subject to ongoing modification due to continuing and often contradictory experiences (Levin & Wadmany, 2006), therefore identifying and minimising first-order barriers to technology acceptance will certainly have an effect on teachers' attitudes to using ICT (Ertmer, 1999). For technology to become an integral part of the learning experience, it must make little demand of teachers' and students' ICT skills (Condie, Munro, Seagraves, & Kenesson, 2006), so understanding what impediments to integration exist, or are perceived to exist, is critical. There is considerable congruence between the findings of research into the extrinsic conditions affecting technology integration, with most reporting the same set or subset of factors.

Access to computers and resources is one of the most significant factors; however, access means more than just the number of computers available to teachers or students. As a significant first-order barrier, access includes not only the number of computers available for use, appropriate software resources,

reliable Internet and network connectivity, but the ease and flexibility of using these resources, where they are placed in relation to when teachers need them; in the classroom rather than isolated computer rooms or suites (Bauer & Kenton, 2005; Butler & Sellbom, 2002; Carmichael & Procter, 2006; Ertmer, 1999; Fabry & Higgs, 1997; P. John, 2005; Jones, 2004a; Lim & Khine, 2006; Mumtaz, 2000; Tearle, 2004a). Effective access requires dissemination of resources as well as connectivity and reliability.

Related to access, but recognised as a major resource barrier in its own right, is time; time to learn how to use technology, to experiment, to prepare lessons using ICT resources and lack of time due to the pressures of schedules, timetables, assessments and just the everyday workload of teachers (Bauer & Kenton, 2005; Butler & Sellbom, 2002; Ertmer, 1999; Grainger & Tolhurst, 2005; Jones, 2004b; Lim & Khine, 2006; Mumtaz, 2000; Tearle, 2004a; Zakopoulos, 2005). Another barrier is the shortage of sustained professional pedagogical development and continuing skills-based training both which impact the level of skill and confidence of teachers and students thereby affecting the use of technology in classrooms and lessons (Bauer & Kenton, 2005; Ertmer, 1999; Jones, 2004a; Mumtaz, 2000; Tearle, 2004a, 2004b; Zakopoulos, 2005). Completing this trio is the idea of technical support, for the technology and for the teachers' and students' use of the technology as an intrinsically important element of these first-order barriers.

Support

Technical support in this context is very much a broad categorisation of a number of aspects of the implementation, ongoing development, maintenance and use of technology in schools, emerging consistently from the literature on technology integration in schools as an important consideration. It comes as no surprise that literature from the initial appearance of computers in schools would show that onsite technical support was essential for successful and meaningful integration and that adequate resources, technical back up and professional support were key factors in increasing teachers' confidence and willingness to explore (Ertmer, 1999; Mumtaz, 2000; Rodriguez & Knuth, 2000). More surprising, perhaps, is that the need for onsite technical support does not seem to diminish even with the increasing pervasiveness of technology. Results from surveys conducted in 2005 and 2006 (Bauer & Kenton, 2005; Grainger & Tolhurst, 2005; P. John, 2005; Lim & Khine, 2006; Zakopoulos, 2005) confirmed that hardware and software related issues, such as; age, access, reliability, suitability and integration with other systems, were still a significant factor in teachers' use of technology and that regular, on-site professional technical support was essential if ICT was going to be used daily in teaching and learning. While it might seem a logical assumption that an additional decade of substantive technology development and penetration would lessen the influence of these factors, continuing research from one-to-one programs and studies into technology integration demonstrates their continuing validity.

Support for teachers and their technology was identified as a predictive variable in successful computer integration (Mueller, Wood, Willoughby, Ross, & Specht, 2008) while technical support and teacher support were found to be vital factors in successful laptop programmes (NSW Department of Education and Training, 2009) so were technical and administrative support revealed as two facilitating conditions that had a definite relationship with laptop use amongst teachers (Mosesa, Bakarb, Mahmudb, & Wong, 2011). Additionally, school-level factors such as technical support were discovered to indirectly influence technology integration and positively influence teacher beliefs (Inan & Lowther, 2010). A longitudinal study conducted over a period of four years provided evidence of an increasing need for technical support as time went on as with increased technology use more technology support was needed (Jing, 2010). This study, unusually, comments on teachers' perceptions of the availability of, technical and computer support and noted that this decreased due largely to the fact that with increasing technology demands grew, increasing the workload of any support personnel and in turn increasing response times in addressing technology needs, causing teachers to feel their expectations on timely and adequate technology support were not being met (Jing, 2010). Another analysis of the perceptions of the barriers to technology integration after two years of mentoring and professional development for the teachers involved reported that consistently available technology and swift resolution of any problems were both still highly rated as significant factors contributing to teachers' perceptions of barriers to integration (Kopcha, 2012).

2.7 Support/ITIL in Education

This link between provision of professional and technical support and increased use of technology is often observed (Butler & Sellbom, 2002; Grainger & Tolhurst, 2005; Tearle, 2003, 2004a, 2004b) while Zhao, (2002), in a study to determine the conditions necessary for technical innovation in the classroom as opposed to using technology to support teachers' administrative tasks, finds three segments of support: the human infrastructure, the technological infrastructure and social support. The components of these three segments include; flexible and responsive technical staff, staff who can help teachers understand how to use technology in their classrooms, supportive and informed administrative and institutional support, an available and reliable technical infrastructure and supportive and enthusiastic peers (Zhao et al., 2002).

Unlike Cuban, who maintains that teachers should be responsible for the purchasing and deploying of hardware and software ("Technology Counts 2007: Looking Back, Looking Ahead," 2007), other explorations in this area, recognizing that teachers have neither the time nor skills to assist others with technical issues, confirm the need for appropriately skilled professional technicians who are effective, take pride in their jobs and have status, respect and are regarded positively by other staff (Butler & Sellbom, 2002; Grainger & Tolhurst, 2005; NCREL, 2006; Scrimshaw, 2004; Tearle, 2003, 2004a). These studies touch on the perceptions of the quality of support received maintaining these are as important as the actual service quality, so technical support staff

should ensure there is awareness of the availability of support and access mechanisms. From a strategic organisational perspective, the Ofsted report into ICT in Schools (2004) in Great Britain stresses how significant a contributing factor technical support is to a school's progress towards technology embedded in teaching and learning and emphasises that technical support must be included as an essential element in planning for ICT and included in the total cost of ownership.

2.8 ICT Technical Support in Schools

Despite the fact there is a broad acknowledgement of the importance of technical support for ICT in schools, there is only sparse published literature on this topic. The British Educational Communications Technology Agency released a synthesis of examination of ICT support in schools in 2003 (BECTA) finding little, refereed research literature regarding ICT support for schools and none which compared existing models of support and their impact on ICT use. Interestingly one of their recommendations for further research was a comparison of different models of support and their effectiveness. Only one, now quite old, report has concentrated on the role of ICT Support Technician in schools and the people in that role, regarding it then as an emerging new profession. The *Employment of IT Technicians in Schools* report (JAPONITE, 2001) looked at the issue of providing onsite technical support for schools in the light of research that demonstrated that need as critical to successful ICT implementation. This report candidly reviewed the status and remuneration of

support technicians in schools comparable to industry, looking at ways of attracting, retaining, and remunerating skilled staff. Recognising that the role ICT technical support in education was a different matter to that in business, the report went on to suggest a pathway of professional development for technicians that would lead to them becoming qualified teachers. In stark contrast were the reported comments of the technicians surveyed for the report who whilst unhappy about their career progression prospects, status and pay were quite clear about their desire to remain in the IT profession. Most importantly, nonetheless, was the recognition of Information Technology as a profession and the educational environment as fundamentally different from business. Despite their recommendation for further research into the different models of ICT support available to schools and the identification of ICT support in schools having differing needs to industry, by the time their report upon the research was released, BECTA seemed to have decided upon a model they called FITS (Framework for ICT Technical Support) which is a slightly modified version of ITIL (APM Group Ltd, 2007). In December 2002, the Department for Education and Skills asked BECTA to set up an advisory service to improve the quality of technical support provision in schools.

A programme of consultation and development was carried out and FITS was launched on the BECTA website in September 2003. FITS is based on the industry best practice standard – IT Infrastructure Library (ITIL Central) – and is a toolkit of advice, checklists and downloads relevant for schools of any size or ICT proficiency (BECTA, 2006). FITS stresses primarily one aspect of ITIL,

the Service Desk function, as the place to start implementing managed ICT services in schools. Not quite as laden with acronyms and with some basic suggestions as how aspects of FITS can be implemented, for example, notebooks and spreadsheets for recording service desk support requests, FITS is a slimmed down version of ITIL for schools and while the underlying principles of ITIL, continuous improvement and proactive rather than reactive management of the entire ICT infrastructure and service are just as pertinent to the delivery of quality ICT support in schools, its take-up by schools has been limited and not without issues. A review report by BECTA on initial FITS implementation in 16 trials schools (2006) has an optimistic tone but closer examination of the results reveals that even the seven schools who were judged to have made excellent progress have only implemented some of the processes, mostly around infrastructure and network management and the establishment of a Service Desk, methods to lodge and record requests and acceptable use policies. Even establishing a Service Desk has not been without issues as most schools have limited number of technicians who are very busy, and they are without the resources to employ a dedicated single point of contact. Many of the school staff considered the filling in of detailed forms to be bureaucratic and an additional administrative burden and this formalised approach to user support is at odds with how many people prefer to ask for assistance. In keeping with research into ITIL implementations in business, it can be hard to change organisational culture and customs (Verghis, 2006). In a day bound by bells and periods and lunch duties perhaps stopping a technician in the corridor as they pass is the most efficient use of a teacher's limited free moments.

Teachers also are expected to be experts so asking for help can be quite threatening and many people are far more comfortable asking people they have come to know and trust for assistance (Verghis, 2006). To be told that this is not an appropriate way of asking for support and being directed to submit a written request instead may close the door on an opportunity for learning and present a perception of less than obliging support. Responsibility for the ongoing support and development of the FITS framework and certification program (the SQA Level 3 Certificate In ICT Support in Education for Practitioners (QCF) and SQA Level 4 Certificate In ICT Support in Education for Managers (QCF)) has been assumed by another not-for-profit organisation, the FITS Foundation which reports (FITS Foundation, 2016; Greenfield, 2016) on its website that use of the framework is growing and used in over one thousand schools further stating a ninety-two percent satisfaction rating for those schools using FITS though empirical research in support of that statement is not apparent.

In Australia, The Better Practice Guide (DEEWR, 2008b) published as part of the Digital Education Revolution to offer advice to schools receiving funding through the National Secondary School computer fund, also directed readers to BECTA's support framework, FITS, as an appropriate infrastructure and support model to follow. There appears to be little or no research into technical support of either users or infrastructure in schools except for one case study of ICT teaching and learning support services in four schools (Lamshed, 2009). Whilst having a somewhat confused premise, in as much as the author tends to

digress into a zealous display of bias towards open source software, the report's intention is to investigate how an internal ICT staff or unit is able to deal effectively with the challenges posed by Web 2.0 technologies and to 'propose a model of ICT service that will better engage teaching and learning with ICT' (Lamshed, 2009, p. 8). From only four, very disparate, educational institutions, the report proposes what is essentially an ITIL based model of operation with an emphasis on an online and phone support service desk. The author quite categorically states, though, that *"ICT engagement in teaching and learning is highly dependent on the attitudes and ICT skills of the teaching workforce"* (Lamshed, 2009, p. 10). The model of ICT support service it recommends is, in every respect based on ITIL principles. Recognising that in education help requests are invariably urgent, that ICT staff need to be not only technically competent but require ongoing professional development, that the infrastructure needs to be robust, stable, and secure, the report also stresses that an online and phone help desk is central to delivering the service required to support user expectations and need and by recording all requests, the services can be best adjusted to meet demands. Reporting requests via the online system is the recommended and preferred method of accessing assistance and there is no allowance for ad hoc or 'just in time' support. Chris Betcher (2002) lists just-in-time technical and skills support, which he describes as; having someone to turn to when you need ideas and answers; having someone to actually come and give you a hand, show you what to do, tell you what button you need to press, whatever it takes to give you what you need, and a reliable infrastructure, amongst the ten factors he considers critical to getting teachers up to speed

when it comes to using technology in a classroom. Well-known author and educator Dr Jamie McKenzie also notes (1998), that teachers need immediate help and support in order to encourage widespread use of new technologies.

These criteria were found to be just as salient in a slightly more contemporary Australian report on collaboration in teaching and learning (Millea & Galatis, 2009) which supports the Ofsted report, (2004) whose findings show there is greater confidence and use of technology in schools where a good working relationship exists between technical staff and teachers but also the most effective practice was demonstrated when ICT technical staff extended their roles into staff development and learning. Just-in-time support, provided by technical support staff, when and where the teacher requires it, would appear to be a highly effective way of encouraging greater penetration of technology to provide innovative teaching and learning practice in the classroom as opposed to merely using technology for administrative purposes such as marking and reporting. By its very nature, however, it is predominantly ad-hoc and difficult to schedule through a formal request system which may indeed preclude such opportunities from arising at all.

2.9 ITIL implementations in independent schools in NSW

Statistics from the Australian Bureau of Statistics show that in 2007 14.3% of secondary school students were attending independent schools and a count of the number of attendees at the NSW Association of Independent Schools IT

Managers' conference from 2008 to 2016 gives rise to the supposition that the majority of these schools have onsite professional ICT staff and have invested not insignificant amounts of money in ICT infrastructure and services so many of the first-order barriers centred on access, availability and onsite technical support, would, therefore, be absent. In NSW, but with members from other states, ICT technical staff who work in schools have founded a user group called MITIE (Management of Information Technology in Education). This group is an association of IT managers, technicians and support staff who work in education, which started gaining structure in 1999 when an electronic mailing list was created. In association with the Association of Independent Schools in NSW, it organises and hosts the annual IT Managers' conference. Apart from forums, the site hosts a number of resources among which are subsites devoted to ITIL/FITS and service desk software systems and each year there is recurring discussion concerned with one piece of software or another for use by a help desk or service desk. Additionally, the interest in the ITIL/FITS framework for IT support persists as evinced by a new forum thread started in June 2016 (J. Stewart, personal communication), the subject of which is ITIL based training for all the IT support staff in one particular Sydney based private school and which garnered half a dozen suggestions and was viewed seventy-seven times. Accordingly, it appears that in the independent school sector in NSW there is a growing, active, and professional group of ICT managers and technicians who provide the ICT infrastructure and support for their schools and who promote the principles of ITIL for service delivery and support. Likewise, the majority of these schools have implemented some form

of Service Desk as the contact between the ICT technical staff and the teaching and support staff and the students, making this set of professionals ideally suited to this investigation into ITIL Service Desk implementations, perceptions, and outcomes.

2.10 Research ITIL/Support in Education

While there has been a handful of studies that looked at service quality (Cervone, 2008; Hochstein et al., 2005a; Hochstein et al., 2004, 2005b; Marrone & Kolbe, 2010a; Potgieter et al., 2005; Praeg & Schnabel, 2006), one that looked for any correlation an ITIL implementation and customer satisfaction (Potgieter et al., 2005) and one that found no simple linkage between an ITIL implementation and improved customer satisfaction (Shang & Lin, 2010), all of these have investigated the relationship in the context of an IT service delivery organisation and external customers.

Two investigations into the use of FITS or ITIL in schools have been published. In 2005, BECTA published an evaluation of FITS which was based upon sixteen schools and their implementations using checklists to evaluate their progress against FITS standards for each process (BECTA, 2005); and in 2009, Education.au released a report into ICT teaching and learning support services which was based upon interviews with ICT technical or managerial staff in four educational organisations (Lamshed, 2009). Both reports support very strongly the ITIL principles for ICT service support and support of users. Upon closer

examination schools who were judged to have made excellent progress had only implemented some of the FITS processes, mostly around infrastructure and network management and the establishment of a Service Desk, methods to lodge and record requests and acceptable use policies.

As noted even the establishment of a Service Desk is difficult for schools to implement. Limited resources, especially human resources make it very difficult to dedicate single point of contact for user support. Many of the school staff considered the filling in of detailed forms to be bureaucratic and an additional administrative burden and this formalised approach to user support is at odds with how many people prefer to ask for assistance. What appears to have been so far overlooked is the relationship between ITIL implementation and user perceptions within the boundaries of an organisation despite current industry editorials and articles that are exemplars of the continued discussion of user perceptions of IT service and the subsequent evasion of the IT department (King, 2012; McIntosh, 2012).

In view of the unquestioned acceptance of ITIL as the de facto standard for IT service delivery and its widespread penetration into the business, government, health and educational sectors it would appear that there is an opportunity to complement the research into ITIL implementations to date by situating this research within an area that has garnered so much investment in and focus on technology and where ITIL is used predominantly to deliver IT services to internal clients rather than to external customers. Lessening the influence of as

many of the first-order barriers to technology integration as possible, enables this research to more accurately reflect the perceptions of the participants in relation to the particular model of support, its acceptance or avoidance and its effect on technology use.

Independent or private schools in NSW have often led the way in providing technology resources, developing over the last decade dedicated ICT departments manned by qualified technical staff to develop and manage the IT infrastructure and support the administrative staff, teachers and students. Access to resources is generally not an inhibiting factor in these organisations with many having introduced one-to-one laptop programs or else providing computer labs and pods in ratios of 1:2 or less even before the Federal Government's Digital Education Revolution. Information technology management and support in education has become a recognized professional avenue for technologists as the Managers of Information Technology in Education (MITIE) group and forum attests. Delivery of support and management of services and infrastructure is a widely and frequently discussed topic within this group who also hold an annual and well-attended conference each year in May. Nearly all members of this group have incorporated an ITIL based service desk at the very least to manage incidents and support their users, so it is proposed to use this group, its members and their teams as research participants. Unlike the participants in other recent ITIL studies however, (Cater-Steel & Tan, 2005; Gacenga et al., 2010; Pollard & Cater-Steel, 2009), technical staff in private schools have little funds for ITIL training or

consultancy as typified by a recent posting in the MITIE forum (C. Maker, personal communication, June 13, 2011). Therefore, while acknowledging ITIL as a best practice approach upon which to base a service delivery infrastructure, there is a definite focus on one aspect only, the service desk component, and little spending on implementation or software. The result is that the justification, planning, implementation and ongoing evaluation of an ITIL Service Desk are conducted by the technical staff almost exclusively. These factors along with the mitigation of first-order barriers to technology use in private schools, combine to create a cultural domain within which the technical IT staff are ‘knowledgeable experts’, a permutation ideally suited to purposive sampling (Tongco, 2007).

Chapter 3: Research Design and Method

3.1 Introduction

Chapter one introduced the context for this research while chapter two reviewed the underpinning literature. The purpose of this chapter is to provide a summary of the rationale for the research design; the chosen research paradigm and methodology; sample selection and size; research questions; measures of ethical protection; the instrument used to collect data; and data analysis procedures and tools. The primary aim of this research was an exploratory investigation of the impact of implementing an ITIL-based Service Desk in a small-to-medium enterprise where the IT staff are part of the internal organisation, rather than employees of a separate service provider. The study's primary focus was on the perceptions of both the IT staff and the users of the Service Desk from the perspective of the IT team. There was a secondary focus on acceptance and utilisation of the service and whether the Service Desk function and process had any measurable impact on the use of technology within the professional context of the sample group. During the iterative and reflective design and analysis process, a hitherto unarticulated supposition emerged as a tertiary aim of the research. This was confirmation of the accepted rationale for the implementation and the ongoing effects of an ITIL based Service Desk process and function.

3.2 Rationale for research philosophy

Business or technical research is largely performed for a specified purpose, usually to solve a problem of concern to the researcher or of significance to the business. Research conducted under a scientific approach has three main functions: discovery, explanation and evaluation; however, what distinguishes research from professional investigation or audit is the use of research paradigms, methodologies and methods to accomplish these functions (Veal, 2005). All research nonetheless is based on some underlying philosophical assumptions about what constitutes valid research and which methods are appropriate to use in any given setting. It is important when conducting or evaluating any research, to have an awareness and understanding of the philosophical basis of any such assumptions. Information Systems research attempts to reveal and understand the managerial and organizational issues associated with innovations in information and communications technology which is multidisciplinary by nature and design. Many discrete subject areas have influenced and continue to contribute to the development, implementation, maintenance and use of IS and IT within organisations. Notable areas include but are not limited to: business administration, computer science, sociology and psychology (Karthikeyan & Manjula, 2010). Research arising from these different disciplines tends to display disparate paradigms, approaches and methodologies, rendering comparative or comprehensive analysis difficult (Chen & Hirschheim, 2004).

Conversely, two historical analyses of information systems research, spanning an 18-year period and comprising between them 2048 published papers and research articles, revealed the dominant paradigm to be positivist or post-positivist. The earlier of the two analyses (Orlikowski & Baroudi, 1991) ascertained a positivist approach in 96% of those studies evaluated while the later one (Chen & Hirschheim, 2004) found 81% to be positivist. Considering information technology's evolution from fields such as mathematics, engineering, programming and computer science, this is not surprising. Even a subsequent evaluation of research pertinent to ITSM and ITIL (Marrone & Kolbe, 2011b) indicates a positivist worldview, though many of the research methods used were qualitative. Information systems technology and management spans technology, people and organisations and contains complex phenomena that consist of social, technical, organisational and cultural components (Gacenga et al., 2011). Given that dynamic, it would seem appropriate that using or combining a variety of research perspectives may well be more effective than a purely positivist approach or a purely constructivist one. Research in an area where one method is most commonly used can often be more fully informed by combining the customary approach with methods common to other associated fields. Information Systems Management research considers technical, managerial and organizational issues and includes the behaviours and perspectives of people and organisations interacting with technology (Hevner, Ram, March, & Park, 2004; Orlikowski & Baroudi, 1991; Walsham, 1995). Unspoken assumptions or 'technological frames' (Orlikowski & Gash, 1993), along with often naïve expectations of technology, have a deep-

seated influence on perception and use of technology and information systems. An approach that allows for the mixing of research design strategies and components, potentially using both quantitative and qualitative methods, can augment the probability of answering the research question (Burke Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2006). Accordingly, research into IS/ICT/ISM is perhaps best positioned when it adopts approaches that include empirical facts alongside socially and culturally constructed knowledge and individual perceptions. If one accepts that IS/ICT is a hybrid sociotechnical field requiring multimethod research, then the choice of research paradigm is contingent on several factors as philosophical assumptions and their practical demonstrations influence the research process and its outcomes. A precise outline of these philosophical assumptions helps to clarify the rationale for decisions made regarding methodology, methods, literature and research design. Consequently, the paradigm upon which the research is based should be nominated as a starting point when reporting the research outcomes (Mackenzie & Knipe, 2006).

A paradigm or research philosophy is a conceptual framework for seeing and making sense of the social world – a 'worldview' (Guba & Lincoln, 1994) centred around a belief about the way in which data regarding a phenomenon should be gathered, analysed and used. It defines the nature of the world, the individual's place in it and the range of possible relationships between the two (Guba & Lincoln, 1994). In plain terms, it is a framework or system of belief that influences the way knowledge is studied and how researchers select both

the questions they study and methods that they use to study them (Morgan, 2007). A research paradigm comprises three elements: ontology, epistemology and methodology. Ontology can be described as the study of the nature of being or the types of things that have existence (Hirschheim, 1992). Epistemology, or the theory of knowledge, is then concerned with the description, limitations and validity of what is known about the things that exist – what can be known and how it is known. Epistemology is philosophical by nature, whereas methodology is its practical expression. Methodology can be viewed as being focused on the specific methods and procedures used to know about things that exist, and by which knowledge is to be generated (Guba & Lincoln, 1994). Yet methodology is not just methods as it includes the methods and procedures as they relate to the specific underlying rationale and philosophical assumptions (paradigm) of a study. Methods are the various instruments by which data is collected and analysed, for example, tests, surveys, interviews, focus groups and observations. The same methods can be used in different methodologies. Methods are generally divided into quantitative and qualitative techniques, the former being associated with the gathering, analysing, interpreting and presenting of numerical data, and the latter with narrative data (Teddlie & Tashakkori, 2009).

Whilst one methodology may be representative of an individual paradigm and influence a researcher towards a specific technique, both qualitative and quantitative methods can be used within the framework of any methodology (Howe & Eisenhart, 1990). The choice of methodology is therefore prescribed

by the nature of the researcher, the nature of the research problem and the purpose of the inquiry. The table (Table 3.1) below displays a summarised overview of the key facets of the predominant research paradigms in educational and social science (Anderson, 2013).

PARADIGM	ONTOLOGY	EPISTEMOLOGY	METHOD
Positivism - Quantitative Research	There is an objective reality which can be understood by the laws which govern it	Derived from rationalism and empiricism. Knowledge gained objectively through factual and testable statements	Experimental and deductive - quantitative methods
Pragmatism	Reality is the result of the effects of the actions of ideas in practice	Any useful way of thinking or doing that leads to practical solutions	Mixed methods, action research, design-based research
Interpretivism or Constructivism	Knowledge is created by social and contextual understanding	Manner in which an individual's unique worldview can be understood	Qualitative methods - case study, interviews, observations, ethnography, phenomenology
Critical research	Reality exists and has been created by social bias	Understand views of oppressed and take action to change social conditions	Critical analysis, historic review, programs of action

Table 3.1 Predominant research paradigms in educational and social science

Pragmatism places emphasis on explicitly stating the guiding principles, values, aim and choices made prior to and during the investigation and when reporting, so that the reader can understand the content in context (Martela, 2015). Pragmatism is also the philosophical approach most commonly associated with

mixed-methods research (Teddlie & Tashakkori, 2009) and is described as spanning the middle ground between positivist and interpretivist epistemologies, thus offering a useful middle position both philosophically and methodologically (Burke Johnson, Onwuegbuzie, & Turner, 2007). Philosophically, it accepts that there are singular and multiple realities that are open to empirical inquiry and orients itself toward solving practical problems (Feilzer, 2010). Methodologically, Pragmatism suggests an applied research approach that considers decisions about which methods are appropriate to use depend on the nature of research questions (Onwuegbuzie & Leech, 2006). As a result, differing assumptions, forms of data collection and analysis are allowed to meaningfully co-exist (Creswell, 2009; Tashakkori & Teddlie, 2003). Pragmatism as a scientific research paradigm arose in the United States in the 1870s. Historically, Charles Peirce is credited for the advance of Pragmatism as a philosophical development, along with later twentieth century contributors William James, John Dewey and George Herbert Mead; the latter three being those who are believed to have exerted the greatest influence on the social sciences (as cited in Burke Johnson & Onwuegbuzie, 2004; Hookway, 2013; Morgan, 2007). Pragmatism waned during the twentieth century, but attracted renewed attention after a revised pragmatism was used to criticize logical positivism in the 1960s and since has experienced a revival with philosophers being increasingly willing to use the writings and ideas of the classical pragmatists along with those of the 'neo-pragmatists' (Burke Johnson & Onwuegbuzie, 2004; Hookway, 2013). The core Pragmatist maxim, devised by Peirce, is a principle for explaining hypotheses by considering their 'practical

consequences', which basically means that when judging ideas one should consider their observed and practical consequences (Hookway, 2013).

The early Pragmatists were interested in examining practical consequences and empirical findings not only to understand the significance of philosophical positions but also to help structure and support actions to be applied to comprehending real-world phenomena (Burke Johnson & Onwuegbuzie, 2004). Pragmatism, considered from the view of a research paradigm, is not committed to any particular philosophical stance, instead, researchers focus on the 'what' and 'how' of the research problem (Creswell, 2009). While Pragmatism is most often seen as the paradigm that provides the underlying philosophical framework for mixed-methods research (Burke Johnson & Onwuegbuzie, 2004; Somekh & Lewin, 2005; Tashakkori & Teddlie, 2003), some mixed-methods researchers align themselves philosophically with the transformative paradigm (Mertens, 2005). However, as mentioned, mixed methods could be used with any paradigm. The attraction and applicability of the Pragmatic paradigm is that it considers the research problem pivotal, applying all approaches to understanding the problem to ensure that the data collection and analysis methods chosen are those most likely to provide insights into the research question (Burke Johnson & Onwuegbuzie, 2004; Creswell & Clark, 2010). This approach resonates with the author as it mirrors the problem-solving temperament and attitude employed over a career in ICT spanning 22 years, all of which was spent as part of, or managing, an internal IT team in various educational, cultural and government organisations. The research problem arose in the mind of the author during the initial introduction of technology to

schools in NSW in the early 1990s and coalesced steadily over the years as IT support matured from the early stages of enthusiastic amateurs into a discrete profession. The rapid development of ICT over the last twenty-five years ensured the ongoing implementation of new or upgraded IT systems, along with their concomitant policies and procedures, all of which were intended to bring multiple benefits to the users or organisation. These systems typically represented a significant financial investment by the organisations in which they were implemented. The author's observations and experiences of the practical effects of these systems, when compared to the stated intentions and expected results, seemed to reveal inconsistencies. This research investigation represents an action taken to determine the reasons for the incongruity in one specific sphere, IT support. Personal experience of the implementation of a formal ITIL-based Service Desk mode of support several times in different environments has produced similar outcomes varying from the official assertion of benefits to be gained among which are; improved user satisfaction and relationships; better quality of service; supporting business change and value creation; justifying the cost of IT services and providing reportable performance metrics (Axelos Global Best Practice; "The Benefits of ITIL," 2008; Gacenga, 2013; Iden & Langeland, 2010; Marrone, Gacenga, Cater-Steel, & Kolbe, 2014; Marrone & Kolbe, 2010b; Pollard & Cater-Steel, 2009; Potgieter et al., 2005; Thibodeau, 2007; "What are the top 5 benefits of using ITIL?," 2017; Wui-Ge, Cater-Steel, & Toleman, 2009). In a similar vein, observations of the use of technology in teaching, especially in the classroom, lead to the secondary research focus. Both are intertwined nevertheless as IT support is a well-known

contributor to barriers to the use of technology by teachers (Bauer & Kenton, 2005; Grainger & Tolhurst, 2005; Jing, 2010; John, 2003; Lim & Khine, 2006; Mosesa et al., 2011; Mueller et al., 2008; Zakopoulos, 2005) and conversely formal frameworks such as ITIL are measured and honed by repeated analysis of comprehensive metrics ("The Benefits of ITIL," 2008). Through the combination of research into the empirical attributes of an ITIL-based Service Desk implementation (including metrics) alongside the organisational attributes and the practical outcomes (including perceptions) of the implementation, the aim was to validate whether an inconsistency was apparent and to explore the factors that might play a part. Pragmatism as an 'attitude or method of thinking' is a research philosophy pertinent to professional doctoral research and has increasingly been used in the study of aspects of professional areas such as organisational practices, organisational learning and knowing, organisational development, change management and strategic management (Martela, 2015). The aim of professional doctoral research in information and communication technology is not only extending knowledge of the subject area but to identify, investigate and resolve problems within the IT profession and organisation (CSU, 2014). The essential make-up of scientific Pragmatic research is that it should be at all times aware of its purpose, its practical outcomes and be relevant to a legitimate human issue (Martela, 2015). The synergy between these two stated intentions is evident as is the interaction between these and the researcher's values, beliefs, and approach.

Of course, as with any paradigm, Pragmatism has accepted weaknesses which seem to stem chiefly from the viewpoint of other philosophical paradigms (Burke Johnson & Onwuegbuzie, 2004). In the context of this research only one of the limitations listed in the table below (Table 3.2) (Adapted from:Burke Johnson & Onwuegbuzie, 2004; Marian, 2016; Thayer & Rosenthal, 2009) would seem to have any significant bearing which can be easily addressed by the researcher stating clearly their definition of usefulness when reporting the outcomes of the enquiry.

Pragmatism weaknesses	
Basic research may receive less attention than Pragmatic applied research because the applied research may appear to produce more immediate and practical results.	Pragmatic theories of truth say that something is useful because it is true as well as the converse and 'truth' can differ from one person to another, a stance which is not accepted by many philosophers as they counter that this reduces truth to a subjective opinion that one happens to find useful to believe.
Researchers from a transformative-emancipatory framework have suggested that pragmatic researchers sometimes fail to provide an answer as to whom the pragmatically derived solution is useful.	Many come to pragmatism as a way to avoid traditional and ethical disputes, however, there are current philosophers who reject pragmatism due to disappointment in what they see as its logical rather than practical failing as a solution to many philosophical disputes.
Pragmatism may only promote incremental rather than a fundamental, structural, or evolutionary change in society.	Pragmatism is in competition with the correspondence theory of truth and rejects the notion that truth is a relational attribute to some portion of reality, a position which concerns many from other philosophical worldviews.
What is meant by usefulness can be vague unless explicitly addressed by a researcher.	

Table 3.2 Some limitations of the Pragmatic paradigm (Burke Johnson & Onwuegbuzie, 2004)

3.3 Research design and methodology

Research intent can focus on one or more goals broadly classified as exploratory, descriptive or explanatory and be characterised as basic or applied depending on whether the aim is to obtain or contribute to knowledge about a phenomenon or to obtain knowledge to apply to the solution to a problem (Bell, 2006).

This research investigation might be evaluated as a mixture of basic and applied research as it had an exploratory purpose in trying to validate the existence of the problem and its relationship to the manner of support as well as attempting to gain knowledge that may help other professionals to frame practical solutions (Gacenga, 2013). It was conducted using a mixed-methods approach embedded in a Pragmatic worldview where mixed-methods research is defined as being where the researcher ‘mixes or combines quantitative and qualitative techniques, methods, approaches, concepts or language into a single study’ (Burke Johnson & Onwuegbuzie, 2004).

In mixed-methods studies, research questions drive the methods used (Onwuegbuzie & Leech, 2006) and moreover, are vitally important because they often dictate the type of research design, the sample size and sampling scheme employed and the type of instruments administered as well as the data analysis techniques employed (Tashakkori & Teddlie, 2003).

Research questions can be formulated from previous experience as well as past research or a theoretical base and even from actions arising within professional practice (Onwuegbuzie & Leech, 2006). For this inquiry, the research questions evolved from a combination of actions taken, and experiences undergone, in professional practice over many years.

3.4 Research questions and methods

RQ1: *Does the implementation of an ITIL based service desk affect users' perceptions of IT service and their use of ICT?*

RQ2: What are user and ICT staff perceptions of the process and outcomes?

RQ3: To what extent do users and ICT staff step outside the formal request system?

RQ4: Is there any correlation between the implementation of an ITIL based service desk and the frequency of use of technology?

Onwuegbuzie and Leech (2006) maintain that framing research questions in a mixed-methods inquiry is more difficult than in investigations using solely quantitative and qualitative methods and describe the following thirteen step process for performing mixed-methods research:

1. determining the goal of the study
2. formulating the research objective(s),

3. determining the research/mixing rationale,
4. determining the research/mixing purpose,
5. determining the research question(s),
6. selecting the sampling design
7. selecting the mixed methods research design,
8. collecting the data,
9. analysing the data,
10. validating/legitimating the data,
11. interpreting the data,
12. writing the mixed methods research report, and
13. reformulating the research question(s) (Onwuegbuzie & Leech, 2006).

Reflecting on this process, the cyclic nature of the last steps informing iteratively the initial steps, reveals an unspoken research aim. This was fundamentally to validate that the observed dichotomy between the seemingly obligatory implementation of an ITIL based Service Desk and its reception and practical use was a wider phenomenon not exclusive to the researcher's reality. Putting this into words might result in something like the ensuing research question; 'Do IT teams in SMEs implement an ITIL Service Desk process because it is the de rigueur accepted practice rather than a planned, measured and regularly reviewed process in response to a recognised need? And does the Service Desk function change any of the dynamics of service delivery or relationships between providers and users of the service?' Whether the inquiry provides an answer even partially to this question is explored in the discussion of results.

When considering the research methods composition, the role of the research questions is evident in providing an organising and focused framework for the investigation, defining its boundaries and, additionally guide the type and manner of data collection (Onwuegbuzie & Leech, 2006). Mixed-methods research designs incorporating quantitative and qualitative data collection techniques can do so in several ways. While these have been described variously by different researchers they can be hierarchically sorted into fixed and emergent designs and topology-based and dynamic approaches (Creswell & Plano Clark, 2011). This study used a fixed, that is predetermined planned design and a topology-based approach defined as 'the selection and adaptation of a particular design to a study's purpose and questions' (Creswell & Plano Clark, 2011). Within this design classification, there are various tactics for combining the quantitative and qualitative strands of data collection and analysis with each component requiring the researcher to make decisions in order to arrive at the final design. Creswell and Plano Clark (2011) sort the decision tree into choices under four categories:

- Interaction between the qualitative and quantitative strands
    - Independent or interactive
- Priority weighting between the qualitative and quantitative strands
    - Equal or slanted towards the qualitative or quantitative strands
- Timing of data collection strands
    - Concurrent, sequential or multiphase
- Mixing of qualitative and quantitative approaches

- During collection, analysis or interpretation of results;

resulting in six mixed-methods designs, specifically four basic designs; convergent parallel, explanatory sequential, exploratory sequential and embedded along with two multi-constituent designs; the transformative and the multiphase designs.

Under this decision tree, the study performed would be classified as being of a mixed-methods convergent parallel design qualitatively driven, that is, with substantially more priority given to the qualitative rather than the quantitative perspective. Teddlie and Tashakkori (2006) argue that a major advantage of mixed methods research is that it enables confirmatory and exploratory questions to be asked at the same time, thereby generating and verifying theory in the same study. This inquiry had a primarily exploratory objective with an underlying hypothesis seeking confirmation. Consequently, this class of mixed-methods design was seen as the most appropriate for the stated and implicit research questions as a convergent parallel research design consists of qualitative or open-ended questions and quantitative or closed questions within the same instrument allowing these questions to be posed simultaneously. Appropriate analysis methods was used for each independent strand, that is, neither the qualitative nor the quantitative data were transformed for uniform analysis but rather inferences made, on the basis of the results from each strand, were synthesized to form meta-inferences at the conclusion of the study (Teddlie & Tashakkori, 2006) as shown in the representative diagram (Diagram 3.1) below (Creswell & Plano Clark, 2011).

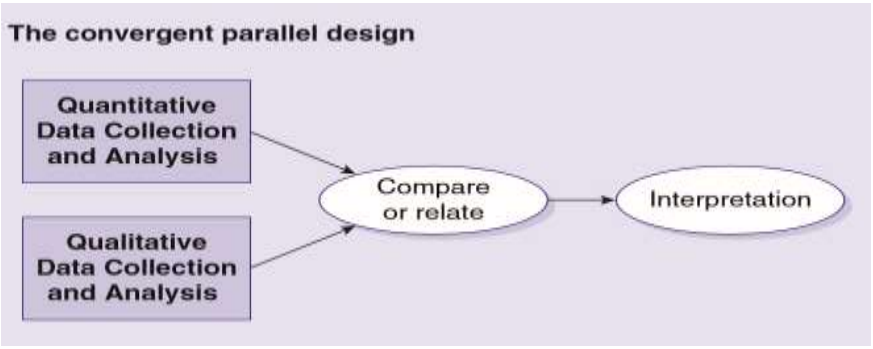


Diagram 3.1 Convergent parallel design

This diagram provides a streamlined view of a convergent parallel mixed-methods design which is one that seeks to compare different perspectives drawn from the qualitative and quantitative data and through interpretation, comparing, contrasting or combining results to develop a stronger understanding of the research questions (Bian, 2013; Hollohan, 2014).
Both sets of data were analysed separately and compared to see if findings confirmed or denied each other or otherwise offered insights or raised further questions. There are multiple possible steps in analysing mixed-methods data sets including data reduction, data display, data transformation, data correlation, data comparison and data integration though not all are required for inclusion in every mixed-methods study (Burke Johnson, 2014). While data can be transformed, for example, qualitative data coded into quantitative variables for statistical analysis or quantitative data converted into narrative data that can be analysed qualitatively, no data transformation was be undertaken in this study. Rather data was merged by identifying content areas represented in both data sets and the results and findings compared and contrasted and the outcomes

interpreted in the discussion to see how they converged, diverged, related and provided a better understanding of the research problem.

The research questions are centred on perceptions, feeling and experiential data which are better explained when studied in depth using a purposive sample (Burke Johnson, 2014). Consequently, in this study, the quantitative data collected was be used for the purpose of descriptive statistics and demographics that are restricted to the population sample only and for potential comparison of groups within the sample. These were used to visualise the characteristics of the typical member of this purposive sample group and explore whether any form of relationship exists between any of the quantifiable variables or whether they exerted any influence over the findings of the analysis of the qualitative data or posed further questions. The qualitative data was explored thematically to uncover the ideas, feelings and perception of the respondents in the sample group to the central topic of an ITIL based Service Desk implementation and its effects on the user and IT staff perceptions and frequency of technology use. The reason for collecting both quantitative and qualitative data was to potentiall y reveal a more complete picture than either quantitative or qualitative data alone could provide. By linking fields in the survey web-based questionnaire instrument, that is open-ended questions linked to one or more close-ended questions, it was hoped to facilitate relating the one to the other during analysis of the results. As an example, quantitative questions on means of measuring the use of technology and frequency of use in the classroom are paired with qualitative questions on whether and how the Service Desk function has

impacted this use and usage in the wider organisation. Similarly, quantitative responses to questions about the mandated use of the Service Desk functions were reviewed in light of qualitative responses to the reasons IT staff and users avoid using the process.

Some of the primary means of comparing and relating results and findings from the data in a convergent parallel design are cross-tabulation of quantitative and qualitative variables and relating qualitative themes with quantitative variables. This study utilised both those methods. As this is an exploratory study, cross-tabulation of quantitative variables and quantitative and qualitative responses was undertaken to uncover whether any relationships can be discerned. This was then strengthened by relating the qualitative themes that emerged from the analysis with the summarised results of the descriptive quantitative variables with the aim of enhancing or elaborating on any perceived linkage as well as uncovering contradictions and framing context and perspectives. Each strand of data analysis was initially reported on separately then both strands integrated to produce meta-inferences. Discussion of this synthesis was used to help describe the complexity of interaction between people and systems in this particular context and then applied to answering the research questions.

3.5 Setting and Sample

The researcher chose to site this research inquiry within a long-standing professional context and the one from which the research problems stem, that being SME organisations in the independent schools' sector in predominantly in NSW which form the unit of analysis. This educational segment more than any other in the sector has had considerable and ongoing financial investment in technology as well as being among the early adopters of the use of technology in teaching, thus providing significant mitigation of the well-documented barriers to the use of technology by teachers. Ongoing research has identified many factors that act as barriers, with access to technology and support being among the more influential (Bauer & Kenton, 2005; Butler & Sellbom, 2002; Carmichael & Procter, 2006; Ertmer, 1999; Fabry & Higgs, 1997; Granger, Morbey, Lotherington, Owston, & Wideman, 2002; P. John, 2005; W. R. John, 2003; Jones, 2004a; Lim & Khine, 2006; Mumtaz, 2000; Sulla, 1998; Tearle, 2003, 2004a, 2004b). Eliminating as many of these factors as possible, enables this research to more accurately reflect the perceptions of the participants in relation to the particular model of support, its acceptance or avoidance and its effect on technology use. Independent or private schools in NSW have often led the way in providing technology resources, developing over the last decade dedicated ICT departments manned by qualified technical staff to develop and manage the IT infrastructure and support the administrative staff, teachers and students.

Access to resources is generally not an inhibiting factor in these organisations with many having introduced one-to-one laptop programs or else providing computer labs and pods in ratios of 1:2 or less even before the Federal Government's Digital Education Revolution. Information technology management and support in education has become a recognized professional avenue for technologists as the Managers of Information Technology in Education (MITIE) group and forum attests. The MITIE group was formed in 1999 with the support of the Association of Independent Schools (AIS) New South Wales and has grown from a membership of around one hundred and seventy members of an AIS IT Managers email list on Yahoo Groups to around one thousand two hundred members in the MITIE community now open to all IT professionals who support IT in education. Delivery of support and management of services and infrastructure is a widely and frequently discussed topic within this group who also hold an annual and well-attended conference each year in May. Nearly all members of this group have incorporated an ITIL based service desk at the very least to manage incidents and support their users, so it is proposed to use this group, its members and their teams as research participants. Unlike the participants in other ITIL studies, however, (Cater-Steel & Tan, 2005; Gacenga et al., 2010; Pollard & Cater-Steel, 2009), technical staff in private schools have little funds for ITIL training or consultancy as typified by a posting in the MITIE forum (C. Maker, personal communication, June 13, 2011). Therefore, while acknowledging ITIL as a best practice or de rigueur approach upon which to base a service delivery infrastructure, there is a definite focus on one aspect only, the service desk component, and little spending on

implementation or software. The result is that the justification, planning, implementation and ongoing evaluation of an ITIL Service Desk are conducted by the technical staff almost exclusively. These factors along with the mitigation of first-order barriers to technology use in private schools combine to create a cultural domain within which the technical IT staff are 'knowledgeable experts', a permutation ideally suited to purposive sampling (Tongco, 2007). Since the objective of the study is to obtain insight into a phenomenon, often the situation in a mixed-methods study particularly the qualitative strand, then purposefully selecting the individuals, groups, and setting maximises the chance of understanding the underlying phenomenon (Onwuegbuzie & Collins, 2007). Patton (2002), states that the power of purposeful sampling arises from the in-depth understanding to be gained from studying information-rich sources. Within the broad classification of purposive sampling are different strategies for 'purposefully selecting' the most appropriate information-rich source (Patton, 2002). Selecting this group for analysis mixes homogenous, where sample constituents have specific or similar characteristics and intensity sampling, where sample constituents have strong experience of the phenomena studied, to reduce variation, minimise variables as much as possible and focus the analysis closely on the research questions (Onwuegbuzie & Collins, 2007). Accordingly, this research will use non-probability or purposive sampling as the best choice to answer the research questions by focusing on specific characteristics that are representative of the dimension of interest rather than attempting to be representative of the entire population (Teddlie & Yu, 2007).

Along with the sampling design, the choice of sample size is vital as it also governs the degree to which statistical and analytic generalisations can be made and is ideally governed by the research design (Onwuegbuzie & Collins, 2007). Whilst there may be no hard and fast rules for sample size in a qualitative inquiry, factors that affect it revolve around the purpose of the inquiry, what will be 'useful' (in the Pragmatic sense as clearly stated by the researcher), what will have credibility, and what is possible (Patton, 2002). A sufficiently sized sample should ideally be attained to reach data saturation or informational redundancy (Onwuegbuzie & Collins, 2007).

The population of independent schools in NSW is around 469 (AIS NSW, 2016) with AIS schools (Association of Independent Schools NSW) numbering 385 of these. Cross-referencing the members of MITIE with the list of AIS schools was the method by which the homogenous purposive sample was chosen. 218 individuals holding a managerial or team leader role in the IT departments of these schools were invited to take part in the research and all attendees at the annual AIS NSW IT Managers Conference were also given the opportunity on the understanding that this latter group comprised all the former as well. A wide variety of independent schools are represented by this membership but, whilst organisations in the form of independent K-12 schools shape the basis of the unit of analysis, the research was endeavouring to investigate perceptions, interactions and behaviour manifest around the process of service delivery of IT support. As a result, all responses from individuals within this purposive sample were analysed rather than selecting only one

response per organisation and responders were encouraged to distribute the survey to their team members as well. Inasmuch as this research will utilise purposive sampling the results will not be judged to be generalisable but still sufficiently representative of the chosen population to the point of redundancy (Patton, 2002). However, setting the sample size to this number meant that achieving a response rate of between 64 and 82 participants would satisfy the criteria required to detect moderate effect sizes in causal-comparative and correlational design with 0.80 statistical power at the 5% level of significance for the descriptive quantitative statistics gathered if required or deemed useful (Onwuegbuzie & Collins, 2007).

3.6 Instrument and Data Collection

An online survey comprising both closed and open-ended questions was the instrument chosen to collect the data to answer the research questions in a concurrent mixed-methods design. A questionnaire was created and distributed using the survey method. This method is judged as being appropriate in the case where comparable data about attitudes, opinions and behaviour is required to be collected systematically from a large group of respondents so that relationships can be explored, analysed and interpreted in the context of the research questions (Fogelman & Comber, 2007). Primarily, as this research is exploratory in nature, the quantitative data whilst providing interesting insights were also utilised to confirm or validate the findings that emerged from the qualitative strand within this single study (Teddlie & Yu, 2007). The self-administered survey questionnaire was designed to collect data to answer the research questions and was designed and distributed online using Survey Monkey (www.surveymonkey.com) as this is a well-known and accepted survey site allowing easy access, branching logic and electronic export of data at a low cost. The survey was designed by the researcher and informed by the literature review, the research questions and academic research on ITIL implementation, benefits and service metrics (BECTA, 2006; Brown, 2003; Cater-Steel & Tan, 2005; Cater-Steel et al., 2006; Creswell, 2009; Dillman, Smyth, & Christian, 2009; Dillon & Morris, 1996; Draugalis, Coons, & Plaza, 2008; Dugmore & Taylor, 2008; Fogelman & Comber, 2007; Gacenga, 2013; Gacenga et al., 2010; Hochstein et al., 2004; Marrone, 2009; Marrone et al.,

2014; Marrone & Kolbe, 2010a, 2010b, 2011a; Potgieter et al., 2005; Shang & Lin, 2010; Verghis, 2006; Wui-Ge et al., 2009). The online questionnaire used parallel quantitative closed questions and qualitative open-ended questions, the latter to obtain more authentic and unique answers (Tashakkori & Teddlie, 2003). The purpose of the closed questions was to inform where possible, the inferences made by analysing the data collected from the open-ended questions, alongside gathering descriptive statistical data on demographics, ITIL Service Desk implementation rates, ITIL knowledge, training and certification, requests for support both using the service desk process as well as those that by-pass it and finally, on technology usage in class if measured at all. The qualitative data gathered revolved around the user and staff perceptions of the implementation, outcomes, the service desk process and IT support overall. The desired outcome of synthesising the results of these two strands was a fuller understanding of the effect of perceptions on use of technology and formalised service delivery processes along with the effect implementing an ITIL based formal Service Desk support delivery process has on people's perceptions of technology and technical staff and with this deeper understanding answers to the research questions would emerge. The questionnaire comprised 45 questions and could be completed in a maximum time of 20 minutes or less depending on how much detail a participant wished to enter in the open-ended questions. There were 22 open-ended questions and 23 closed questions requiring either a set choice of answer or a Yes/No response.

The survey questionnaire was designed to answer each of the research questions and therefore was constructed around five central topics as shown in the table (Table 3.3) below.

Topic	Number of Questions
Demographics	16
ITIL	9
Metrics	5
Support/Perceptions	10
Technology Use	5

Table 3.3 Survey questionnaire topic categories

3.7 Ethical Issues

An application for ethics approval was submitted to the Charles Sturt University Human Research Ethics Committee to obtain approval to conduct the research project. With any research that involves human participants respect for the rights of the participants must be paramount throughout the design, execution and reporting phases of the project. This was demonstrated in a number of ways by the researcher. All participants took part in the survey voluntarily after having been invited to join. The researcher disclosed the purpose of the research, its intended contribution and explained the required involvement of the potential participants in the Information Statement that preceded entry to the survey. This online statement which was required to be viewed before a participant clicked next and commenced the survey.

Consequently, any participant who proceeded to the survey and answered questions was deemed to have given their informed consent to participation. The initial notification to the sample group of the survey was via the MITIE Managers Forum a closed forum for members and a common vehicle for other members to ask for information, opinion or assistance. Using this approach, the researcher hoped to alleviate any concerns generated by the chosen online medium, primarily unsolicited emails and infringement of peoples' privacy, along with allowing the forum members to be informed about the research before being invited to take part. The Survey Monkey web tool generates a unique URL for each consenting participant thereby facilitating anonymity whilst lessening the risk of multiple responses per contributor. Finally, the participants and the CSU Human Research Ethics Committee were assured of the care to be taken with the physical and digital security of the collected data.

3.8 Survey Pilot

Once ethics approval was received the research project commenced. As the questionnaire was not pre-existing apart from the inclusion of basic ITSM performance metrics as the choices for one question (Brown, 2003; Gacenga et al., 2010) and had not been validated through previous application pre-testing was carried out. Four MITIE members who had been IT Managers in AIS NSW large independent schools were asked to test the survey instrument online. The feedback received, solely on the clarity of the wording of some questions and typographical errors, was incorporated into the slightly revised version and, as

the changes were minimal, their responses were included in the final analysis as well.

As initial high-level analysis of the responses received to the questions in the pilot revealed no serious issues invitations to participate in the study were distributed to the members of the MITIE (Managers of Information Technology In Education) group of educational information technology professionals via a web link on the online forum, direct personal email invitations of three rounds commencing in June 2014 all with follow-up reminders and finally, via Twitter during the annual AIS IT Managers Conference in May 2015.

3.8 Limitations and key assumptions

This section describes the limitations of the methodology and key assumptions used in the study. For qualitative data methods, towards which this research design is inclined, criteria for evaluating the rigour, relevance and trustworthiness of the research include credibility, transferability, dependability and conformability (Collins, Onwuegbuzie, & Jiao, 2007; Denzin & Lincoln, 2005; Gobo, 2004; Lincoln & Guba, 1985; Onwuegbuzie & Collins, 2007; Onwuegbuzie & Leech, 2004). Pragmatic mixed-methods research designs group these into two criteria, internal and external validity. For qualitative research, the criteria used for judging quality and credibility will vary conditionally upon philosophical underpinnings, research design and purposes and intended audiences (Patton, 2002). Limitations of qualitative research

include researcher prejudice and bias, observer effects, and writing about qualitative research so that readers can replicate the study. Rather than generalizability, repeatability or transferability are key issues for legitimacy and research validity in non-random sampling designs (Gobo, 2004). Credibility corresponds with internal validity and transferability is a form of external validity (Rolfe, 2004). Transferability relies upon an arguably strong and representative sample and refers to the extent in which the findings would be similar if applied to other comparable situations as judged by readers of the research rather than specified by the researcher as is the case with generalizability (Hoepfl, 1997). Dependability is demonstrated by proving lack of bias and replication of results if the data were collected again. Adherence to accepted best practice principles in the choice of research design, measurement, sampling and procedure improves the probability that the results have demonstrated validity (Cohen & Manion, 2000). Equally, as the sampling method is not probabilistic, issues of bias derived from non-response, response rates and sample size are somewhat minimised, however, every effort was made to ensure a high response rate so that there is some confidence the resultant data is representative of the purposive population chosen. Mixed-methods research relies on the mixing of quantitative and qualitative methods that include all of the strengths of both put together in multiple and creative ways to overcome the perceived weaknesses of either single strand of analysis (Onwuegbuzie & Leech, 2004). A mixed-methods approach to this enquiry, therefore, includes separate strand analysis followed by combined analysis at the interpretive phase and, in so doing, mitigating the limitations of either single approach.

There are also limitations of the survey methodology used in the study, therefore, a description of the measures put in place to minimise these follows. The population and sampling issues attendant on the survey method have already been addressed by using an expert population and a purposive sampling scheme. The MITIE members have generally extensive knowledge and experience on the subject and have been chosen for this reason so their expert opinion on the phenomena of interest is the basis for their inclusion. Thus, sampling bias is not really an issue here. As the sampling method is not probabilistic, nor are the quantitative data gathered statistically significant, issues of bias derived from non-response, response rates and sample size are somewhat minimised. The questionnaire was designed to be unemotive and objective and to minimise effort on the part of the participants as much as possible without putting the veracity of responses at risk with the intention of reducing the chance of facile or unreliable answers.

Other issues relate to questionnaire design, how easy is it for respondents to understand and follow, the wording of the questions and how each individual respondent might interpret each question. Pre-testing the survey instrument with a subset of the sample group was designed to illuminate any problems with comprehension of questions or ambiguous wording and any feedback to that effect was incorporated before the final release of the questionnaire. There is also increasing reference material about web-based survey methods resulting in further best practice design principles as the use of differing media brings with it considerations of questionnaire design. For example, the size of the response

box in open-ended questions influencing the answer either directly through character limits or more subtly by perceived space for the response (Dillman et al., 2009). Whilst the focus in survey method reference material is often on statistical questionnaires and probability sampling, the same principles of best practice apply to qualitative questionnaires used as a research instrument and provided useful guidelines.

During the development of a survey questionnaire decisions and assumptions about what is important and what not are made at every stage by the researcher and these decisions cannot help but be embedded in their beliefs and bias. The limitation of the analysis, particularly with the open-ended questions, will be that it is the effort of one researcher who brings their own perceptions and beliefs to the task with the result unequivocally subjectively filtered through their philosophical lens. Transparency through fully detailed reporting of each phase of the research project combined with the role of the quantitative data in enhancing the resulting should allow repeatable results and give the project validity (Draugalis et al., 2008). The validity of this research study and its conclusions will be judged to be present if the outcome is of high quality and defensible to the professional practice communities for whom the research is produced and may potentially be used (Onwuegbuzie & Leech, 2004).

3.9 Data Analysis

The mixed methods identical concurrent exploratory design consisted of a single phase involving identical homogenous purposive samples for both quantitative and qualitative components of the investigation. The qualitative component had significantly more weight than the quantitative data component which played a supplemental role in the research design. The data was merged following separate analysis of each strand to determine if any meta-inferences could be made that enhanced the qualitative findings and more fully answered the research questions. The quantitative research design is descriptive in nature and the qualitative design phenomenological. Both the closed and open-ended questions in a concurrent design were included in a single survey instrument as the neither the quantitative nor the qualitative phases informed the design of the other. The survey questionnaire instrument containing both open and closed-ended questions is one type of convergent design and appropriate methodological analyses were used for each independent strand.

The qualitative data contained in the open-ended responses were imported into in the QSR Nvivo software package as case nodes using the survey import wizard along with the closed-ended questions as classifying or attribute information. This enables more effective comparison of this quantifiable data with open-ended, qualitative data ("The NVivo Guide to Mixed Methods," n.d.).

The open-ended responses were then reviewed line by line in an iterative manner and analysed for reoccurring patterns and themes and as one became apparent a code was assigned to that segment of the data. New nodes were created for emergent patterns detected in the data and subsequent related categories grouped under the relevant nodes as they were identified and coded. The qualitative data analysis process is described in more detail in the Qualitative Analysis section of Chapter 4.

The quantitative data is primarily descriptive and demographic in nature and was analysed initially in IBM Statistical Package for Social Sciences (SPSS). Attributes such as frequency, mean, median and mode were recorded where relevant. Cross-tabulations were performed on related variables to determine whether any relationships could be discovered. The quantitative data was also imported into NVivo where it could be reviewed together with any related free-text, that is open-ended, qualitative response and then with the results from the same data analysed in SPSS.

The idea that the research questions in a mixed-methods inquiry determine the methods used can be extended to the research question guiding the data analytic procedures also. Data reduction of the qualitative data via exploratory thematic analysis and the quantitative data via descriptive statistics followed by data display and then data comparison and interpretation are appropriate for this research design schema.

Neither the qualitative nor the quantitative data were transformed for uniform analysis, rather interpretations made based on the results from each strand were merged to reveal possible meta-inferences.

3.10 Conclusion

This chapter provided a comprehensive account of the philosophy, methodology and strategy that supplied the scaffolding to develop a research project that meets required academic standards and demonstrates practical professional relevance. The rationale for choosing a parallel concurrent mixed-methods design strategy was provided and supported by the literature. The research questions were expounded as the basis for the subsequent decisions made on the choice of sampling scheme and sample constituents along with the practical components of research instrument and data collection and a broad overview of the data analysis procedures.

Chapter 4: Survey Questionnaire Report of Results

4.1 Introduction

This chapter provides a detailed account of the survey analysis and results, both quantitative and qualitative and subsequent strand integration. Chapter 3 described the research design rationale, including the research philosophy, the sampling approach, the survey instrument and the data analysis procedures planned for the study. The aim of the survey was to undertake an exploratory investigation of an ITIL based Service Desk in an SME environment to elicit information concerning perceptions, acceptance, utilisation of both the service and technology, along with the effects, perceived or measurable, of the mode of user support on any of these factors. The chapter will first report on the results of the survey responses, preliminary data considerations and preparations prior to analysis. This will be followed by a description of the quantitative data analysis approach. Next, the analysis results, including descriptive statistical tests and non-parametric tests conducted to determine any relationships between the quantitative variables will be given, culminating in a depiction of the survey sample respondents. Included will be respondent demographics and organisational characteristics, along with any correlations between these variables.

The next section will focus on the qualitative data from the survey responses and the content analysis of the open-ended survey questions together with

coding for patterns and themes that emerged during a predominantly deductive analytical approach. Finally, the means of integration of the two strands of analysis and the ways and extent to which they converge to give a fuller understanding of the research problem will be recounted. The structure of this chapter is shown in the figure below (Figure 4.1).

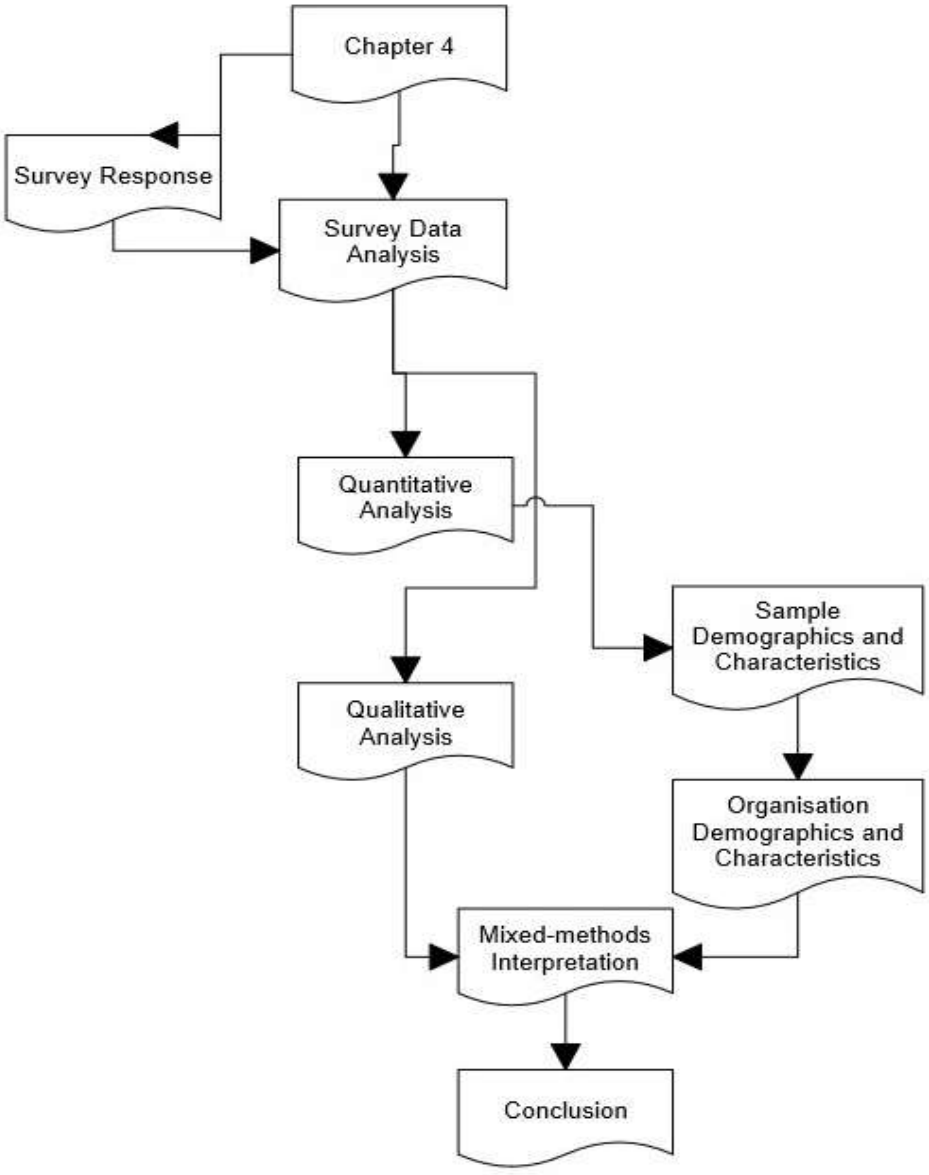


Figure 4.1 Chapter 4 outline

4.2 Survey response

In this study, the data collection technique used to perform the survey was a questionnaire. Survey questionnaires are an appropriate method of collecting data from geographically distributed research participants, may reduce bias compared to interviews and are a more time efficient means of collecting data, therefore, more attractive to potential participants (Queensland Government Statistician's Office, 2017; Sekaran & Bougie, 2013). This is especially true when the researcher unambiguously communicates the information of interest as was the case in this study (Sekaran & Bougie, 2013). Not only were the questions intelligible and straightforward and verified through a pilot study but the objective of the study was published in the sample group forum on several occasions to ensure clarity. The survey questionnaire is included in the appendix for reference. The self-administered survey questionnaire was distributed online using Survey Monkey™, a well-known and accepted survey site offering many advantages in convenience, data entry and analysis, layout, ease of follow-up and integration with various analysis software packages.

Acknowledged weaknesses of online survey questionnaires such as issues relating to sample attributes, online experience and access technology were not germane in this study (Sekaran & Bougie, 2013). The design of the survey focussed on a service central to the roles of the participants. As all worked in the IT area of their organisations they were very conversant with the study subject matter and comfortable with this approach and online surveys and

questionnaires generally. Sampling was controlled by the choice of a purposive sampling scheme. The questionnaire, comprising 22 open-ended questions and 23 closed questions was distributed to the members of the MITIE (Managers of Information Technology In Education) group of educational information technology professionals via a web link on the online forum, direct personal email invitations of three rounds commencing in June 2014 all with follow-up reminders and finally, via Twitter during the annual AIS IT Managers Conference in May 2015.

4.3 Non-response, Respondent, and Sampling bias

The sample population was chosen by cross-referencing all 385 AISNSW schools (Association of Independent Schools NSW) and the members of MITIE and attendees at the annual conferences resulting in a sample size of 218 as not all AISNSW schools are represented in the MITIE group and it is from this group the organisers of the annual conference are drawn. Several different invitations to participate were produced to increase the response rate with the collective web link posted both on the forum and at the annual AIS NSW IT Managers Conference being published on the understanding that these groups included the email participants and representatives from the AISNSW schools.

Apart from the web link and pilot group three further rounds of individual email invitations were sent via Survey Monkey™ totalling 218 participants including the pilot group. 64 responses were returned (32 from the web link and 32 from

the email invitation rounds) however four responses were judged to be incomplete (only a subset of the demographic questions answered) and excluded thereby giving 60 sufficiently completed responses. In the email collectors, there were 3 opt-outs (refusals) and 7 emails bounced (out of scope). Using the formula; Response Rate = Number of valid responses ÷ (Total number approached - Out of scope), a response rate of 27.5% was achieved based on the total number of direct invitations sent. The response rate is shown in the chart below (Figure 4.2) and is generally representative of the average response rate to email or online survey questionnaires (FluidSurveys, 2014).

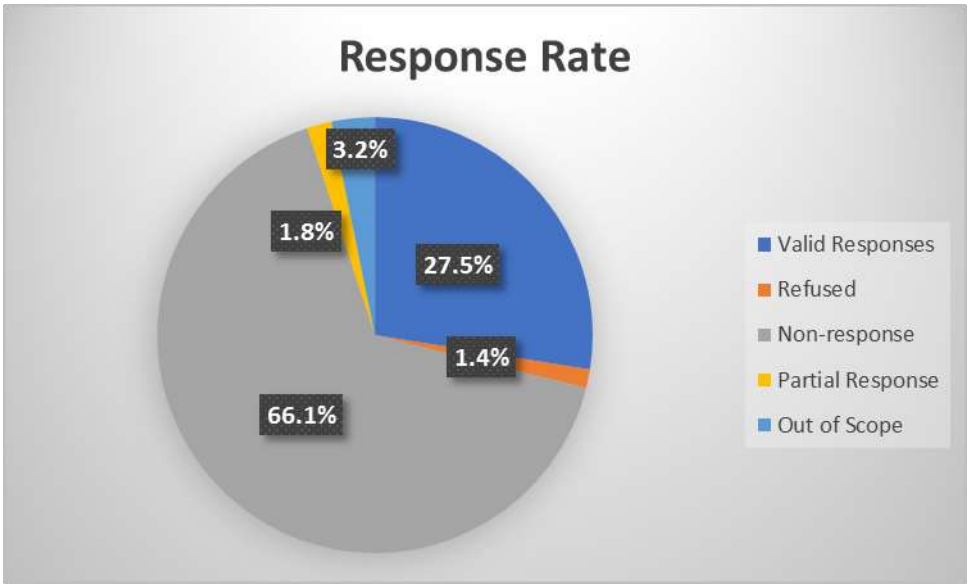


Figure 4.2 Survey response rate

The response rate may be to a certain extent explained by the nature of the survey questionnaire subject, particularly the open-ended questions which required some reflection, as well as the usual time constraints that IT professionals experience in their normal workday.

Considering that this was an exploratory study the response rate is not deemed an issue as the results of the survey were not intended to be generalizable to an entire population rather representative of the purposive sample. Whilst acknowledging that a high response rate is advantageous in minimizing the possibility that the responses are not representative of the population being studied and that non-probability methods such as purposive sampling are not free from bias, in this case looking at the representativeness of respondents may be more accurate (Biersdorff, 2009). Of the 60 participants, 56 (93.3%) were from a non-government, that is private, faith-based or non-denominational school (some were combinations of these, however, were only counted once) and 50 (83.3%) of these schools were in NSW so most respondents were very representative of the sample group (Table 4.1).

State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	3.3	3.3	3.3
	Abu Dhabi	1	1.7	1.7	5.0
	ACT	2	3.3	3.3	8.3
	NSW	50	83.3	83.3	91.7
	QLD	2	3.3	3.3	95.0
	SA	2	3.3	3.3	98.3
	TAS	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Table 4.1 Distribution of respondents by state

Thus, the sample can provide internal validity whilst recognising that any interpretation of results is limited to this population. As the weighting in this mixed-methods study is towards the qualitative strand this number of respondents was adequate to achieve redundancy during analysis.

The survey questionnaire method also has an impact on response rate. Generally, e-mail surveys seem to attract a lower response rate than mail, telephone or face-to-face surveys, with response rates for the former varying from around 21% to around 33% whilst rates in the range of 40 -70% are not uncommon for the latter (Biersdorff, 2009; FluidSurveys, 2014; Nulty, 2008; Wiersma,). Steps were taken in line with good practice to minimize non-response bias as much as possible. The survey questionnaire and distribution methods were pre-tested with a pilot group who represented a subset of the purposive sample population and only required minor changes following completion of the questionnaire and their comments. A generous response period comprising four rounds of data collection from June 2014 until May 2015 was allowed to reduce any risk associated with rushed or short collection time spans and several well-spaced reminders were sent during each round to gently nudge those who had not yet responded. Reassurance as to the confidentiality and anonymity of responses and responders was posted each time on the MITIE forum when notifying or reminding them of the research study and was stated clearly on the Participant Information and Consent sheet at the beginning of the survey questionnaire. Using any sort of remuneration incentive was beyond the resources of the researcher but potential participants

were told that once the thesis was completed and submitted the results of the questionnaire and outcomes would be presented back to them via the forum for their professional interest and use.

Respondent bias was reduced as far as practicable by allowing for opt-out type responses such as ‘Don’t know’ and ‘Prefer not to say’ and the anonymity of the survey questionnaire combined with the careful, unbiased, and non-judgmental language used in the questions was intended to reduce any unwillingness to provide factual and honest responses particularly in the open-ended questions.

4.4 Filtering responses

Considering that the unit of analysis was the members of the MITIE group and that the respondents from the same organisations held differing roles thus potentially providing a diversity of qualitative responses on the effects of the Service Desk function, any responses from multiple respondents from the same organisations were retained. Once the data was downloaded from the online survey tool into an Excel file, it was reviewed for missing data and outliers. Four responses were found to have answered some of the initial demographic questions only and so were removed from the dataset leaving 60 responses for analysis. Data cleansing was then performed in as much as values in numeric fields were standardised into the same format. For example, budget figures written as 1.5M or 350K were changed to 1500000 and 350000 or 3 ½ staff

changed to 3.5 or state name abbreviations made uniform. No data cleansing apart from also making uniform the supplied names of Service Desk software, for instance, changing variations of 'solarwinds webhelp desk' to Solar Winds Web Help Desk (correct trade names of the software being garnered from the suppliers' websites), was performed on the open-ended responses. Extreme values found in a few variables, namely annual budgets, student numbers and number of IT staff were left in the data set as they represented real data and since only descriptive statistics and comparisons were being generated from the quantitative data these were not classified as outliers or generally removed. In any instance where an extreme value was removed, this has been noted in the analysis results pertaining to that set of variables. Data allowing identification of the respondent (e.g. email address) was removed to further reduce researcher bias before the spreadsheet containing the combined responses was then imported into IBM SPSS Statistics (SPSS) - both the whole data set and another data subset comprising only the numerical quantitative variables - and in its entirety into QSR International NVivo (NVivo).

Quantitative analysis

Once the dataset had been imported into and opened in SPSS the data the variables and values were examined; initially for missing data or other inconsistencies and variable type classifications. This former was significantly reduced in most quantitative questions due to the survey questionnaire instrument which restricted input by presenting a choice of responses.

As mentioned, four respondents providing only a few demographic responses and answering no further questions had been eliminated from the dataset leaving 60 valid responses for analysis. None of the questions were mandatory however there were very few quantitative demographic questions not answered and the missing fields were reported in the descriptive statistics. Sometimes a non-response was valid due to the answer to the previous questions. As an example, questions, such as 'If you answered Yes to Question 8 how many staff are dedicated to user support?', only required an answer from those participants who had answered yes to question 8 whereas those who had answered no were directed to the next question. For all the open-ended questions participants had the choice of whether to respond or not, in part to reduce the risk of respondent bias, so analysis was only performed on the completed responses. Response rates have been reported for each question to assist in evaluating the degree of relevance of the collected data and interpretations.

4.5 Descriptive Statistics

The first stage of the analysis involved deriving descriptive statistics in relation to all the demographic questions. For all items, where possible, frequency and distribution were calculated. When this initial data was examined, any observed or suspected relationships were explored using cross-tabulation of results and for the strictly numerical variables, a correlation analysis was undertaken.

4.6 Sample demographics and characteristics

The first parts of survey questionnaire gathered data about the background of respondents and are presented in this section to present a picture of the respondents and their organisations.

Using SPSS, descriptive statistical tests were performed on all quantitative variables including frequency (and percentage), along with the mean, median and mode where appropriate.

Overwhelmingly, but not unexpected for the IT profession, the respondents were male (90%) with only six female respondents (10%) (Table 4.2), a representative balance borne out by attending and examining the attendee list at several annual AISNSW MITIE IT Managers conferences where conference registrations are listed by name, position title and organisation.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	6	10.0	10.0	10.0
	Male	54	90.0	90.0	100.0
	Total	60	100.0	100.0	

Table 4.2 Gender distribution of respondents

The age range, including one ‘Prefer not to answer’ and one ‘Other’ response (66) - outside the pre-determined selectable ranges (the upper age range had been set as 65 given that within schools 60 has been the common retirement age) and converted to a range (66 – 70) for uniformity of analysis - produced a normal distribution curve with the majority (46.7%) falling into the mid-range of 34-49 with 25% falling into the 18-33 range and 25% falling into the 50-65 range on either side. The last two values (66 -70 and NA – Prefer not to answer) one of each equalled 1.7% each of the results (Figure 4.3).

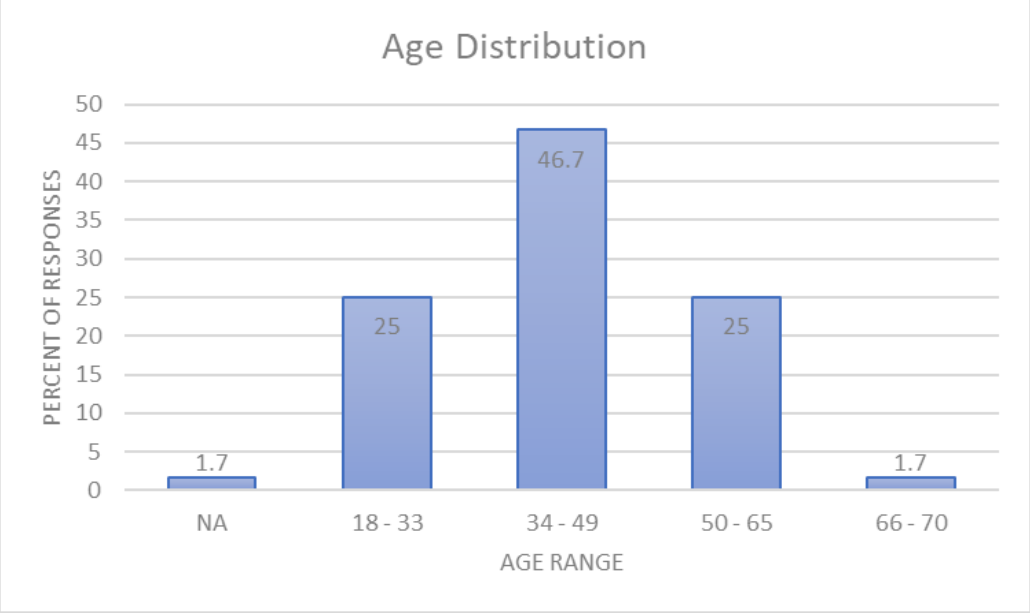


Figure 4.3 Distribution of age ranges of respondents by percentage of responses

In relation to the level of position held by respondents, 83.3% of respondents managed the IT team and 16.7% were IT team members (Table 4.3). The distribution of respondents over the choices for professional background

concentrated around Information Technology (71.7%) then Teaching (25%) and finally Business (3.3%) (Table 4.4) amongst which 83.3% had heard of ITIL.

Manage or team member

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manage	50	83.3	83.3	83.3
	Team member	10	16.7	16.7	100.0
	Total	60	100.0	100.0	

Table 4.3 Respondent Position

Professional background

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Business	2	3.3	3.3	3.3
	Information Technology	43	71.7	71.7	75.0
	Teaching	15	25.0	25.0	100.0
	Total	60	100.0	100.0	

Table 4.4 Respondent professional background

Fifty of the sixty (83.3%) had heard of ITIL or FITS and there were 26.7% who had an ITIL V3 qualification,13.3% an ITIL V2 qualification, 5% another service desk qualification and 13.3% had undertaken an ITIL course or study for a total of 58.3% though some respondents had multiple responses. Those with no ITIL qualification numbered 35% and only 15% had not undertaken any ITIL study or course of any sort (Tables 4.5 – 4.11).

Have you heard of ITIL or FITS?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		10	16.7	16.7	16.7
	Yes	50	83.3	83.3	100.0
	Total	60	100.0	100.0	

Table 4.5 Heard of ITIL/FITS

Yes - qualification ITIL v2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		44	73.3	73.3	73.3
	Yes - qualification ITIL v2	16	26.7	26.7	100.0
	Total	60	100.0	100.0	

Table 4.6 Frequency ITIL v2 qualification

Yes - qualification ITIL v 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		52	86.7	86.7	86.7
	Yes - qualification ITIL v 3	8	13.3	13.3	100.0
	Total	60	100.0	100.0	

Table 4.7 Frequency ITIL v3 qualification

Yes - other qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		57	95.0	95.0	95.0
	Yes - other qualification	3	5.0	5.0	100.0
	Total	60	100.0	100.0	

Table 4.8 Frequency Other qualification

Yes - study/course

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		52	86.7	86.7	86.7
	Yes - study/course	8	13.3	13.3	100.0
	Total	60	100.0	100.0	

Table 4.9 Frequency Yes to ITIL study or course

No - qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		39	65.0	65.0	65.0
	No - qualification	21	35.0	35.0	100.0
	Total	60	100.0	100.0	

Table 4.10 Frequency No ITIL/FITS qualification

No - study/course

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		51	85.0	85.0	85.0
	No - study/course	9	15.0	15.0	100.0
	Total	60	100.0	100.0	

Table 4.11 Frequency No study or course

Despite this, of the 51 (85%) valid responses to the question of whether an ITIL qualification was one of the attributes sought in a prospective employee, 53.3% of those who responded replied in the negative and only 31.7% said they did look for an ITIL qualification or ITIL experience in prospective employees. There was no discernible correlation between the proportion of each looking for

ITIL knowledge or certification in prospective employees with having an ITIL qualification, or having studied ITIL or not, nor with having implemented an ITIL based Service Desk or not (Tables 4.12 – 4.13).

Look for ITIL when employing IT staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		9	15.0	15.0	15.0
	No	32	53.3	53.3	68.3
	Yes	19	31.7	31.7	100.0
	Total	60	100.0	100.0	

Table 4.12 Look for ITIL qualifications or experience potential employees

Look for ITIL when employing IT staff cross-tabulated with Have you heard of ITIL or FITS?

Count

		Have you heard of ITIL or FITS?		
			Yes	Total
Look for ITIL when employing IT staff	No	8	1	9
		1	31	32
	Yes	1	18	19
Total		10	50	60

Table 4.13 ITIL in prospective employees cross-tabulated with Heard of ITIL or FITS

However, an interesting pattern was noted between the age range of the sample and seeking ITIL qualification in potential staff members. In the 18 - 33 and 50 – 65 only ~13% and ~26% respectively sought qualification were in the majority age range 34 – 49 it was equally weighted between yes and no with 13 (46.4%) respondents in each category (Table 4.14).

Look for ITIL when employing IT staff cross-tabulated with Age range

Count

		Total
Look for ITIL when employing IT staff		9
	No	32
	Yes	19
Total		60

Table 4.14 ITIL in prospective employees cross-tabulated with Age range of respondents

A partial explanation for this relationship might be teased from cross-tabulating Age Range with Professional Background (Table 4.15) and then both these with 'Look for ITIL when Hiring' (Table 4.16 – 4.17). As can be seen in Table (4.15) there is a noticeable trend down the age range of moving away from a teaching background to an IT background. This then produces a peak in the 34 – 49 age range of managers from an IT background looking for ITIL knowledge, experience or certification in those they are considering for employment.

Professional background cross-tabulated with Age range

Count

		Age range			
		18 - 33	34 - 49	50 - 65	66 - 70
Professional background	Business	1	1	0	0
	Information Technology	14	22	6	1
	Teaching	0	5	9	0
Total		15	28	15	1

Table 4.15 Respondent - Professional background cross-tabulated with Age range

Look for ITIL when employing IT staff cross-tabulated with Age range

Count

		Age range				
		18 - 33	34 - 49	50 - 65	66 - 70	NA
Look for ITIL when employing IT staff	No	4	2	3	0	0
	Yes	9	13	8	1	1
		2	13	4	0	0
Total		15	28	15	1	1

Table 4.16 ITIL prospective employees cross-tabulated with the Age range of respondents

Look for ITIL when employing IT staff * Professional background Crosstabulation

Count

		Professional background			
		Business	Information Technology	Teaching	Total
Look for ITIL when employing IT staff	No	1	6	2	9
	Yes	0	26	6	32
		1	11	7	19
Total		2	43	15	60

Table 4.17 ITIL prospective employees cross-tabulated with the Professional background of respondents

Regarding Service Desk implementation, 28.3% had done so, 18.3% were planning or intending to and 40% had not (Table 4.18), however, a likely hypothesis is that this was taken to mean they had not personally been responsible for an implementation as a greater percentage had a service desk process in place with only 4 (6.7%) responding 'No Service Desk' in the implementation timeframe question (Table 4.19). Only 3.3% had implemented in the last six months, then 11.7% in the last two years with 30% of

implementation time frames between 3 to 5 years ago, and 31.7% were over 5 years ago, so up to ~62% of implementations possibly predated the arrival of some of the respondents at their respective organisations. Given the 15% non-response to this question along with the 6.7% who chose 'No Service Desk' in response to the implementation timeframe question, we can assume around a 78% (78.3%) use of an ITIL related Service Desk process and function within the organisations of the sample group.

Implemented ITIL or FITS based Service Desk process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		8	13.3	13.3	13.3
	Intending to/planning	11	18.3	18.3	31.7
	No	24	40.0	40.0	71.7
	Yes	17	28.3	28.3	100.0
	Total	60	100.0	100.0	

Table 4.18 Frequency of implementation of an ITIL/FITS based Service Desk

Implementation timeframe

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		9	15.0	15.0	15.0
	< 6 months	2	3.3	3.3	18.3
	> 5 years	19	31.7	31.7	50.0
	1 - 2 years	7	11.7	11.7	61.7
	3 -5 years	18	30.0	30.0	91.7
	No Service Desk	5	8.3	8.3	100.0
	Total	60	100.0	100.0	

Table 4.19 Implementation timeframe

For those who had been involved in an implementation or used an ITIL related Service Desk function in their organisations, the most common implementation method was an ad hoc evolution within the IT team (33%) followed by an informal, planned though not funded IT team project (28.3%) (Table 4.20a). These two categories of implementation formed the clear majority of implementation methods with the more formal project management process of business case, funding through a budget and project managed either internally or with the assistance of a consultancy nominated by 9 (15%) and 1 (1.7%) respondents respectively and there was no correlation between implementation method and implementation time frame (Table 4.20b).

Implementation Method	**Frequency**	**%**	**Valid %**	**Cumulative %**
No response	9	15	15	15
Ad hoc evolution within ICT team, not a project, not planned, not funded	20	33.3	33.3	48.3
Business case, budget funded, project manager - external consultancy involvement	1	1.7	1.7	50
Business case, budget funded, project manager - no external consultancy	9	15	15	65
Informal ICT team project, planned, not funded	17	28.3	28.3	93.3
Not applicable - no implementation of Service Desk	4	6.7	6.7	100

Table 4.20a Service Desk implementation method

Implementation timeframe cross-tabulated with Implementation method

Count

		Implementation method		
		Business case, budget funded, project manager - no external consultancy	Informal ICT team project, planned, not funded	Not applicable - no implementation of Service Desk
Implementation timeframe		0	0	0
	< 6 months	1	0	0
	> 5 years	1	8	0
	1 - 2 years	3	3	0
	3 -5 years	3	6	0
	No Service Desk	1	0	4
Total		9	17	4

Table 4.20b Service Desk implementation method

By far the most popular software package used to manage the Service Desk amongst the 41 (68%) the respondents who nominated using software was Solar Winds Web Help Desk which totalled 35% though it was characterised by respondents as both ITIL (18.3%) and Non-ITIL (16.7%) based software, a categorisation seemly founded on the preference of the participant as no pattern to the decision to classify it as ITIL or Non-ITIL could be seen with possession of an ITIL qualification or not or having implemented an ITIL based Service Desk or not.

A total of 8.4% of responses did not use software (email and telephone 6.7%) among the 46 (76.6%) responses in total to these sets of questions (Tables 4.21 – 4.24).

ITIL software for SD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		38	63.3	63.3	63.3
	Dell KACE	2	3.3	3.3	66.7
	HPSM	1	1.7	1.7	68.3
	Managed Engine Help Desk	2	3.3	3.3	71.7
	Not specified	1	1.7	1.7	73.3
	Solar Winds Web Help Desk	11	18.3	18.3	91.7
	SysAid	2	3.3	3.3	95.0
	Zen Desk	3	5.0	5.0	100.0
	Total	60	100.0	100.0	

Table 4.21 ITIL Service Desk software packages

Non-ITIL software for SD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		41	68.3	68.3	68.3
	Core Processes	1	1.7	1.7	70.0
	GLPI	1	1.7	1.7	71.7
	Managed Engine Help Desk	1	1.7	1.7	73.3
	Previously osTicket	1	1.7	1.7	75.0
	ReadyDesk	1	1.7	1.7	76.7
	Solar Winds Web Help Desk	10	16.7	16.7	93.3
	Spiceworks	3	5.0	5.0	98.3
	wiki	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Table 4.22 Non-ITIL service Desk software packages

Use email or phone for SD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		56	93.3	93.3	93.3
	email and telephone	4	6.7	6.7	100.0
	Total	60	100.0	100.0	

Table 4.23 Email or phone used for Service Desk

Other means SD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		58	96.7	96.7	96.7
	in person	1	1.7	1.7	98.3
	Jobcard for Change Requests	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Table 4.24 Other means used for Service Desk

Of the 38 responses to the question regarding use of other ITIL processes apart from Service Desk, 50% responded negatively, 8.3% said they had used other processes in the past and only 5% were currently supporting the use of an ITIL Service Desk with other processes in the overall ITIL framework (Tables 4.25 - 4.26).

Currently use or implemented in past other ITIL functions and processes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		22	36.7	36.7	36.7
	No	30	50.0	50.0	86.7
	Yes, currently.	3	5.0	5.0	91.7
	Yes, in the past	5	8.3	8.3	100.0
	Total	60	100.0	100.0	

Table 4.25 Use or implementation other ITIL processes

Currently use or implemented in past other ITIL functions and processes cross-tabulated with Implemented ITIL or FITS based Service Desk process

Count

		Implemented ITIL or FITS based Service Desk process				
			Intending to/planning	No	Yes	Total
Currently use or implemented in past other ITIL functions and processes	No	8	1	9	4	22
	Yes, currently.	0	8	14	8	30
	Yes, in the past	0	2	0	1	3
		0	0	1	4	5
Total		8	11	24	17	60

Table 4.26 other ITIL processes cross-tabulated with Implemented ITIL/FITS based Service Desk

Forty-four responses were received to the Yes/No question regarding the use of metrics to measure Service Desk or service delivery performance or usage and of these 27 (45%) were positive responses with 17 (28.3%) responding negatively (Table 4.27).

Use metrics to measure SD or IT usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		16	26.7	26.7	26.7
	No	17	28.3	28.3	55.0
	Yes	27	45.0	45.0	100.0
	Total	60	100.0	100.0	

Table 4.27 Use of metrics

If respondents answered yes to using metrics they were then asked to choose from a list of common ITSM/ITIL metrics to indicate which ones they employed. Taking into consideration that multiple choices were allowed the top metrics clustered around problems, calls (number received, resolved and outstanding) and response times (Figure 4.4).

Metric	**Frequency**
Number of calls logged	18
Number of problems logged	17
Number of problems fixed	15
Number of calls received	13
Number of problems outstanding	13
The elapsed time to follow up and resolve issues	12
Response times per incident	12
Percentage of incidents resolved by the help desk	11
Historical data on incidents, problems, emergencies and disasters	10
Percentage of operations support requests closed	9
Mean time to achieve incident resolution	9
Time taken to repair per incident	9
Actual spend against budget	8
Hardware, software and help desk support, response and performance	8
Number of calls escalated	7
Network usage trends	6
Percentage number of repeat calls for the same incident	5

Results of customer satisfaction surveys	5
Percentage of problems escalated	5
Resolution times with respect to service level agreements	5
Agreed service hours, per service	5
Number of complaints and compliments	3
Percentage of incidents defined as problems	3
Total downtime per service	3
Actual availability	3
Utilisation statistics	3
Other (please specify)	3
Number of calls missed	2
Reliability compared to expectations	2

Figure 4.4 Most frequently used metrics

Twenty responses stated that they used other means to measure performance and delivery with the overlap assumed to be those who use both standardised and other metrics (Table 4.28). Of these 13 (21.7%) said they did not measure these indicators at all and 7 (11.7%) said they used other means of measuring and were given the opportunity to list those means in the subsequent open-ended question.

no to Q25, how do you measure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		40	66.7	66.7	66.7
	We don't measure or report on any of those areas	13	21.7	21.7	88.3
	We use different criteria to measure and/or report on some or all of those areas	7	11.7	11.7	100.0
	Total	60	100.0	100.0	

Table 4.28 Other means or metrics or no reporting

Participants were then asked whether they had any means of measuring the use of technology in the classroom and of the 42 responses received only 13 (21.7%) responded that they did. Taken as a percentage of all responses that means only 21.6% or around one fifth of the respondents have any method of measuring the use of technology in the classroom yet, when asked, two thirds of the group, that is, 40 of the 60 (but 66.7% of those who responded) said they could show or they felt that use of technology in classroom had increased over the last seven years with only one respondent stating that it had remained much the same (Table 4.29).

Show through metrics or think from experience use of ICT in teaching-classroom has

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		19	31.7	31.7	31.7
	Increased over the last seven years	40	66.7	66.7	98.3
	Stayed much the same as it was seven years ago	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Table 4.29 Increase in classroom use of ICT or no change

Again 32 of the cohort (53.3% of responders) stated that the introduction of the Service Desk function had positively affected the use of technology in the classroom despite the majority having no means of measuring this. There was an equal number of responses (4 each) for not applicable as no Service Desk function was implemented and the third choice which was that the Service Desk function had no effect on the use of technology in the classroom (Table 4.30). Cross-tabulating the results from the responses to any means of measuring

classroom use and showing or feeling that this use had increased over the last seven years revealed that just over twice as many (27) who had no means of measuring classroom usage thought that usage had increased as opposed to 13 who did nominate having a means of measuring usage (Table 4.31).

Implementation of SD function-process have effect on use of ICT in classroom

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		20	33.3	33.3	33.3
	N/A - Service Desk function not implemented	4	6.7	6.7	40.0
	No - no effect at all	4	6.7	6.7	46.7
	Yes - a positive effect	32	53.3	53.3	100.0
	Total	60	100.0	100.0	

Table 4.30 Effect on use of ICT in classroom

Means of measuring the use of technology in the classroom * Show through metrics or think from experience use of ICT in teaching-classroom has Crosstabulation

Count

		Show through metrics or think from experience use of ICT in teaching-classroom has			
			Increased over the last seven years	Stayed much the same as it was seven years ago	Total
Means of measuring the use of technology in the classroom		18	0	0	18
	No	1	27	1	29
	Yes	0	13	0	13
Total		19	40	1	60

Table 4.31 Means of measuring * Use of ICT in teaching perception

The final question in this set asked whether the participant thought that the Service Desk function was the primary interface between the IT team and the user to which 10 responded no (16.7%) and 27 responded yes (45%) to considering the Service Desk function and process to be the primary point of contact, between the IT team and the users (staff, students, parents) of the service they provide (Table 4.32). When asked if they required all requests to be logged 48.3% said they did while 23.3% said they did not.

Following on from this they were asked if the IT staff ensured that all requests were logged to which responses were evenly divided between yes and no with 21 (35%) in each category (Tables 4.33 & 4.34).

Think SD function primary interface between the IT team and users

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		38	50.7	50.7	50.7
	No	10	13.3	13.3	64.0
	Yes	27	36.0	36.0	100.0
	Total	75	100.0	100.0	

Table 4.32 Service Desk as primary interface

Require all requests to be logged

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		17	28.3	28.3	28.3
	No	14	23.3	23.3	51.7
	Yes	29	48.3	48.3	100.0
	Total	60	100.0	100.0	

Table 4.33 Respondents requiring all requests to be logged or not

Do IT staff ensure all requests are logged

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		18	30.0	30.0	30.0
	No	21	35.0	35.0	65.0
	Yes	21	35.0	35.0	100.0
	Total	60	100.0	100.0	

Table 4.34 Do all staff ensure all requests are logged or not

4.7 Organisation demographics and characteristics

As noted, of the 60 participants, 56 (93.3%) were from a non-government, that is private, faith-based or non-denominational school or a combination of these classifications (Table 4.35) with 50 (83.3%) of these schools in NSW, 7 in other Australian states (ACT, SA, TAS, QLD) and one an international school (Abu Dhabi) as seen in Table 4.1. Tables (4.36 – 4.37) show the distribution of school types and student class levels offered.

Non-Government School

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	56	93.3	100.0	100.0
Missing	System	4	6.7		
Total		60	100.0		

Table 4.35 Non-Government school

School Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		30	40.0	40.0	40.0
	7-12	11	14.7	14.7	54.7
	K - 12	32	42.7	42.7	97.3
	K - 6	2	2.7	2.7	100.0
	Total	75	100.0	100.0	

Table 4.36 School levels

School Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		35	46.7	46.7	46.7
	Boarding	1	1.3	1.3	48.0
	Day	16	21.3	21.3	69.3
	Day and boarding	16	21.3	21.3	90.7
	Other	7	9.3	9.3	100.0
	Total	75	100.0	100.0	

Table 4.37 School Types

The average number of staff members was 258.4 with the median value being 150 and the mean number of students was 1,437.3 with a median value of 1100 (Table 4.38). For users supported the mean was 1,443.1 with a median value of 1200 and for servers (physical and virtual) supported the mean was 59.1 and the median was 46 (Table 4.39).

Statistics - Staff and Student numbers

		Staff numbers	Student numbers
N	Valid	57	57
	Missing	18	18
Mean		258.40	1437.32
Median		150.00	1100.00
Std. Deviation		295.64	1743.61
Range		1697	13500
Minimum		3	0
Maximum		1700	13500

Table 4.38 Staff numbers

Statistics – User devices and servers supported

		User devices supported	Servers supported
N	Valid	58	57
	Missing	17	18
Mean		1443.19	59.12
Median		1200.00	46.00
Std. Deviation		841.85	52.82
Range		3995	294
Minimum		5	6
Maximum		4000	300

Table 4.39 User devices and servers supported

Thirty-two responses were received equally to the questions on the topic of annual IT budgets. The mean operational (OPEX) budget was $703,624.78 and the median value $550,000.00 per annum (Table 4.40). There was a greater range in the reported annual capital budget provisions (CAPEX) ($2,495,000 as opposed to $1,990,000) with the mean CAPEX budget being $520,937.50 and the median amount $300,000.00 per annum (Table 4.41).

Statistics – Annual OPEX budget

Annual IT budget-OPEX (unit = $)

N	Valid	32
	Missing	43
Mean		703624.78
Median		550000.00
Std. Deviation		575358.75
Range		1990000
Minimum		10000
Maximum		2000000

Table 4.40 Annual operational IT budget

Statistics – Annual CAPEX budget

Annual IT budget-CAPEX (unit = $)

N	Valid	32
	Missing	43
Mean		520937.50
Median		300000.00
Std. Deviation		546415.65
Range		2495000
Minimum		5000
Maximum		2500000

Table 4.41 Annual capital IT budget

All the respondent group answered the question regarding the number of staff members in the IT team. These responses ranged from 1 to 30 with a mean of 7.2 staff and a median of 6 (Table 4.42). For those who had staff dedicated to user support alone (93.3%), the median quantity of dedicated staff numbered 3 people with an average of 3.7 staff members in a range from 1 dedicated staff member to 24 staff members dedicated solely to user support (Table 4.43). This latter value is quite extreme, as the next highest was 10 staff, was not considered an outlier and removed as it represents useful data once interpreted

in view of the total team size, which was also 24 staff, thus implying no specialisation of IT staff, at least in the area of user support.

Statistics – numbers of IT staff

How many IT staff

N	Valid	60
	Missing	15
Mean		7.192
Median		6.000
Std. Deviation		5.2514
Range		29.0
Minimum		1.0
Maximum		30.0

Table 4.42 Numbers of IT staff

Statistics – number of staff dedicated to user support only

Yes to Q8 how many staff dedicated

N	Valid	56
	Missing	19
Mean		3.73
Median		3.00
Std. Deviation		3.222
Range		23
Minimum		1
Maximum		24

Table 4.43 Number of staff members dedicated to user support

Finally, non-parametric correlations were performed on the numeric variables to see if there were any patterns observed within this purposive sample. Expected relationships were noted between variables such as the number of IT staff in the team and the number dedicated to user support; between IT team size and OPEX budget and between staff and student numbers as would be expected. However, there was a stronger correlation between staff numbers and

number of devices supported and staff numbers and IT team size than with student numbers or budgets (Figure 4.5).

Spearman's rho		How many IT staff	Yes to Q8 how many staff dedicated	User devices supported	Servers supported	Staff numbers	Student numbers	Annual OPEX	Annual CAPEX
How many IT staff	Correlation Coefficient	1	.781**	.654**	.660**	.789**	.690**	.722**	.631**
	Sig.(2-tailed)	.	0	0	0	0	0	0	0
	N	60	56	58	57	57	57	32	32
Yes to Q8 how many staff dedicated	Correlation Coefficient	.781**	1	.632**	.612**	.737**	.647**	.710**	.679**
	Sig.(2-tailed)	0	.	0	0	0	0	0	0
	N	56	56	54	53	53	53	31	31
User devices supported	Correlation Coefficient	.654**	.632**	1	.627**	.818**	.753**	.474**	.437*
	Sig.(2-tailed)	0	0	.	0	0	0	0.006	0.012
	N	58	54	58	56	55	55	32	32
Servers supported	Correlation Coefficient	.660**	.612**	.627**	1	.506**	.412**	.651**	.613**
	Sig.(2-tailed)	0	0	0	.	0	0.002	0	0
	N	57	53	56	57	55	55	32	32
Staff numbers	Correlation Coefficient	.789**	.737**	.818**	.506**	1	.737**	.563**	.535**
	Sig.(2-tailed)	0	0	0	0	.	0	0.001	0.002
	N	57	53	55	55	57	57	32	32
Student numbers	Correlation Coefficient	.690**	.647**	.753**	.412**	.737**	1	.582**	.552**
	Sig.(2-tailed)	0	0	0	0.002	0	.	0	0.001
	N	57	53	55	55	57	57	32	32
Annual OPEX	Correlation Coefficient	.722**	.710**	.474**	.651**	.563**	.582**	1	.685**
	Sig.(2-tailed)	0	0	0.006	0	0.001	0	.	0
	N	32	31	32	32	32	32	32	32
Annual CAPEX	Correlation Coefficient	.631**	.679**	.437*	.613**	.535**	.552**	.685**	1
	Sig.(2-tailed)	0	0	0.012	0	0.002	0.001	0	.
	N	32	31	32	32	32	32	32	32

**. Correlation is significant at the 0.01 level *. Correlation is significant at the 0.05 level - (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level - (2-tailed).

Figure 4.5 Nonparametric correlations

In conclusion to this section, a demographic profile of the typical MITIE IT Manager and organisation can be presented. This is a male in the age range 34 - 49 who has an IT background. He manages an IT team of six, three of whom are dedicated to user support, along with budgets (CAPEX and OPEX) of approximately half a million dollars per annum each. He and his team support 46 servers and 1200 users and work in a private school in NSW alongside 150 staff and 1100 students. He has not only heard of ITIL but is most likely to have an ITIL qualification or studied ITIL and have an ITIL - based Service Desk function and process in place which is delivered via a commercial software package. The Service Desk process will doubtless be the only ITIL framework process implemented and he is more likely than not to believe that use of technology in the classroom has increased over the last seven years but probably does not have any means of measuring that usage.

Qualitative analysis

The dataset was imported into NVivo in its entirety and the data and meta-data examined during the import process to ensure the correct sorting of closed and open-ended response data under case classifications and nodes.

The case classifications were then reviewed and where there was a related structured free-text question, they were evaluated together to see if this enriched the descriptive analysis performed in SPSS. Following on from that successive cycles of coding were carried out on the open-ended responses classified under a node for each question. The initial cycle consisted of reading the information

contained in the open-ended responses repeatedly, question by question and respondent by respondent, to gain a broad as well as a deep view of the data. From this first level of coding label, names were created to sort the responses into similar groupings in an iterative process. As this data was explored, emerging patterns were created as individual nodes so that all instances of the category detected could be grouped under each thus identified and then organised into thematic nodes. The second level of coding undertaken was to analyse the relationships between the nascent themes which revealed that the data had more structured responses directly correlated in many instances with the research questions. Consequently, the findings were then coded to categories and themes under each question topic rather than being separate entities, necessitating a re-arrangement of categories and themes. This created a more logical structure from which overarching nodes were created for each of the research questions and themes thereafter developed could be grouped by research question for further analysis and reporting. This also made exploring any correlation between themes and both strands of enquiry more straightforward. This whole process was then repeated to test the validity of the researcher's choices of code names, categories and the derived themes.

Triangulation was demonstrated by the use of multiple methods to provide and test cross data consistency, an approach increasingly attracting credibility as each method gathers differing aspects of empirical reality and social perceptions and their combination offer a means of explaining complementary aspects of the phenomenon being studied (Patton, 2015).

The data were checked for consistency within responses across the entire data set which spanned a reasonably extended period, however, the main instrument of triangulation was testing for consistency when the mixed methods integration analysis was executed. Where pertinent, response rates and top layer coding results were quantified to demonstrate relative importance and representation across the group. The focus of the open-ended questions was to stimulate meaningful commentary and opinion on the Service Desk process in the respondents' organisations, so the questions used wording designed to encourage participants to be comfortable giving answers about their feelings and perceptions.

Many questions started with the words 'Do you think or feel' while others explored impartially whether there were any measures in place to authenticate the opinions presented. Broadly the questions were grouped into those exploring further the attitude towards an ITIL based Service Desk and user support generally including measurement, use and avoidance and those pertaining to frequency of use of classroom technology and factors affecting this. No questions were mandatory with participants able to skip any question they wished. The findings are reported here in three topic sets under the broad grouping described above. These are in order of reporting; those pertaining to the Service Desk function and processes, those related to the use of metrics and technology use and those concerned with feelings and perceptions.

4.8 Service Desk Function and Processes

From the quantitative findings, we can assume a 78% penetration of an ITIL-based Service Desk function within the organisations in the data set with very few having in place, or using, any additional ITIL processes. With such a dominant focus on one function that is one of several other related functions and processes within one of the five core ITIL publications, findings connected with the drivers for the implementation were particularly pertinent to the analysis of the perceptions of the effect and use of the Service Desk function. There were many responses to this question (36) which, when examined, revealed three main themes; ICT Service Improvement; ICT Support Feedback and Perceptions and Growth or Change. A common thread in the Growth and Change theme was either the establishment of a one to one laptop programme or the increase in devices to manage due to the DER fund injections. Comments such as "*Evolution and expansion of network from a largely desktop environment to one of mixed desktops and laptops (esp. with the injection of Rudd govt money designated for a 1:1 "solution"*)" and "*starting a 1:1 program due to DER funding*" typify these drivers for a Service Desk process.

The theme of ICT support feedback and perceptions was well represented as one of the two key drivers of implementation along with ICT Service Improvement and often these two themes were intertwined within a single response as was the case with the following comment; *"Possibly the drivers were to increase efficiency and provide transparency of issues, allow improved*

workflow management and to help address trends or groups of issue types."

Improved, better, enhanced, need, transparency, accountability, efficiency, log, report, feedback and customer service among were the initial label names that presented again and again in the respondents' answers in both themes though some comments were more plainly stated in the ICT Support Feedback and Perceptions theme, - *"feedback from the College community in regards to ICT support", "Customer dissatisfaction", "'happy customers'", "stopping the who yells loudest getting the attention.",* as these exemplars demonstrate.

Within ICT Service Improvement there was a definite emphasis on the logging, tracking, prioritising, and reporting of requests along with the need for a better, improved, and consistent approach to support. For example, *"Keeping track of service requests and managing them effectively"*. Only a handful of respondents mentioned more ITIL focused reasons such as a '*structured framework*', '*higher availability', 'improve our processes', 'asset management*' and *'incident management'*. Leading on from this, the next topic was concerned with teasing out further the participants' deeper opinions of an ITIL based Service Desk by posing the hypothetical 'greenfield' implementation scenario in which one has a clean slate to deploy and implement a completely new and clean IT organisation and infrastructure from the ground up. Whilst this is something most IT Managers will never be fortunate, or perhaps in the view of some, unfortunate enough to enjoy, it does cause reflection on the systems and strategies a manager both is familiar with and believes are the best employed to deliver IT services. There were three items within this set of questions in which respondents were asked to nominate yes, they would implement an ITIL-based

Service Desk in a green field environment and why they would do so; or to nominate no, they would not and why not; and finally, if they responded no, what they would do instead of ITIL. The greatest quantity of responses was received to the yes question (32) and which reduced to two main themes categorized as Generic Benefits and Best Practice.

Generic Benefits was a more developed theme but as the name implies comprised a collection of imprecise statements such "*Yes. The structure is a must for a site of our size. It would provide us with many benefits", "Yes, because long term it's a better option as we grow" and "To give robustness to our processes.".* A few answers were a little more specific; *"clear tracking of service requests, transparency, reporting", "better understand and tracking of issues", "quality assurance"* and *"The BECTA's FITS manual is GOLD and I would recommend it to anyone starting from scratch",* while an interesting counterpoint was detected in comments such as the following:

Generic benefits - counterpoint
"It's always to begin as you intend to continue - no prejudices to overcome, no bad habits to break for staff and users."
"I think ITIL works for most processes, but the nature of schools requires that sometimes we step out of it."
"Set the ground rules and establish an appropriate service culture from the outset"
"Because it would save re-inventing the wheel. Although we'd need to make changes to make it appropriate for our environment."
"it's easier to start early, then get people used to one system and change part way through".

Table 4.44 Generic Benefits

These comments were judged to be indicative of an acceptance of an ITIL Service Desk as the default without any rationale for that acceptance, so these were also classified to the overarching theme of De Rigueur. Of interest and possible relevance to the area of perceptions was the notion of ground rules and bad habits and getting people used to a system from the outset as were the comments of needing to retrofit ITIL to suit a school environment.

The other recurrent theme though less represented was the assessment of ITIL being Best Practice given as the reason why one would use it in a greenfield implementation. Here the comments were suitably standardised around the same few descriptors and phrases; *'best methodology', 'Best Practice', 'an excellent framework', 'ITIL foundations is good', 'Best practices that are proven', 'high quality product that has a good reputation', 'most common, most practical ways', 'Better, known process', 'common standard'.* Once again, these comments were thought to be suggestive of acceptance of ITIL as the De Rigueur methodology for IT Service Desk at the very least and seemed to be indicative of a lack of questioning of its suitability to the individual aspects of the potential environment and user base. None of these responses applied this opinion of ITIL Service Desk to the practical implementation by stating, for example, that ITIL offers proven best practice, therefore, providing a widely-accepted framework on which to base IT service delivery and making it easier to deploy and support. For those who answered in the negative two main ideas emerged. These were that ITIL did not fit their environment or the putative greenfield environment and that ITIL was too large, complex and took too

much time. This last concept, time, re-appears again and again as a fundamental issue woven into the responses to many of the survey questionnaire topics. In this context, however, time was related to the perceived size and complexity of implementing a system such as ITIL in environments that did not warrant it or have the resources.

The responses for those who selected Other as the follow-on to their negative opinion on ITIL for a green field implementation all said they would just keep doing what they currently do though what this is was not specified apart from the mention of a wiki, presumably to provide a web interface for help desk requests. Each of these responses fitted into one primary theme of ITIL being Too Large, Complex and Time-Consuming for the SME environment as shown by these comments:

Too large, complex and time-consuming
"Extra time taken to record the detail required for the system to be useful";
"full Itil is too large for small school teams to fully utilise.";
"No, for a school based environment";
"For us - with low staff numbers where we are run so hard we wonder how long we can do it - the full ITIL would take too much time I think"
"No, time and budget considerations";
"No, it has been looked at and found wanting".

Table 4.45 Too large, complex and time-consuming

Re-examining the responses from those who said they wouldn't use an ITIL based Service Desk in a green field implementation only one had any form of ITIL qualification and that was classified as 'other ITIL' and four either answered no or left blank the question as to whether they had implemented an ITIL based Service Desk with two replying in the affirmative and one intending to implement. Therefore, it may be lack of information or experience with ITIL that leads them to discount its use, judging it by perception rather than knowledge of the framework, as no other relationship was discerned between this negative response and any other variable.

As these responses were in the minority it can be agreed that most participants used an ITIL-based Service Desk and would implement one if they had the opportunity, so the enquiry turned to examine the adherence to the processes of the Service Desk function. This included logging requests, beliefs on its role as the primary interface (point of contact) between the IT team and those they support (Tiong, Cater-Steel, & Tan, 2009), avoidance of the Service Desk function entirely as well as its role in the overall use of technology.

The basic issue of requiring all ICT requests and incidents to be logged in the Service Desk system is fundamental to its operation and was broached in two parts. A good response rate was returned to the question, 'Do all IT staff ensure requests are logged – why or why not?' with over half the participants choosing to answer. Just under a third returned a confirmatory comment and the remaining two thirds, twenty individuals responded in the negative.

For those who said that the IT staff made sure all requests were logged the reasons fell reasonably equally into three main categories. One was some variation of *"I make them or else they get a 'talking' to about it".* Another was due to the need to justify their jobs or staffing levels; "*so that we can track metrics to report to management*" along with "*Management are interested in helpdesk load vs staffing to see if cost savings can be made. Therefore, everything we do gets logged to validate our workload and staff numbers*", also *"by having ticket tracking logged and visible to management, the agent would be highly secured and appreciative with end user satisfaction score."* and "*because it will help when budgets are created and if we need and extra person it will show load"* while the third category was related to using the Service Desk software in its intended manner and for efficiency. In the negative response group, the theme of Time once again stood out with over half the comments related to logging requests taking or being perceived to take too much time when it was often quicker just to fix the issue, or the team was too busy to take the time to ensure all requests were logged.

Other themes teased out from these comments were those to do with organisational culture and belief in the value of the system and logging requests. Respondents commented on the perceived lack of value of systematic logging (sometimes labelled as 'apathy' or 'lack of discipline'), a culture of quick fixes and responding to being grabbed while out and about or phoned directly and responding along with statements that not all requests are worth logging, for example replacing a broken network patch cable.

Examining these comments more deeply one sees a common theme which is a Lack of Commitment to the Service Desk function, whether through perceptions of the value of the system to their situation or whether due to lack of ITIL knowledge and experience.

This lack of commitment manifests as thinking it takes too long to log all requests even retrospectively, or that some things are better fixed quickly then and there and do not deserve to be logged which negates one of the principles of the Service Desk function which is to serve as a mechanism to have reportable measures to improve service delivery and underpin problem resolution, not just incident management and workflow alone. When there is little-perceived value in or commitment to a system or process then it not surprising that there is also little time commitment to using the system as it is intended as is shown in these examples:

Lack of commitment
"not everything is worthy of spending extra time writing it down. Eg: Network cable came out of PC because of broken patch cable clip. replace the cable. too easy and a waste to record the detail in electronic system that has no further benefit by including it in there."
"Not all service requests require logging, e.g. password renewal, toner replacement, power outages due to tripped circuit breakers, etc."
"possibly apathy, possibly lack of understanding of benefits. Established culture probably plays a part. Perceived additional time taken to log requests is also a disincentive."
"Lazy - they still don't see the value.. not sure which."
"Sometimes it is a 2 second fix that would take longer to create a log about it."

"Quick fixes from walkups, some phone calls or grabbing an ICT team member when they are out & about, don't need to be logged."
"Not everyone is as committed as they could be"
"Mainly time or lack of perceived value in logging."

Table 4.46 Lack of Commitment

Participants were also asked if they required all requests to be logged by their team members (48.3% said they did while 23.3% said they did not) and then those who answered no were asked to expand on why not. Once again, the twin themes of time and personal interaction were detected with comments repeating ideas surfaced in other questions. Too busy or not enough staff, routine jobs quickly fixed as logging would take longer than fixing so it was more *"efficient"* not to log were among the reoccurring instances of the Time theme while one aspect of the personal interaction theme was also the time it took to try to get users to log their requests and how many were too busy to do so. Other concepts detected within personal interaction was again the benefit of face to face interaction but also the issue of people actively avoiding using the Service Desk system and seeking out interaction via phone or in person. Some of the rationale for this given was that they found it too hard to use the system or they had no faith in the system *("Too busy, need help now, no faith in getting a timely response"*) or their request was urgent, or they were too important *("Also if the boss rings we jump - yes I know it shouldn't be that way but it is!")*.

In view of the responses to this central question of logging all requests it was not surprising to find that most of the respondents when queried on their thoughts about the Service Desk function being the primary interface or point of contact between themselves, their teams and the organisation's users were ambivalent. A bit less than half the responses agreed that it was the primary interface but many of these were qualified so were coded into other categories also these being either Multiple Interfaces or the majority category of Person to Person which attracted twice as many references as Service Desk as the primary interface. There were half a dozen decisive comments on the Service Desk interface being the main point of contact or the most frequent and where qualified these were due to the number of users to support or needing a structured approach as shown in the comments below.

Main Interface
"It has to be the focus otherwise there is no structured approach to fault reporting / fault resolution and the ability to report and record on issues which in turn leads to identifying key areas that need addressing."
"If by primary you mean most frequent. Most if not all questions come to the service desk inbox or to the staff responsible."
"Regarding day-to-day help then the service desk is definitely the primary interface."
"Once this is established and if a Service Desk function is implemented then yes that becomes the primary point of contact for requests and incidents"
"It means that staff have one point of call for issues"
"Due to the amount of staff versus our IT Staff, this is the only mechanism that allows us to manage all of our users issues"

Table 4.47 Main Interface

Within the category of Multiple Interfaces comments made mention of the role of ICT integrators and training sessions as well as physical visits to the Service Desk all of which fall into the much larger theme of Person to Person as the primary interface or point of contact between IT staff and those they support, especially other staff members (teachers) but also students. Just over half of the comments coded to this theme are shown in the table below to demonstrate the extent and depth of the belief that person to person or face to face communication was the primary interface and point of contact along with some of the reasoning behind those assertions. These do not include the responses detailing the use of training or planning sessions or the functions provided by an ICT integrator role in supporting, training and liaising with non-ICT staff. Of note, even amongst those who thought that the Service Desk was the primary interface, this was not for students, as in all cases where student support is specifically mentioned it is always delivered face to face.

Personal Interaction
The amount of time my 6 Service Desk team members spend face-to-face or on the phone with staff and students is way more than I or the Infrastructure / Projects team members spend, just because of the nature of the work - despite all of us constantly getting out to as many staff as possible
Face to face contact, easy communication flow and the best and quickest method to get accurate data, a feeling for the problem to produce a quick response. Although much of the point of contact happens in hallways, lunch rooms, in the play ground and other non typical Service Desk environments.
People talking to people - either by phone or in person.
Face to face is very important
students attend a counter to get issues resolved

Schools are about relationships not just business and therefore there will always be a need for people to interact.
My role also has a large component of interaction with leadership staff to determine overall planning and strategy.
The primary interface is the people, not a system
Nothing beats face to face contact
We've gone for human interaction as the primary contact. We employ a term-time admin lady who is the friendly face of the department. Since she's been employed we're more efficient, we get told about more problems, we've consistently surveyed users and gotten increased satisfaction levels. Having that role has made more of a positive impact to our department than any of the other systems/services we've implemented.
Face to face always comes first here, emailing helpdesk comes later. The nature of a small school.
We are a school, students come face to face when wanting assistance
Just pointing users at a web page to log a request will never solve all the user vs support issues. Discussion and agreement on any operational processes is the first step and this requires face to face contact. Once this is established and if a Service Desk function is implemented then yes that becomes the primary point of contact for requests and incidents. Ongoing face to face meetings ensure that the processes are working as planned and adjustments or re-education can be made at various points.
I think "service" is definitely seen as secondary to the interaction that exists between primary IT staff (such as myself) and the stakeholders (staff and student). Assemblies, staff meetings, classroom visits, regular background visits to all extremities of the network etc. are a much more dynamic interface than the "service" function, which for some people is indeed never even needed - their hardware just seems to chug along and they remain in their comfort zone with no need to rely on "service desk" operations.

Table 4.48 Personal Interaction

Along with the recurring theme of Time, even though it has multiple modalities, Person to Person was a major theme to emerge from the qualitative findings and one that had significance for the group as it seemed to arise from beliefs about what a school should be or should offer though this was not overtly stated except in a couple of instances as above. Time as a theme was also found to be entwined with Person to Person as often 'time' as in *"don't have enough time"* or *"it takes too long"* were reasons given for avoidance of using the Service Desk function.

Avoidance of the Service Desk process query, presented in three parts, attracted a good number of responses. To the first part of the question; Yes: How many and how often, 26 responses contained a variety of labels to quantify how often their users tried to bypass the system. Whilst not quantitative measures these are listed to highlight the substantial numbers who avoid using the Service Desk system: from *"all of them, a significant number, very frequently, frequently, regularly"* to more numeric measures such as percentages (*15 -20, 20, 25, 30, 50%*) to numbers (*5 -10 a day or a week 30 a month, 20*). This is quite a significant finding which impacts clearly the value of using a process driven system to manage, measure, report on and improve service delivery as well as providing insight into the perceptions and acceptance of such systems.

The second part of this question asked how they handle these requests that bypass the Service Desk system and the users who try to avoid the Service

Desk process. A response was received from all who answered the first part of the question. These were coded into four common managing strategies.
The most popular category was named Reminders which included training and re-training along with requests to log the job before the team could action it. There was still a focus on completing the request anyway but always with a request or reminder to log the request retrospectively or next time or an offer to log it with the user, which overlapped slightly with the next most frequent response category. This was labelled IT Team Log Job which as its name implies contained the repeated comment that the IT staff logged the request in the system for the user and this was only sometimes accompanied by an email (cc) to the users as a passive way of reminding them about the proper process.

Whilst there was overlap between these there was a definite difference in that the priority in the first category was to remind, prod or train the user to log the request first whereas the second group were more passive and concerned more with ensuring the request was in the system and only sometimes emailing or carbon copying the user as a gentle nudge to follow the process next time. The last two categories of strategies, both with lower response rates, were Just Service Request as in just resolve it regardless of whether it was logged or not and finally, a few made of sterner stuff who replied that they deprioritised or refused jobs not logged through the Service Desk process/system.

Finally, the respondents were asked if they tried to minimise requests that bypassed the system and again a response was received from all who had

answered the first two parts. As could be expected overwhelmingly the response was Yes, they do (85%) however only a few elaborated beyond those restating tactics described in the previous comments; emails to staff, reminders and attention to timely responses to logged request to make using the system more attractive. That these tactics had little effect can be seen by the reported quantities of avoidance of the Service Desk processes and can be suitably summed up by this comment given in response to this last question; *"Yes but in most cases they avoid the help desk".*

The concluding topic in this set of questions explored the participants' views on the role of the Service Desk function in increasing innovation or use of technology and the ways it had affected technology usage in the classroom. Respondents were asked to choose yes or no to the question of the role of the Service Desk function and then elaborate on the reasons behind their choice. Considering the findings so far it was interesting to see that there were more than twice as many responses to the affirmative question, 'Do you think that the role of the IT Service Desk is to increase the use of technology or help users use technology better or in more innovative ways - Yes. Please comment' than to the negative question, with response rates of 25 and 11 respectively. Reasons for thinking that the Service Desk role was to impact positively on the use of technology or to help users be more effective or innovative reduced to two main themes, Better Technology and Help Users with some overlap between them as many responses contained elements of both themes. In the former theme, comments revealed that its impact was through increasing efficiency, reliability,

availability and effectiveness of technology as might be expected. What was unexpected though were the comments positing the Service Desk function as providing knowledgeable experts and exemplars of how technology could be used, raising awareness of features and helping to reduce risk and error. The selected examples below demonstrate these two views.

Better Technology	
Improve reliability, efficiency etc.	**Experts and Exemplars**
for increasing efficiency and effectiveness	*Yes, in terms of making users aware of new/updated functionalities of services, new features, processes, workflows, etc*
Yes, to improve the reliability and availability of the technology	*helps reduce risk of trying a new thing*
Improve the use of technology	*and reduce mistakes.*
Customer service and proactive approaches to ICT	*YES - IT often understand better how technology works and can therefore contribute to the overall discussion on how best to use technology or develop innovation.*
it ensures technology is functioning	*Very much so, in many ways the service desk is a repository of how technology can be effectively used and if the service desk works well, these ideas can be spread.*

Table 4.49 Better Technology

The remainder of the positive responses fell into the more generic category of Help Users whether this was by communicating new or updated functionalities or features or helping user understand technology better or training to increase

competency, the central premise was that the Service Desk function was there to help the users use technology and to use it more and differently.

Help users
This is what we are trying to achieve. Staff and students are using technology a lot already and now we are in a position to help them use it differently.
It is all of those. Service desk should not just be for break/fix but as a source of training and increasing end user competency as well
help users use tech better
Yes, in terms of making users aware of new/updated functionalities of services, new features, processes, workflows, etc
both, but more about providing people with help.
Yes to help users understand how to better use the technology, if you have enough staffing

Table 4.50 Help Users

For those (11) responses who took the opposing view, the Service Desk function was purely there to provide technical assistance, 'break/fix' support and a reliable IT infrastructure platform, leaving other specialist roles within the organisation to provide the training and scaffolding for innovation and increased usage. As an example, comments such as, *"The service desk supports the technology. End user training would achieve the above but it is not a function of the IT service desk"* and *"I see "service desk" as purely technical assistance - the rest can be left to other IT professionals"* typify this attitude.

Rounding off the views of respondents on all aspects of the Service Desk function, the closing questions asked them one, if the Service Desk function

had any effect on other uses of technology in the organisation and two, in what way had the use of ICT in teaching in the classroom been impacted by the Service Desk function.

There was three times more positive response to the first question than negative and mostly the negative responses simply returned a no or none or a variation thereof. The positive responses could be sorted into three main areas of effect; Productivity, Usage and Visibility.

Under Productivity the observations were consistent and focussed on logging and tracking of requests leading to improved service and quicker responses in turn leading to greater confidence, greater use and increased productivity. Usage, on the other hand, focussed on an increased willingness to try a greater range of technologies, such as interactive whiteboards, as an outcome of the Service Desk function though directly due to the support available via the function, as this example suggests*;*

"Yes - an effective, available, friendly and supportive service desk does encourage the use of technology in other areas of the school and they are now more inclined to use technology specifically the Business office, Alumni Relations, development (Fund raising), archives, P&F, general back office support and the executive all have increased their use of ICT as our support has improved. Although it is difficult to separate the generally higher reliability of technology from better support when answering this question." Thematically both these categories were included in an umbrella term, Confidence as it

appears that the Service Desk function regardless of the extent of adherence to its processes can engender a belief in the reliability of a system and the availability of support for its use or at least the respondents believe this to be the case.

A smaller subset of responses to this query were classified by the term Visibility somewhat similar to the Justification findings earlier in that having a Service Desk function can both provide accountability and justification to the school and management through reporting, metrics, and provision for the strategic technology goals of the school but also by providing a supporting mechanism (or interface) for IT staff and users to interact and share knowledge. Finally, any specific effects of the Service Desk function on the use of technology in the classroom were surveyed. This question attracted a good response rate (37) and quite verbose answers in some instances for this questionnaire, so was clearly an area of opinion and interest for the participants. By far the greatest number of responses (25) fell into the theme of Confidence with a refrain of reliability, availability, functioning, assurance and quicker response times being repeated over and over as is encapsulated in this representative comment*, "1. Technology more reliable 2. Issues more rapidly responded to and resolved 3. Teacher confidence based on above two aspects encourages more use of technology"*. A further 6 responses within this overarching theme of Confidence had a more specific focus on proactivity. By this, the respondents meant that the Service Desk function allowed them to be more proactive in ensuring little things were resolved before they became big

things and previously frequently re-occurring issues were identified and resolved so that they no longer arose. Making the IT team more proactive provided a more featured and reliable platform and the ability to prioritise teachers' requests thus giving more confidence in the system and the IT team. Examples of this are seen in the following table.

Proactivity
We have been able to identify areas where we required a better understanding of staffs needs. This allows us to regularly circumvent issues that arose in the past.
It has meant a more structured approach to managing users issues and provides a method to prioritise issues.
A focus on service delivery rather than technology has given our team a good reputation for meeting the needs of teachers rather than implementing technology for its own sake.
Pro active approach to allow staff to pre-book technical support
It has meant that more things get lodged I believe. Previously smaller things never really made it to us until they became big. So there is more of a proactive and collaborative feeling and that improves the functionality of the ICT items in the classroom and means smoother lessons and more excitement around using technology.

Table 4.51 Proactivity

Another three echoed the same theme but again specifically pointed to the Service Desk function potentially having an impact in the classroom by removing some of the barriers teachers have traditionally seen to using technology in their teaching. All in all, these still represent just different facets of the theme of Confidence; in the support, the IT teams, the functionality, availability and reliability of the IT systems and a belief that issues will be quickly resolved by help that is close to hand.

4.9 Metrics and measuring

Many comments throughout the data source revolved around tracking, better reporting, prioritising and other similar concepts which fall under the topic of metrics, findings on which were primarily reported in the quantitative data section. The findings reported here are the open-ended elaboration on how participants measured service delivery or performance where they had answered in the negative to using metrics and further detail concerning the methods employed to measure classroom use when the respondent had signified they had the ability to do so. From the 7 responses stating another means of measuring service delivery, service desk performance and usage, 6 elaborations were recorded on what those other measures might be, and all varied from 'number of visits to door' and 'feedback' to 'anecdotal' and 'just a feeling'. As none of these revealed any concrete measures this was taken to mean that the participants really did not measure service delivery or performance or report on it so were included in the 'we don't measure or report on those areas' statistics increasing this cohort to 24 or 40% of the respondent group.

From the group of 13 who stated they had a means of measuring technology use in the classroom 15 clarifications were received. On examination of the open-ended data, it became apparent that the extra two were elaborating on their No response and so were discounted. Of the remaining 13 the majority nominated Device or Service Statistics as how they could collect metrics related to logons and logins, use of projectors or any other network connected device such as an

Interactive Whiteboard (IWB) though as noted by the representative comments below this does not necessarily reflect the use of technology or how it is used as it largely records access.

Device statistics and logons
Usage statistics in our LMS can show this to some extent, though it tracks all access not just classroom access.
Quantitative - we use metrics on the LMS - largely not accurate.
Remote monitoring on desktops and user logins allows the generation of basic stats on whether a piece of technology is being used but at this stage not what it was used for.

Table 4.52 Device statistics and logons

The next most numerous category was labelled Communication and included feedback from staff and student, observations of lessons, meeting with teachers and reporting back from ICT Integrators all of which are clearly prone to different interpretations depending on the person involved and the reason for the interpretation. Such measures would perhaps form the basis for feelings or perceptions about the use of technology and may go some way to explaining the high percentage of respondents thinking or feeling that classroom technology use had increased.

Only four participants had a potentially quantifiable method of measuring technology use in teaching and all four used surveys to achieve this. Two just stated that they used ‘surveys’ or ‘regular staff and student surveys’ but two were more specific. One said, *“Longitudinal Study running over 5 years now”*

and the other, *"surveys of students and teachers that explicitly seek to quantify/explore ICT use in the classroom,"* both responses clearly targeted at factually measuring technology use in teaching. All respondents who said they had means of measuring classroom use also believed that such use had increased over the last 7 years.

4.10 Feelings and Perceptions

The last group of responses to be reported deals with feelings and perceptions of users and IT staff to the Service Desk function and implementation, of the users towards the IT team and of the IT team towards user support generally. Around half of the response, group offered their opinions regarding the level of acceptance and support by the IT team following the adoption of the Service Desk processes. On first examination, there seemed to be an overwhelmingly positive response, however, after re-reading several times it became clear that many of these responses were qualified in some manner.

Apart from a couple of brief comments along the line of *"Yes"* or *"Yes, supportive"* only a handful were firmly of the opinion that the IT staff had been or were fully supportive of the Service Desk process mostly due to the positive impact it had on their roles and tasks. "*ICT Staff are very supportive as it gives them a clear framework to operate under, and also provides a clear process to resolve jobs and also minimises jobs not being forgotten or handled incorrectly*" and *"It was received very well as we could all work much more*

efficiently together when we had a logical overview of what was happening. The trends that became evident allowed us to fine tune how we supplied our support service. Staff also gained an appreciation of how many tasks we deal with" are typical of those comments. Qualifiers, on the other hand, clustered around language such as; *"resistance", "not at first", "after", "once" "training", "slow", "in the main", "not followed through", "waste of time"* and *"mostly"* building the picture as shown by bold highlights in the multiple comments below, of an eventual tolerance of the function and even a theoretical understanding of the benefits combined with resistance to always following the processes.

Qualified acceptance – tolerance – of Service Desk function but not processes
*in every firm you'll face a **resistance** from group of members specially when it comes to **change** in process or the way they used to complete their tasks, At this stage it's the management task to drive the change and freeze the old process behaviour*
***Not at first, but after** being sent for some training and there was general agreement within the department that it was something worth doing, then it gradually got traction.*
*positive. sometimes **resistance due to time demands***
*Some key staff have **not followed through** with actions - **following processes** in a disciplined way.*
*but when it comes to **being so disciplined** as to record every service request correctly in WHD and follow all the associated procedures, they **will not do it as they believe that this is a waste of time.***
***In general** they understand the need but it is **not always used** in the business of the day. They have a fear of saying no and therefore to not push back when people ask them for help.*

Mostly, once *they understand the benefits to the team and themselves even though it is a* ***repetitive process that takes time.***
Yes accepting especially ***once data had accumulated*** *System is* ***not perfect*** *and is evolving*
They accepted it will ***when they understood*** *the need to track and report on jobs.*
great, just ***taking a bit of time*** *to ensure he updates the ticket and the time spent.*
The Service Desk processes are firm, but ***not mandated****. We recognise that in a real-world situation where IT have limited resources we need to be flexible and respond accordingly. IT staff are very supporting of the process and* ***believe in the benefits*** *of have structured processes. The flip-side is we* ***don't have complete visibility*** *of all work coming through the service desk.*
In general*, yes, it was received in a supportive way.*
Very supportive of the process, but ***slow in recording their time*** *spent on tasks and* ***concluding job recording***
good ***- but still habits*** *of phone calls = no ticket*
Initially *supportive*

Table 4.53 Qualified acceptance of Service Desk function but not processes

The next area to be explored was the acceptance and support for the Service Desk function and processes by the non-IT staff, the users of the technology service provided by the IT team. This was asked as a two-option question with respondents choosing either Yes or No and providing commentary or expanding on the reasons they believed this. There was a slightly greater response rate for the negative choice (24 to 22) and examination of the positive responses revealed half a dozen qualified responses *("in general"* or *"generally*" or *"most"* or *"in principle"*). Amongst the affirmative comments, the common thread was acceptance of a structured and equitable system where there was some visibility of the progress of requests and a vehicle for

communication between the user and the IT team. There were two stating that the function was accepted but the processes still often bypassed or resisted. This theme of Avoidance was very apparent when examining the comments from those who answered No rather than Yes to the question 'Are all the users supportive of the Service Desk processes for obtaining support and assistance?'. The reasons behind the avoidance of using the support logging processes and thereby the basis of the lack of support from the users for the system were repetitions of the findings from the questions directly related to users going around the system. Once again, the processes were judged as "*bureaucratic*" and "*an unnecessary annoyance*", taking too much time either to log the request or longer to resolve the issue than previously. Others said some users thought they were too busy or preferred or found easier, person to person communication via phone or face to face.

Another idea to emerge strongly from these comments was the notion of 'self-importance'. Numerous comments made mention of executives or VIPs or individual staff who liked to "*jump the queue*" or approach the IT Manager directly and in person or "*prefer to do things their way*" and so chose to ignore the service desk processes perhaps thinking "*they get better support in person, they can demand they get help now*" or as one respondent succinctly stated: "*Most teachers can't be bothered with such things ..... email, phone or drop in is easier and quicker*".

Finally, the thoughts of the group on whether the Service Desk process had any impact on the users' perception of the IT team and the service they deliver and as a counterpoint, their feelings about supporting users were explored. The question, 'Do you think or feel that the users' perceptions of the IT service you deliver and of the IT team in general was or is impacted at all by the Service Desk process' garnered the greatest response rate (44 responses) of any of the open-ended questions. There was an even distribution of responses between those asserting a positive impact and those a negative or neutral one. A great number of the positive responses, unfortunately, did not elucidate the basis for their belief often just responding with "*Yes, in a positive way"* and similar wording. For those who did expand on their choice the rationale most often given for improved perceptions centred around the visibility inherent in logging requests and the perceived improvement in response times, communication and lessening of *"forgotten"* requests. As one respondent put it, "*they change their opinion after they receive a good experience using the service desk process*". Over time it appears these experiences lower frustration and build confidence in the eventual resolution of user issues leading to the IT staff being held in higher regard as these comments reveal; *"Yes I think there is a growing perception (and appreciation) of the way the IT staff deliver assistance …. The "satisfaction" factor is real, not imagined"; "Yes it improved user perception over time"; "Staff have a high regard for the Service Desk and staff"*. Countering this viewpoint were an equal number of responses that articulated a neutral or negative impact on user perceptions. Once again there were several brief responses, *"No", "Not really"* and a couple of interesting ones in that

vein, "*I doubt they care" and "I don't think users realise we even have a service desk process. They don't think about it*". Other participants explained the basis for their opinion, central to which was primarily the user perception that the Service Desk processes meant it took longer than previously to resolve their issues; was too bureaucratic and was a "*bucket*" into which jobs were put "*and never get looked at".* As one participant stated: "*Any IT service desk creates a feeling of distance between IT and the users*".

To close, the participants were asked for their views on user support in general and ITIL particularly and as this was the last question of the questionnaire, it might be expected that the response rate might be low or the comments perfunctory, but this was not the case. Half the total response group answered and contributed some lengthy comments. Appraising the comments around the subject of ITIL first, opinions were only slightly more weighted towards a positive estimation than towards a neutral or negative stance. Those who took the latter view offered the following reasons for their feeling; ITIL was more suited to large organisations and needed modification to fit the culture of school or SME environment; ITIL had a lot of overheads financially, time and resource wise, needed uniform adoption and support and was too process driven meaning it was easy to get lost in the system to the detriment of truly supporting the users. These reasons and the rich information contained in a lot of the comments to this question is aptly shown by the following comment from one participant; *"ITIL/FITS is very difficult to implement when a different culture of support is already in place - staff will agree that it is a great idea,*

then keep doing what they have always done. ITIL requires users to buy in too - especially senior leaders in the school (my experience is that they will often say that there is one system for students/teachers and expect another for them) Using the metrics from ITIL data stored in our help desk data base is a great idea, but sometimes the time taken to extract that data and make meaningful sense of it is too long given other priorities…. Checking by service desk staff for support requests until late in the night is common amongst dedicated staff".

From those who had a positive view of ITIL, some were lukewarm or qualified in some way, for example, *"Great in the early days"* and *"Overall though it provides a good system"* but the remainder were clear about why they thought ITIL was worthwhile. This position was based upon ITIL being a good approach, tool or framework that allowed for the collection of data, better tracking and scope for service improvement. Remaining comments focussed on ITIL providing an established best practice set of standards for a relatively young profession and that was often already integrated into service desk software:

Best practice
ITIL is Best Practice
ITIL define quality of service and standard for IT sector which still in need for rules and standards .IT is 40 Y old only and still got lot of gaps to fill comparing with other industries.
ITIL provides a well documented, and thought out method to provide that support. Why reinvent the wheel when ITIL/FITS is already there and integrated reasonably well into packages like WHD.

Table 4.54 Best practice

The comments pertaining to user support, in general, were more nuanced however and perhaps the only overarching theme detected was that user support was not an easy job, people matter, and no system provided a perfect solution. That being said, two recurring viewpoints were detected amongst the responses clustering around the classifications summarised as technology and people. Within the former the thrust of opinion was the essential nature of the role of user support to the use of technology in schools whilst the latter and more numerous category comments revolved around the importance of human interaction, building trust and confidence in systems and IT staff and the role and resourcing of IT support staff. Both areas are encapsulated by this remark, *"Good support is critical to a successful program in any school Provided an ICT system is reasonably reliable, people skills trump technical skills for service desk staff every time Failure to adequately fund a suitable physical service desk sends a bad message about the schools view of technology".* Surprisingly there were few negative comments about the users themselves and those, bar one, focussed on training primarily, *"Users are patient, but need more training in IT things, basic skills are missing"* and only one respondent among all the collected responses replied with a stereotypical IT help desk type comment, "*users continue to amaze me with their inability to follow simple instructions and the endless stupidity they cheerfully bring to the workplace".*

Mixed-methods interpretation

This study was classified as being a mixed-methods convergent parallel design with a significantly more qualitative than quantitative perspective. It had a primarily exploratory objective seeking to provide, if not answers, then at least, elucidation of the research questions. Following the two separate strands of analysis inferences made based on the results from each strand were integrated with the aim of interpreting further the qualitative findings by examining the influence of the quantitative results and descriptive statistics. This phase of the data analysis also provided for triangulation using multiple methods to provide and test cross data consistency as the survey was designed to ask in some instances both closed and open-ended questions on the same topic thus intentionally gathering quantitative and qualitative data in support of triangulation (Patton, 2015).

4.11 Strand synthesis

The integration of the two parallel streams of analysis was performed within the bounds of certain parameters with the extent of convergence of both sets of findings and how each strand helped to more fully explain findings from the other at the forefront. During the interpretive analysis, quantitative and qualitative findings were cross-tabulated looking for a relationship and qualitative themes were also related to quantitative variables when appropriate.

Findings were compared, contrasted, and combined to build on each other and produce conclusions that gave a deeper understanding of the research topic.

First, quantitative and qualitative questions in the survey questionnaire that were asked on the same subtopic were examined together to tease out potential relationships or suppositions then all the text was reviewed alongside the quantitative variables to see if they were influenced by anyone or set thereof. Consistency across the two strands was demonstrated through the evaluation of these topic-related quantitative and qualitative questions supporting triangulation. Reviewing responses across the entirety of an individual participant's closed and open-ended responses likewise showed consistency with only one apparently inconsistent comment though potentially just not understood in context. As this was in the response to Professional Background – Other it was judged to have no relevance.

Merging the quantitative results with the qualitative findings started with looking for any trends across the topic areas possibly representing factors that might influence the perceptions expressed by the cohort. This was key to legitimising the findings and to exploring the factors that might play a part in unduly impacting the open-ended responses so that the research question could be evaluated for validity across the entire respondent group and thereby the broader purposive sample rather than limited to certain subsets of the group. As part of the demographic descriptive statistics, participants were asked about their professional background and given three choices plus an 'Other' option.

Every respondent nominated one of the three categories, Business, Information Technology, or Teaching, but15 respondents also filled in the ‘Other’ category as well and provided 15 different individual responses which largely revolved around IT qualifications or teaching subjects. Of those, slightly more than half (~53%) had nominated Teaching as their professional background and their secondary responses centred around expanding on their IT/computing and business experience or qualification. Slightly less of those who elaborated (40%) had chosen Information Technology as their primary professional background and their comments revolved around educational experience. Only one primary Business category responded to the Professional Background - Other question with a response detailing some IT background experience. From this researcher's perspective with over 20 years in IT and around 15 of those in schools/education, this appeared to represent a form of justification for these respondents being in an IT-focussed role in an educationally based organisation as initially these roles were filled by teachers (often from a Science or Maths area) but gradually they have been replaced by mostly IT professionals as the quantitative results confirm. This would seem to suggest a perceived need for justification for some IT Managers (as all had nominated Manage rather than Team Member for their role in the IT team) regarding their 'fit' for their role in an educational environment, either demonstrating necessary technical expertise to manage IT or the necessary pedagogical understanding to deliver IT services in a school environment. That 15 responders felt the need to expand on their professional backgrounds after easily fitting into one of the primary categories (that is none of the expanded responses show that the initial

category choice was not completely suitable) suggests that tension between these two attributes is still perceived to exist in some of the organisations surveyed or perhaps it is indicative of the possibly apocryphal suspicion that exists between IT and the user?

Examining the responses of the 8.3% of respondents who said they had used other ITIL processes currently or in the past as can be seen from the comments to the open-ended component (Table 4.44), very few (5%) were currently using or were in the process of implementing any other ITIL process. In two of these responses the processes implemented were non-ITIL related as Facilities or Asset or Event Management are not part of the ITIL core publications, leaving three respondents who had or were in the process of implementing other functions in the core ITIL Service Management publication of which Service Desk is one part. One commented that the other processes in the ITIL framework were *"beyond the abilities of a small team"* though pertinent points could be isolated from the framework and incorporated into daily use which is not a recommended practice, however this sentiment echoes many of the participants' feelings about ITIL's suitability for their environment as does the low infiltration of other aspects of the ITIL framework.

Other ITIL processes implemented currently or in the past
Facilities Management, IT Operations Control, Application Management, Event Management and Technical Management.
As one delves further into the ITIL "stack" the resourcing around, say, financial or capacity management get beyond the abilities of a small team. However, one can always pick the pertinent points out and try to accommodate them in day-to-day practice.
Change Management Configuration Management Service Desk
Service Desk Incident Management Service Continuity Change Management
Service Desk, Change Management, Incident Management, Service Request, Service Catalogue
Asset management goes hand in hand with service desk. Change management is in process of being implemented.
CMDB & other change management stuff at a previous job in a University support desk. IT organization there was much more rigidly controlled due to the number of systems and users. Changes had to get approved through multiple layers.

Table 4.54 Other ITIL processes implemented

A curious cross-correlation was found when looking at Service Desk metrics, measurements of classroom usage and feelings about the degree of use over the last seven years. As reported in the quantitative findings, cross-referencing any means of measuring classroom use and showing or feeling that this use had increased over the last seven years revealed that just over twice as many (27) who had no means of measuring classroom usage thought that usage had increased as opposed to 13 who did nominate having a means of measuring usage (Table 4.55).

Means of measuring the use of technology in the classroom cross-tabulated with Show through metrics or think from experience use of ICT in teaching-classroom has increased

Count

		Show through metrics or think from experience use of ICT in teaching-classroom has			
			Increased over the last seven years	Stayed much the same as it was seven years ago	Total
Means of measuring the use of technology in the classroom		18	0	0	18
	No	1	27	1	29
	Yes	0	13	0	13
Total		19	40	1	60

Table 4.55 Means of measuring classroom use correlated with any increase in ICT use in teaching

Performing further cross tabulation on the use of metrics to measure Service Desk performance or service delivery with showing or feeling that classroom use had increased or stayed the same showed almost exactly the opposite result with 25 who used Service Desk metrics feeling usage in the classroom had increased over the last seven years as opposed 14 who had no metrics in place. Whereas there was little difference (20 as opposed to 18) between those where IT staff ensured all requests were logged and those who did not in the feeling that technology usage in the classroom had increased over the last seven years (Table 4.56) as well as little difference (18 versus 13) between those where IT staff logged all requests and those who did not in thinking that the implementation of the Service Desk function had a positive impact on classroom use (Table 4.57) when it came to the respondents requiring all

requests to be logged there was a markedly greater difference. As can be seen in the table (Table 4.58) where a respondent required all IT requests to be logged they were three times as likely to think that the implementation of the Service Desk function had positively impacted the frequency of use of technology in teaching and yet there were only 9 affirmative responses (Table 4.59) from those who did require the logging of all requests to having any means of measuring the technology use in class (24 responses). Once again this shows consistency across the strands as the qualitative findings support the reasoning for belief in increased classroom use and impact of the Service Desk function to be based predominately on non-quantitative metric measures such as feedback, device statistics and logons (counting access not use), anecdotal communications and perceptions of improved confidence and trust in technology by the staff following a Service Desk implementation.

Do IT staff ensure all requests are logged cross-tabulated with Show through metrics or think from experience use of ICT in teaching-classroom has:

Count

		Show through metrics or think from experience use of ICT in teaching-classroom has			
			Increased over the last seven years	Stayed much the same as it was seven years ago	Total
Do IT staff ensure all requests are logged	No	16	2	0	18
		3	18	0	21
	Yes	0	20	1	21
Total		19	40	1	60

Table 4.56 Do staff ensure all requests logged cross-tabulated with ICT classroom usage

Do IT staff ensure all requests are logged cross-tabulated with Implementation of SD function-process have effect on use of ICT in classroom

Count

		Implementation of SD function-process have effect on use of ICT in classroom				
			N/A - Service Desk function not implemented	No - no effect at all	Yes - a positive effect	Total
Do IT staff ensure all requests are logged	No	16	1	0	1	18
		4	2	2	13	21
	Yes	0	1	2	18	21
Total		20	4	4	32	60

Table 4.57 Do IT staff ensure all requests logged cross-tabulated with Implementation effect of Service Desk on classroom usage

Require all requests to be logged cross-tabulated with Implementation of SD function-process have effect on use of ICT in classroom

Count

		Implementation of SD function-process have effect on use of ICT in classroom				
			N/A - Service Desk function not implemented	No - no effect at all	Yes - a positive effect	Total
Require all requests to be logged	No	16	1	0	0	17
		1	3	2	8	14
	Yes	3	0	2	24	29
Total		20	4	4	32	60

Table 4.58 Require all requests logged cross-tabulated with Implementation effect of Service Desk on classroom usage

Require all requests to be logged cross-tabulated with Means of measuring the use of technology in the classroom

Count

		Means of measuring the use of technology in the classroom			
			No	Yes	Total
Require all requests to be logged		16	1	0	17
	No	1	9	4	14
	Yes	1	19	9	29
Total		18	29	13	60

Table 4.59 Require all requests logged cross-tabulated with Means of measuring classroom use

Combining the responses for status of a Service Desk implementation (Tables 4.60 – 4.62), whilst noting that some of the responses to the No status were taken to mean the respondent personally had not implemented but the organisation did have a Service Desk in place, with whether IT staff ensured all requests are logged and whether the respondent required all requests to be logged revealed the same number falling into the intersection between ensuring and requiring all requests to be logged. No Service Desk equated to 7 and Yes Service Desk to 8 while Intending/Planning Service Desk was 5. As might be expected the intersection between No Service Desk, No to IT staff ensuring all requests are logged and No to requiring that they are was also 7. Similar results across all three categories of implementation status for the other possible combinations (IT staff do not ensure all requests are logged but this is not required (3, 3, 2) and IT staff do not ensure all requests are logged and it is required (3,3,1)) were also found suggesting that despite a Service Desk

implementation if a logging mechanism was in place (and the frequency of using service desk software was 39 of the group or 65%) the expectations of and compliance with the system were about the same (Table 4.63) with almost half responding that IT staff did not ensure logging of all requests.

Do IT staff ensure all requests are logged * Require all requests to be logged * Implemented ITIL or FITS based Service Desk process Crosstabulation

Implemented ITIL or FITS based Service Desk process: Intending to/planning

Count

		Require all requests to be logged		
		No	Yes	Total
Do IT staff ensure all requests are logged		0	1	1
	No	3	2	5
	Yes	0	5	5
Total		3	8	11

Table 4.60 Do staff log all cross-tabulated with Require all requests and with Intending to implement

Do IT staff ensure all requests are logged * Require all requests to be logged * Implemented ITIL or FITS based Service Desk process Crosstabulation

Implemented ITIL or FITS based Service Desk process: No

Count

		Require all requests to be logged			
			No	Yes	Total
Do IT staff ensure all requests are logged		6	0	0	6
	No	0	7	3	10
	Yes	0	1	7	8
Total		6	8	10	24

Table 4.61 Do staff log all cross-tabulated with Require all requests and with No implementation

Do IT staff ensure all requests are logged * Require all requests to be logged * Implemented ITIL or FITS based Service Desk process Crosstabulation

Implemented ITIL or FITS based Service Desk process: Yes

Count

		Require all requests to be logged			
			No	Yes	Total
Do IT staff ensure all requests are logged		3	0	0	3
	No	0	3	3	6
	Yes	0	0	8	8
Total		3	3	11	17

Table 4.62 Do staff log all cross-tabulated with Require all requests and with Implemented Service Desk

Do IT staff ensure all requests are logged cross-tabulated with Require all requests to be logged and with Implemented ITIL or FITS based Service Desk process

Implemented ITIL or FITS based Service Desk process: Total 60

Count

		Require all requests to be logged			
			No	Yes	Total
Do IT staff ensure all requests are logged		17	0	1	18
	No	0	13	8	21
	Yes	0	1	20	21
Total		17	14	29	60

Table 4.63 Do staff log all cross-tabulated with Require all requests to be logged and with having Implemented Service Desk process

Comparing the results of this analysis, wherein half of the respondents reported IT staff did not ensure that all requests were logged with the comments as to why this was the case, alongside the finding of little-perceived value in, or commitment to, the Service Desk process manifesting particularly in 'time' related themes and then looking at IT staffing numbers (as a good indication of resources) no trend was discernible, at least from those who responded. That is, there was no obvious marked decrease in not logging as staff numbers increased, lending credence to the supposition that feelings about Service Desk,

user support and as shown with the metrics/classroom use correlation, were not bound to variables such as more or less staff as with more staff there would be more time so one would expect an obvious relationship between these. No other potential influence was found on these factors neither staff, student or servers supported nor budgets lending further support to the applicability of findings on the feelings and perceptions of the respondents to the larger group of similar knowledgeable experts from which they were drawn.

Conclusion

This chapter has presented the results of the quantitative analysis of the closed questions in the survey questionnaire along with the findings from the evaluation of the qualitative responses to the open-ended questions and then the integration of both sets of data. Discussion of consistency across both strands confirmed triangulation and supported the legitimacy of the findings as representative of the group from which they were drawn. Areas of interest that emerged from the strand synthesis were highlighted to be discussed along with the findings in relation to the research questions in the next chapter. Several major themes emerged from the qualitative exploration providing interesting counterpoints to each other in some instances. These themes both major and minor are woven throughout the findings and often are contingent on and influence each other. For example, justification appears several times even in the descriptions of professional backgrounds, again in drivers for a Service Desk implementation, as part of the rationale for a positive impact of a Service

Desk implementation and may even be behind the unusual relationships discovered between perceptions of usage trends and lack of metrics to justify these. Time was a significant component in many guises and underpinned a seeming lack of real commitment to the Service Desk function and an eventual tolerance but not full adherence to its processes. Avoidance of these processes by both IT staff and the user base was seen multiple times in the responses and yet at the same time the Service Desk function was seen to have improved perceptions of the IT team, the IT service delivery and increased usage through building confidence and trust in the users.

Personal interaction was a key theme that surfaced several times; during discussions on avoidance of the Service Desk, measurements of usage, the role of the Service Desk function and was linked with the overall lack of sustained commitment to an ITIL-based Service Desk function which was often seen as not a good 'fit' without modification for an educational environment or the organisational culture inherent in those. Discussion of these themes, findings, and quantitative results in relation to the literature and the research questions is the focus of the next chapter.

The MITIE group was selected for the purposive sample as knowledgeable and professional experts using an ITIL-based Service Desk in an environment where the first-order barriers to teachers' acceptance and use of technology were minimised and could be discounted as unduly influencing the findings. Analysis of the descriptive statistics in the quantitative results section of this

chapter then presented a demographic profile of the typical MITIE IT Manager and their organisation. In conclusion, analysis of the qualitative responses now allows the completion of the portrait of the representative member of this purposive sample by incorporating detail surrounding the perceptions and feelings that emerged from the findings.

In summary, the demographics presented the typical MITIE IT Manager as male, with an IT background, who is somewhere between 34 and 39 years old, managing an IT team of 6 and significant IT budgets. He is responsible for delivering and maintaining an IT service to 150 staff and 1100 student in a non-government school in NSW. He uses an ITIL - based Service Desk process, delivered via a commercial software package to manage the support requests. However, the Service Desk process is the only ITIL framework process implemented and while he believes that use of technology in the classroom has increased over the last seven years he has no means of quantifying that belief. Overall, he feels that the Service Desk has had a positive impact on users by increasing their confidence in the reliability of the technology and in having their issues resolved leading to increased usage. He believes in the apparent value of having performance measures but does not use metrics to any great degree to improve service delivery. The more he tolerates avoidance of the Service Desk system the more likely he is to think that use of technology has increased over the last seven years. He sees the need for a systematized process to manage large numbers of devices but still accepts that personal interaction is often a better or more desired and desirable way to offer and receive support

and considers ITIL as not necessarily a good fit for his environment. He also sees a need to justify both his fit for his role and the resources he feels he needs to provide the IT service to his organisation and uses the Service Desk function to support this whilst at the same time seeing its process-driven nature as a bit onerous and time-consuming.

Chapter 5: Discussion and Conclusion

5.1 Introduction

The previous chapter presented results and findings from the analysis and integration of the survey questionnaire data and demonstrated consistency and legitimacy of these as representative of the group from which they were drawn. This chapter summarises and interprets these findings, first in relation to the topics in the literature presented in chapter 2 and then addressing the focus of the study by discussing the findings in terms of each research question.

The context of this enquiry was derived from the intersection of three outwardly independent fields some of which have substantial bodies of research as chapter 2 noted though very little covering their junction which this enquiry was designed to explore. For this reason, this chapter will discuss the findings in the context of each of these areas and any analogous studies separately before turning to a discussion on the value and meaning of the findings to the integration of these areas in responding to the research questions. To begin, the literature on ITIL research, particularly in the areas of adoption and implementation, will be examined in view of the findings. Next, the focus will turn to assessing the relevance of the findings to the subjects of support of teachers, technology and using the ITIL/FITS framework in education

as well and finally the use of technology in education. Drawing these strands together will then explain how the findings provide and support answers to the research questions. To finish, the conclusions of the research study are stated before the contributions made by this research enquiry to knowledge in the context of professional practice are presented. Limitations of this study are then noted and suggestions regarding potential areas for future research are proposed. The structure of this chapter is shown in Figure 5.1

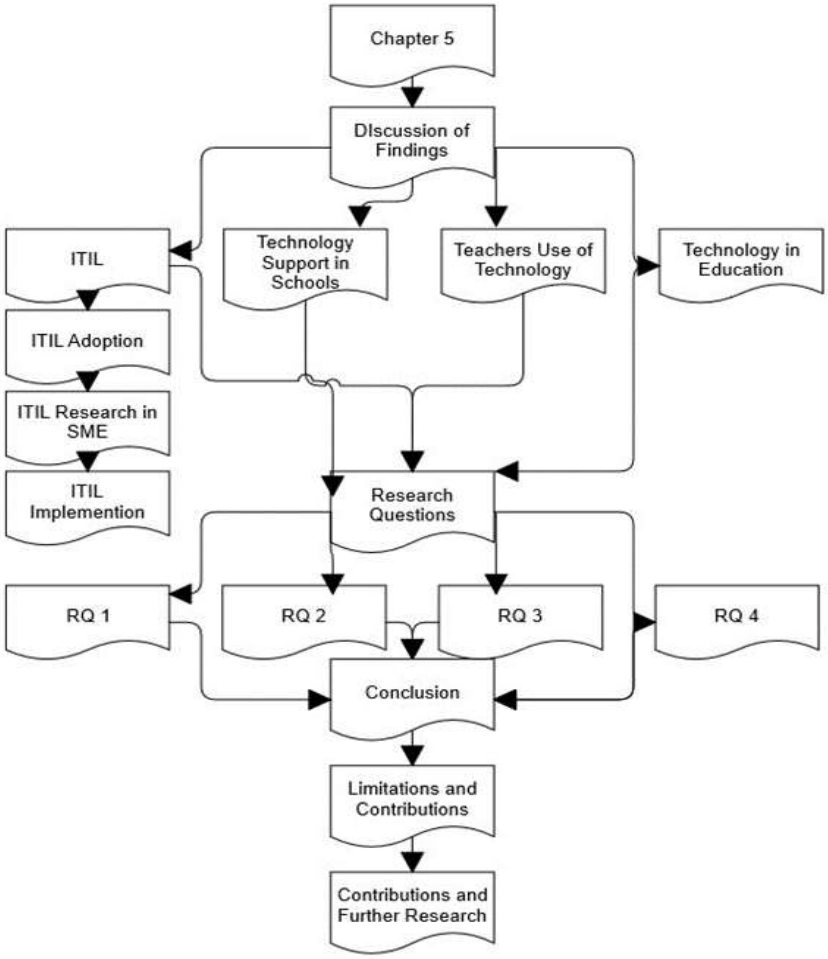


Figure 5.1 Chapter Structure

Discussion of Findings

Despite the discussion on relating the findings to the research questions being positioned after the initial discussion of the findings in the context of each background topic, it is worthwhile to repeat those questions here, at the beginning, to afford a guide to the ensuing narrative.

> RQ1: Does the implementation of an ITIL-based Service Desk affect users' perceptions of IT service and their use of ICT?
>
> RQ2: What are user and ICT staff perceptions of the process and outcomes?
>
> RQ3: To what extent do users and ICT staff step outside the formal request system?
>
> RQ4: Is there any correlation between the implementation of an ITIL-based Service Desk and the frequency of use of technology?

5.2 ITIL

Since this study is positioned around the effects of an ITIL-based Service Desk implementation it is fitting to start with that broad baseline topic and sequentially narrow the focus step by step towards the research questions. The review of literature in chapter 2 covered the history of ITIL including its worldwide penetration, organisational adoption rates, incorporation into various standards and development into the accepted de facto IT service delivery framework. Research on ITIL including drivers for implementation, outcomes

and critical success factors including user satisfaction was reviewed and gaps identified. The aim of this study was to address one of those gaps. This section will examine each of these topics in view of this study's findings to highlight areas of consistency and contrast.

5.3 ITIL Research in SME

The academic literature as detailed in chapter 2 revealed a somewhat limited body of research into ITIL as a specific ITSM methodology. As noted, a gap in the research was uncovered in the exploration of ITIL implementations in small and medium enterprises (SME) exclusively. Though Marrone et al (2014) included SMEs in their study of ITIL implementations, as they also noted the absence of academic research on ITIL adoption benefits for smaller organisations, those in their study were all members of the itSMF association therefore not representative of primary and secondary educational organisations. Nor were they representative of other small professional organisations with internal IT teams where ITIL may be the accepted standard for ITSM but few resources are available to invest in implementation and training. Certainly, the response from the participants in this study confirms that view, as when asked to nominate the implementation method used for their Service Desk implementation only 15% had used any form of a formal project management approach and only one respondent (1.7%) had augmented this with the use of an external consultancy. Furthermore, no investigation has been carried out into the perceptions of both end users and IT staff involved, whether

users and IT staff accept the new ITIL processes or try to bypass them, and whether this model of ICT service delivery and support produces quantifiable increases in the use of technology.

The findings of a review of the available academic literature on the ITIL framework in SME organisations published in 2016 (Cruz-Hinojosa & Gutiérrez-de-Mesa) noted that not many were relevant to the topic of ITIL and SMEs. The authors did not define an SME organisation rather they searched for literature in which SMEs were examined so there were a range and variety of organisational sizes, industries and turnover. In their analysis they found a number of common factors among the literature some of which were noted in this research project;

- ITIL does not provide much help on each of its processes, or best practices;
- ITIL does not distinguish clearly between the processes that produce services and processes that support services;
- There is a lack of descriptive literature on the concepts of the management of services and ITIL frameworks;
- There is confusion about how to implement ITIL successfully;
- There is very little research on the application of ITIL with SMEs; and
- SMEs cannot introduce ITIL easily due to its complexity, cost and risk, shortage of technical talent and insufficient financial resources.

Despite this analysis, there was no literature which specifically evaluated the perceptions of users and IT staff and the authors go on to stress the need for further research on this topic by adopting a broader approach to the design of the investigation (Cruz-Hinojosa & Gutiérrez-de-Mesa, 2016). Likewise, the need for further research with a deeper and cross-industry approach has been deemed necessary (Cruz-Hinojosa & Gutiérrez-de-Mesa, 2016; Potgieter et al., 2005; Shang & Lin, 2010).This research study has the potential to be a small part of that broader approach and cross-industry approach adding its findings to the limited body of research on ITIL in SMEs.

5.4 ITIL Adoption

As ITIL processes have become institutionalised over the decades following its inception (Cater-Steel et al., 2009) its dissemination has not just been confined to large organisations in the public and private sectors but has been embraced by the educational sector also as the use of technology increased and the IT function became centralised. Along with the Gershon Report (Gershon, 2008) urging Australian Federal Government agencies to utilise ITIL for ICT infrastructure improvement, The Better Practice Guide (DEEWR, 2008b) published as part of the Digital Education Revolution (DER) directed schools to the modified ITIL framework, FITS, as an appropriate model to implement thereby ensuring uptake in the educational sector. This is well supported by the findings of this study which show a 78% use of an ITIL/FITS-based Service

Desk process within the group (median staff numbers = 150), more than twice as many as reported by Marrone et al (2014) for Australian SMEs with less than 500 employees (36%). Previous literature on ITIL adoption again documented in chapter 2, reveals agreement on the most common processes implemented being incident management, problem management and change management and finds that the Service Desk function is the most common entry point into ITIL, a starting point also recommended by the FITS manual. That many organisations do not progress beyond this level of implementation or much beyond operational rather than tactical ITIL processes is recognised (Marrone et al., 2014) and corroborated by these findings as, amongst the 78% using an ITIL-based Service Desk, only 5% had implemented or were currently using any other ITIL processes. These processes were also only related to Incident, Change and Configuration Management, all operational level or in FITS nomenclature, reactive processes of the core Service Management publication.

5.5 ITIL Implementation: Drivers, Benefits and Issues

Some of the reasons given for implementing ITIL that emerge from the literature are aimed at reducing costs, increasing ICT systems reliability, improving performance and efficiency, and increasing customer satisfaction and quality of services. Comparing these factors with the motivations of the respondents indicates many similar intentions among the group which are classified into three categories. The first, ICT Service Improvement covers both increasing systems reliability and improving performance and efficiency.

Increasing customer satisfaction quite neatly aligns with the category of responses labelled ICT Support Feedback and Perceptions while the third classification to emerge from the findings, Growth and Change, may indirectly affect costs of ICT service delivery but is related again more to efficiency and service improvement as its underlying premise is the need to find better ways of managing a significant increase in devices or supporting the delivery and use of technology as shown by the following comment. "*Evolution and expansion of network from a largely desktop environment to one of mixed desktops and laptops (esp. with the injection of Rudd govt money designated for a 1:1 "solution)".* Thus, the categories, ICT Service Improvement and ICT Support Feedback and Perceptions are aligned with the ITIL implementation rationale reported in the literature. However, there is sparse research on customer satisfaction and an ITIL Service Desk relationship and this was explored deliberately in this study. Whilst this will be discussed in more detail in answer to the specific research question on this subject it is worth repeating here that improving perceptions of IT (as viewed through feedback received) and IT service delivery along with improving the reliability of the latter were significant findings for the main reasons for Service Desk implementations. Responses such as *"increase efficiency and provide transparency of issues",* and *"Customer dissatisfaction",* typify both the responses and the tenor of previous research not only into implementation rationale and benefits but in impact on the user aspect of the people and technology interaction. Problems such as; modifying existing systems and processes; getting people to use the system instead of their preferred ad-hoc processes; the amount of procedure and

documentation required; the changes in roles, responsibilities, and day to day tasks and the fit or otherwise with the organisational culture are echoed by the findings within the themes, Avoidance and Lack of Commitment. Participants commented on the substantial numbers of users who avoided the Service Desk system and the significant frequency of avoidance as recorded in chapter 4, summarised aptly by the comment, *"Yes but in most cases they avoid the help desk"* as well as the regularity with which their staff neglected to use the system, 35% responding that staff did not ensure all requests were logged due to, *"possibly apathy, possibly lack of understanding of benefits. Established culture probably plays a part. Perceived additional time taken to log requests is also a disincentive."* The common refrain was that an ITIL-based Service Desk function, without modification, lacked perceived immediate value to an educational environment and organisational culture. Possibly due to paucity of extensive ITIL experience or knowledge within the team despite over 50% of the IT Managers who responded having some form of ITIL study or certification this avoidance and lack of commitment and understanding was expressed in terms of how much longer adhering to the Service Desk procedures took as well as arbitrary judgements about which incidents and requests should be logged at all.

Thus far we have looked at some of the outcomes of the study and compared them to the results of prior research and seen that this study supports these in the areas discussed above; those being the basis for implementation and some of the resultant issues specifically around both IT staff and users of the ITIL

processes. In contrast, however, is the collection and use of configuration data (metrics and reporting) which are to be used to continually monitor and improve service delivery, performance, and efficiency and to manage and plan for growth and change. The Configuration Management Database (CMDB) is at the core of the Service Management function and requires that all Configuration Items (CI) are logged or entered into the system. This includes incidents, requests, user data, device data, assets, and financial data amongst others. Not adhering to this negates one of the core key capabilities of ITIL which is to define, measure and report relevant metrics to help with fact-based decision making for continual improvement, support of business outcomes and change, enhancing customer experience, managing risk and showing value for money (Axelos Global Best Practice). Less than half the respondents (27 of 60 or 45%) used any form of metrics to measure Service Desk or service delivery performance and of the common ITSM categories of metrics, the most frequently chosen were simply focussed on incident logging. That is the number logged, closed, open, resolved and less frequently, response times, mean time taken to resolve and time taken per incident. More than a quarter (28.3%) did not use any metrics at all presumably not concerned with measuring any performance indicators or not concerned with continual service delivery improvement or perhaps not able or willing to spend the time collecting metrics and generating and evaluating reports. Even among those 27 using some form of metric there were seven who reported using other metrics to measure their Service Desk performance and when evaluating the six responses received to the type of metric used there is justification for adding these to the

non-metric users as all the comments revealed no other form of empirical measurement just subjective gauges such as "*feedback*" and "*just a feeling"*. Consequently, these respondents were included in the 'we don't measure or report on those areas' statistics increasing this cohort to 24 (40%) of the respondent group and decreasing the number who at least reported collecting metrics to around a third (33%). Comparing this statistic with the 29 responses classified under the ICT Service Improvement label uncovers an apparent anomaly, as indicated in chapter 4, where a definite emphasis on the logging, tracking, prioritizing and reporting of requests along with the need for a better, improved and consistent approach to support was reported.

Leaving aside any discussion on capability levels of the IT department or the organisational maturity level or IT and business alignment (Marrone & Kolbe, 2010b) as data on these were not collected in this study, an explanation for this inconsistency may be found within the use of Service Desk software data results. This shows that over two thirds of the group (68%) use some sort of software to administer their Service Desk function all of which, regardless of whether they perceived these to be ITIL or non-ITIL based, log incidents, requests, calls, resolution, dates, times, technician, and user data, in effect, collect metrics and have reporting capabilities. A reasonable conclusion from this would be that many of the group use software that collects metrics but few of them then use those metrics for service delivery improvement even though stating that aim as one of their prime motivations for implementing the Service Desk function. It would be interesting to explore further this dichotomy

especially given findings around the Service Desk function providing the means for accountability and justification to the school and management through reporting and metrics.

5.6 Technology in Education, Barriers, Support and Use

Having reviewed the relevance of the research findings to the literature on ITIL this section will evaluate them within the area of technology and support specifically in the field of education. Though there is sparse research on technical support, FITS or ITIL in schools an ample body of research, as detailed in chapter 2, exists on the use and acceptance of technology in schools. The recognised barriers to teachers' use of technology include the attitudes and beliefs of teachers and the organisational culture of schools along with what is termed first-order barriers of which access to technology, lack of resources and support (of infrastructure, devices and users) are numbered. Whilst established culture plays its role in the use or otherwise, of the Service Desk system, this study gathered data on factors that could be classified as first-order barriers to ascertain whether these were affecting perceptions of ICT and use of technology.

Due to both the investment by the NSW Government during the 1990s as well as the Digital Education Revolution (DER) funding in the early 21st century, this study posited that the AISNSW set of private schools would have both dedicated IT support staff (as represented by the MITIE group of IT Managers)

as well as demonstrable investment in and access to technology. Moreover, it was suggested that these professional IT staff would most likely have a Service Desk function based on ITIL/FITS principles which was the main point of contact between them and the users they supported. It is important to confirm that this is the case as the basis for this study and the purposive sample group was to remove as far as possible any first-order barriers that could have an impact on the perceptions of the Service Desk and the IT team so that the findings could be judged to be authentic and relevant to the group. The results of the quantitative data confirm this is the case.

Sixty responses were analysed for all the closed questions posed in the survey questionnaire and though response rates varied many of the questions received a 100% or close to it response rate thus increasing the relevance to the group as a whole. These have been reported in chapter 4 however, relevant descriptive statistics are repeated here. Mean staff (administrative and teaching) numbers were 258.4, students 1,437.32 and user devices 1,443.19 giving fundamentally a one-to-one scenario and confirming the investment in and access to computers. Annual budgets as reported by almost half the group (OPEX mean = $703,624.78 and CAPEX mean = $520,937.50) establish that this investment is ongoing at the individual organisational level. Responses from all participants were received to the question on IT staff numbers with a resulting mean of 7.19 IT staff in the IT team and from the 58 who responded to the query on staff dedicated to user support a mean of 3.73 was recorded. The participants were predominantly IT Managers (83.3%), had heard of ITIL and or FITS (83.3%)

and had undertaken some ITIL study, coursework or certification (58.3%). A trend was noticeable in the responses to the question on professional background with the majority choosing Information Technology (71.7%) over either Teaching (25%) or Business (3.3%).

Already noted is the 78% penetration of the Service Desk function within the group and the 68% use of an ITIL based or ITIL similar piece of Service Desk software to manage that function. Taken together this information confirms the parameters for selecting the MITIE group for the purposive sample as knowledgeable and professional experts using an ITIL-based Service Desk in an environment where the first-order barriers to teachers' acceptance and use of technology are satisfactorily minimised and could be discounted as unduly influencing the findings.

5.7 Technology Use and Frequency

Introduced in 2005 and following a 3-year cycle with further assessments in 2008, 2011 and 2014, the National Sample Assessment for Information and Communication Technology Literacy (NAPLAN ICT Literacy) testing was designed to assess Year 6 and Year 10 students on their digital literacy skills. As detailed in chapter 2, of relevance to this study is the reported use of computers at school by year level and by state or territory. Even though there were statistical reporting changes mid-way through the cycles, across all rounds of assessment NSW scored the lowest frequency of use at school for Years 6

and for Year 10, except for 2014 where Year 10 ranked second last. The 2014 report showed that the ICT literacy of Year 6 and 10 students decreased significantly, particularly in NSW, with the overall average Year 10 performance lower than in 2005 and 2008. There was also a drop for both year levels in the number attaining the Proficiency Standard level.

Home use of computers and use of personally owned mobile technology still exceeds use at school suggesting that ICT literacy is more dependent upon technology use at home not in school. This is confirmed by the findings of a relatively recent OECD report, (OECD, 2015) which found Australian school use was one third less than home use on average. A further OECD report on adult ICT literacy skills published in 2016 (OECD, 2016) shows that 62% of Australians 16 – 65 are level 1 or below with only 38% (admittedly above the OECD average) at levels 2 or 3. Comparing these results with the levels of investment in and commitment to technology in education along with the stated ambitions of governments since the Adelaide Declaration on National Goals for Schooling in the Twenty-First Century in 1999 does not produce a glowing report card for these strategies as a number of the Australians included in this OECD report would have been of school age during the period covered by this focused attention on ICT skills for a digital economy. One of the aims of this study is to answer the question, 'Is there any correlation between the implementation of an ITIL-based Service Desk and the frequency of use of technology?' so in view of the statistics published in the NAPLAN and OECD reports this study asked respondents if they had any means of measuring

classroom use of technology. It is accepted that schools prepare their students for the numeracy and reading literacy of other NAPLAN testing through repeated administration of similar test instruments so given the results reported in the ICT literacy tests it might be expected that use of technology in the classroom is not only practised and monitored but measured as well.

In this study though, only 21.7% responded in the affirmative when asked whether they had any means of measuring this use. On closer inspection, most of these means revolved around device or system access, not use. A smaller number relied on feedback, observations, meetings, and other personal communications prone to interpretation and confirmation bias. Many of the responses elaborated on these points, for example, two comments received regarding metrics about counting logins to the learning management system (LMS) pointing out that this tracks "*all access not just classroom access*" and is not that accurate "*use metrics on the LMS – largely not accurate*". Only two respondents replied with any form of potentially quantifiable ways of measuring technology use and one of these were exploratory staff and student surveys designed to "*explicitly seek to quantify/explore ICT use in the classroom".* This leaves one "*longitudinal study running over 5 years now*" as the only example of a committed and serious approach to investigating technology use and frequency in the classroom. The interesting finding that contrasted sharply with these is the number (66.7%) who believe that this classroom use of technology has increased over the last 7 years which is not confirmed by the NAPLAN results over a similar period. This will be discussed in more detail in the research questions section.

5.8 Technology Support in Schools

As previously discussed, there are few investigations into ITIL of FITS implementations in schools and most of it has been published by the FITS Foundation which reports (FITS Foundation, 2016; Greenfield, 2016) on its website that use of the framework is growing and used in over one thousand schools further stating a ninety-two percent satisfaction rating for those schools using FITS. However, no evidence-based research in support of that statement is apparent in the five published 'what people are saying' reports from the period 2009 -2010 which present positive testimonials on the benefits realised since implementing the FITS framework or components thereof. Two other investigations into the use of FITS or ITIL in schools have also been published, one in England and one in Australia. Prior to the FITS Foundation assuming oversight of the framework following the disbanding of BECTA the latter published, in 2005, an evaluation of FITS which was based upon implementations in sixteen schools. This report, along with one Australian report in 2009 (Lamshed, 2009) in four educational organisations, supports very strongly the ITIL principles for ICT service delivery and support. Common to both reports, most schools had only implemented some of the FITS processes with the establishment of a Service Desk and methods to lodge and record requests the usual entry point, a result congruent with the findings of this study. Similar issues were found also though, unlike the schools in these earlier reports, the organisations in this study had ample IT staff in the main and were often able to have dedicated Service Desk staff. This does not seem to have

impacted the fact that in both cases many school staff consider the Service Desk processes to be bureaucratic, too time-consuming and an additional administrative burden. These phrases are repeated in this study and represented by the major theme of Avoidance within which were many references to time in relation to it as a limited resource and not one to be applied to using the Service Desk processes. This was aptly expressed by the following comments in which the processes were judged as "*bureaucratic*" and "*an unnecessary annoyance*" and taking too much time, for example, "*don't have enough time*" or "*it takes too long*" and summed up neatly by this particular comment, "*Most teachers can't be bothered with such things .... email, phone or drop in is easier and quicker*". Whilst a limited acceptance of the Service Desk function in providing equity, visibility of request progress and structured and communication between the user and the IT team was apparent it was clear that the processes were still often bypassed or resisted. The findings from this study demonstrate how significant is avoidance by the users of the IT service in these schools. The frequencies of avoidance reported by the participants were both substantial and significant with agreement across responses that this was a regular or daily occurrence with some users using other methods to gain assistance sometimes and others avoiding the Service Desk processes all the time. Apart from the time as a resource issue there was a perception that emerged from the analysis that aligns with the literature on teachers' beliefs and organisational culture resulting in feelings that a formalised approach to user support is not compatible with beliefs of the ethos of a school and at odds with how many people prefer to ask for assistance face to face or over the phone.

Personal interaction as a preferred method of support or obtaining information and assistance dominated the responses with comments mentioning the notion of ‘self-importance’ to describe those, often management, who think that the established Service Desk processes do not apply to them but also stressing communication, information sharing, relationships, confidence and trust as being built on face to face interactions.

While this investigation did not explicitly examine organisational culture or teachers’ attitudes and beliefs it does add further to the continued discussion of user perceptions of IT service and the subsequent evasion of the IT department (King, 2012; McIntosh, 2012). The perceptions of the IT staff and the users will be expanded upon in the next section when we suggest answers based on the findings to the research questions posed by the study.

Research Questions

Having examined discoveries of this study in comparison to the literature on ITIL implementations, benefits and issues, and technology in education, in turn, confirming their legitimacy and representativeness, the following sections will merge the findings to propose answers to the research questions. The three sub-questions will be discussed first sequentially then conclusions drawn in answer to the overarching question, does the implementation of an ITIL-based Service Desk affect users’ perceptions of ICT service and their use of ICT?

5.9 RQ2: What are user and ICT staff perceptions of the process and outcomes?

Before beginning discussion on the how the findings pose answers to the question above, it must be noted that the perceptions explored are those of the participants and how they feel their IT staff and the users they support have accepted the Service Desk implementation as neither of the latter two were included in this study. Consequently, the findings are being viewed through the eyes of the respondents, an IT manager responsible for IT service delivery and user support in a school environment.

The synthesis of the qualitative and quantitative data presented a portrait of the typical participant of this group as generally feeling the Service Desk implementation has had a positive impact on users by increasing their confidence leading to increased use of technology across the school and in the classroom. Reviewing the findings, however, reveals fewer positive responses to the questions on whether the users were supportive of the Service Desk function and processes and among these were several mixed or qualified responses which reduced the positive perspective substantially.

Reasons for users having at least accepted the Service Desk function centred around the visibility inherent in logging requests and the perceived improvement in response times, communication and lessening of ‘forgotten’ requests, all elements of tracking and accountability. Being able to track a logged request not only engenders some confidence in its eventual resolution,

ensuring it is not lost as may be the case when assistance is asked for in a non-systematic way, but also enables the user to hold the IT team accountable should there be a delay or no resolution. This gives some mechanism of control to the user resulting in acceptance of a structured system that is considered equitable and offers a recorded communication channel between users and the IT department. As one comment suggests, *"they change their opinion after they receive a good experience using the service desk process"*, it appears repetition of similar experiences gradually lowers frustration and builds confidence in the reliability of the technology and in having their issues resolved. Participants responding positively believed that just having the Service Desk function implemented engenders a belief in the reliability of a system and the availability of support even though, as detailed in the response to the next question, the function was accepted but the processes often bypassed. The negative response to the same question attracted more responses with comments highlighting users' perception of the processes as requiring too much time to follow, a *"hindrance"*, a *"hassle", "bureaucratic"* and an *"unnecessary annoyance"* as well as perceiving the Service Desk function to slow down the time taken for a response and resolution. Other comments addressed a fundamental finding regarding personal interaction as being the perceived preferred medium for users to gain assistance and ask for support. Whether due to entrenched organisational culture and resistance to change, feelings of being more important (as in the Executive of the schools) and not required to use the system or trying to influence the priority or speed of

resolution of requests, many respondents felt that users tried constantly to go around the Service Desk and by-pass its processes.

For the IT staff, the tone of comments was tolerance of the system but avoidance of its processes and an overall underlying lack of commitment to the Service Desk function. Some IT staff had little choice as use was mandated but for others, an eventual tolerance of the function and even a theoretical understanding of the benefits developed over time and often following training, but always combined with frequently sidestepping the processes. Perceptions of IT staff regarding the processes of the Service Desk function were expressed in terms of thinking that they took too much time and were repetitive and they frequently used their personal judgement on which requests they thought worth logging, often allowing users to phone or grab them in passing, fixing the issue quickly and not bothering to then log the incident retrospectively. More positive perceptions were mentioned as well, these being an acknowledgement of the framework offering a structured approach to their roles and tasks and increasing visibility of the daily workload they had to manage. Nevertheless, and regardless of whether logging all requests was required or not, IT staff and users circumvented the Service Desk processes regularly. These findings suggest that both users and IT staff gradually develop a tolerance of the function and are accepting and supportive of the principles behind its implementation, theoretically, but in practice the perceptions of the processes involved in using the function are that they are too involved and time-consuming and better service is gained by personal interaction instead.

5.10 RQ3: To what extent do users and ICT staff step outside the formal request system?

It is not entirely possible to give a quantitative answer to this question as this area was investigated through open-ended questions in the survey questionnaire. However, the questions attracted good response rates so whilst the extent of avoidance of the prescribed Service Desk system processes is illustrated by words rather than numbers it is a good indication of the degree of circumvention. For the IT staff, where just over half the participants chose to respond, the number who replied that not all IT staff ensured requests were logged equated to around one third (~33.3%) of the group. Reasons for this circumvention ranged from logging requests taking too much time when it was often quicker just to fix the issue and not all requests were worth logging; the team was too busy to ensure all requests were logged; to the organisational culture; being approached in the corridors or lunch room or phoned directly; a culture of quick fixes and fundamental beliefs in the value of the system. Putting this into perspective participants were also asked if they required all requests to be logged by their team members with 48.3% saying they did while 23.3% said they did not. So twice as many IT Managers said they enforced logging and yet one-third report regular avoidance of the processes by their staff. The frequency of avoidance of the Service Desk process by the users was even greater as shown by the 26 responses received from those who answered yes to the question, do staff regularly try to go around the Service Desk process and seek assistance in other ways.

When asked to quantify if possible how often this occurred the language used was significant in describing the extent to which this happened, as noted in chapter 4 and repeated here: *"all of them, a significant number, very frequently, frequently, regularly"* to more numeric measures such as percentages (*15% - 20%, 20%, 25%, 30%, 50%*) to numbers (*5 -10 a day or a week, 30 a month, 20*). This can be condensed into a notable number of staff every day and encapsulated by the comment, "*Whenever they see us in corridors, classrooms, or call our phones directly".*

Suffice to say that overall avoidance of the Service Desk processes is not an insignificant issue impacting the value of using the Service Desk function to manage, measure and especially report on service delivery as the data collected under such circumstances cannot be said to be either accurate or representative. This also provides further insight into the perceptions and acceptance of the Service Desk function corroborating the response to RQ2.

5.11 RQ4: Is there any correlation between the implementation of an ITIL-based Service Desk and the frequency of use of technology?

The interpretation of the results and findings on this subject produced the most interesting of the study and highlighted an area worth future investigation. While the unimpressive ICT Literacy reported by NAPLAN in its Proficiency Standard levels along with the 2016 OECD report on adult digital literacy as a performance indicator on ROI (Return on Investment) of the resources put into

technology in schools for the development of a digital economy is an area deserving more research it is not in the scope of this study. The results on the use of technology in those reports are however and from 2005 until 2014 shows little statistically significant increase and is accompanied by a drop in ICT proficiency standards in the 2014 report (ACARA, 2011, 2015). Use of computers at home still exceeds use at school from data collected by NAPLAN and by the OECD which found that computers were used only two thirds as frequently at home as at school in 2015 (OECD, 2015). This provided the background against which participants were asked several questions on the use of technology in the classroom.

These questions were,

1. Do you have any means of measuring the use of technology in teaching in the classroom?
2. If yes, please describe how you measure this.
3. Can you show through metrics or do you think from your experience that the use of ICT in teaching in the classroom over the last seven years has increased, decreased, or stayed much the same?
4. Did the implementation of the Service Desk function and process have any effect on the use of ICT in the classroom?
5. In what way has the use of ICT in teaching in the classroom been affected by the Service Desk function and process?

As reported in the results chapter only 13 (21.7%) had any means of measuring the use of technology in the classroom which when extrapolated across the

respondent group means only 21.6% can potentially measure how often technology is used in class as opposed to administrative or homework use. An evaluation of how that use is measured from the following question showed that these means fell into one of two main categories; recording device or system access (not use) and personal communications including verbal feedback. None of these was judged to be quantifiable measurements. Four participants used surveys to evaluate use but only two of these were specifically aimed at factual data, *"Longitudinal Study running over 5 years now"* and *"surveys of students and teachers that explicitly seek to quantify/explore ICT use in the classroom,"*. However not only did all 13 respondents who said they had any means of measuring classroom use also believe that such use had increased over the last 7 years so did 40 of the 60 with only one respondent stating that it had remained much the same. Cross-tabulation of results from the means of measuring classroom use question with the feelings about an increase or decrease in frequency of use question shows over twice as many (27) who had no means of measuring classroom usage thought that usage had increased.

The same contradiction was seen again in the questions relating to the impact of the Service Desk function on this classroom use where over half the respondents with no means of quantifying this statement agreed that the introduction of a Service Desk had positively affected the use of technology in the classroom. When asked to comment on how this had improved use the observations were consistently clustered around increased confidence leading to increased productivity and a willingness to try a broader range of technologies

such as interactive whiteboards and overhead projectors knowing that support was available via the Service Desk if needed.

These findings suggest very strongly that it is perceptions, not facts, giving rise to these beliefs. Given the thread of justification that emerged from the analysis; justification for team size, budgets, workload etc., it may be that these feelings are a form of unconscious justification of the effect of IT service delivery and support in the minds of the participants. It would seem very demoralising to think that one's function and role had very little impact at all on the acceptance and use of the service you are employed to provide. The question needs to be asked as to why there is not more measurement of classroom technology use and more quantifiable measurement, within the groups' organisations.

5.12 RQ1: Does the implementation of an ITIL-based Service Desk affect users' perceptions of IT service and their use of ICT?

Before reviewing how the integration of the results and findings inform the answer to this central question this section will first assess the responses to the direct question on this topic put to the respondents. This was an open-ended question which sought to elicit the participants' feelings on the impact of the Service Desk process towards how the users they supported perceived the IT team and the IT service they delivered. The conclusions from the responses to this question can then be compared to the integrated findings. Interestingly, this

question attracted the greatest response rate (44 or ~73%) of any of the open-ended questions and feelings were evenly divided between positive remarks and negative and neutral combined (25 positive, 11 neutral and 14 negative). Chapter 4 reported on the inferences made from analysing and classifying the comments whilst noting that in all three categories not all respondents chose to elaborate on their initial answer to the question.

On the positive impact side, the general reason for improved perceptions of service delivery appeared to be again the increase in visibility and accountability due to requests being able to be tracked and the provision of a systematic mode of obtaining support when required. The communication resulting between users and IT staff within the boundaries of the Service Desk function helped to instil a growing confidence in the eventual resolution of any issues and developed a perception of the IT staff as being professional and more responsive which translated into a higher regard for the team members than they had previously enjoyed. On the negative side, the issues of requests being lost in the system, resolution times increasing and Service Desk processes being too bureaucratic and time-consuming were re-iterated suggesting a widening gap between user and the IT team affecting perceptions of the service delivered and by association the team members as well. It should be stressed here that the negative responses to this question were slightly more than half the positive responses with the neutral category contributing the rest. Thus, the respondents generally thought that the Service Desk function had improved the opinion of the IT team and their service delivery or at the least considering the tone of

remarks in the neutral category had hopefully improved things or left the status quo unchanged. Merging the results from all questions an empirical answer to this question is not revealed. What is suggested though is that the perceptions of the IT Managers are that implementation of the Service Desk function does positively impact on several areas of the organisation. Taken together, the themes of confidence, proactivity, visibility, accountability, justification, service improvement and the feelings about the increased use of technology evoke an overall perception by the participants in an improvement in the acceptance of the Service Desk and an associated improved perception of the IT team and the services they manage. It could be argued, however, that rather than improved perceptions or positive impact there is just an unconscious acceptance of the requirement to have a Service Desk system by both the IT staff and the users even if it is not the preferred way of seeking assistance.

The findings revealed quite clearly that personal interactions, whether face to face or by phone, formal or informal were continually used and responded to by users and IT staff and captured in the most positive comment received; "*We've gone for human interaction as the primary contact. We employ a term-time admin lady who is the friendly face of the department. Since she's been employed we're more efficient, we get told about more problems, we've consistently surveyed users and gotten increased satisfaction levels. Having that role has made more of a positive impact to our department than any of the other systems/services we've implemented*."

Is there a definitive answer to this question? Not one that emerged from the findings, however they are supportive of the notion that perhaps in an environment where IT evolved from its small beginnings to a professionally delivered and vital service having a Service Desk function, or even Service Desk software for logging and tracking issues, helps give a perception of structure and visibility and does impart some confidence in users. The undisputed finding that most users and a third of IT staff go around the system on a regular basis and the reasons why lend credence to the view that the perceptions of the Service Desk process in daily use are not positive and not the manner in which most users would like to ask for assistance in their use of technology.

Conclusion

That most respondents would implement an ITIL-based Service Desk if starting from scratch, as the findings on the hypothetical 'greenfield' scenario showed, is reflected by the 78% penetration of that function within the group's organisations. The reasons and benefits provided for having the function are not supported by the descriptive statistics and the findings. The low responses in the areas of logging all requests, the frequency of avoidance and the collection and use of metrics for service improvement being cases in point. This is suggestive of the perception of benefits for users, for their IT staff, for the school and for increased use of technology being based in justifying the requirement for that systematized approach to user support, the latter being felt by all respondents to be critical and the main purpose of their role in a school environment. It is also suggestive of the concept of ITIL/ITSM processes becoming institutionalised resulting in little questioning of other ways of delivering a quality IT service. A related theme emerged during the cyclic rereading of the qualitative responses which was labelled De Rigueur and explained as a hypothetical research question: *"Do IT teams in SMEs implement an ITIL Service Desk process because it is the de rigueur accepted practice rather than a planned, measured and regularly reviewed process in response to a recognised need? And does the Service Desk function change any of the dynamics of service delivery or relationships between providers and users of the service?"* Whilst admitting to confirmation bias as a factor as from personal observation it seems that there is a gulf between the unexamined

implementation of an ITIL based Service Desk and its reception and practical use, this suggestion is supported by literature (Cater-Steel et al., 2009;Marrone et al., 2014) and by the findings from this study.

The comments, reported under variously labelled categories of Generic Benefits, Best Practice, ICT Service Improvement, Better Technology, Help Users contrasted with those of Avoidance, Lack of Commitment, Qualified Acceptance and Tolerance and most notably use of metrics and means of measuring use in classrooms, provide an answer to the first part of the question. Yes, mostly the IT teams implement a Service Desk function because it is just the accepted way of managing service requests and incidents. Very few of them planned the implementation in a formal manner and even if the software they predominantly use collects metrics these are not used to regularly review and improve or expand upon their service delivery. Further, there was the use of the fact that there was a Service Desk function as a justification should it be required, the justification for resources or to provide evidence of the performance of the IT team and the technology they provide. It was clear also that many respondents just implemented a piece of software and processes for using it as the Service Desk function but rarely was this supported by any other components of the ITIL framework although almost 60% had some ITIL knowledge, training or qualification. Avoidance of the Service Desk processes was endemic and tolerated by the respondents even when it was their staff avoiding using the system and they noted a lack of commitment to the function on the part of their staff or at best a qualified acceptance or tolerance.

Notwithstanding agreement that the Service Desk was usually the first point of contact between the IT staff and the users seeking assistance in the main they remarked that personal interaction was and should be the main interface between the IT staff and the (staff) users as it was in all cases where the students needing assistance were mentioned. In fact, personal interaction was considered more appropriate in a school environment though only one response had put that into action by employing a personal face of the Service Desk to manage all initial contact.

Were the dynamics of service delivery changed and what was the impact on relationships between and perceptions of the providers and the service they deliver? Clearly, there is support in the findings for the change in dynamics as shown by the frequency and number of avoiders and the dominant theme of personal interaction being the preferred mode of seeking assistance and disseminating knowledge and information. No-one appears to like using the Service Desk processes though they are generally accepting of the perceived need for the system. There is an outward contradiction in that both IT managers and users like the potential for justification and accountability offered by the Service Desk logging, tracking and reporting but the former rarely collect or use if they do, metrics for that purpose and many users bypass the system thereby negating the ability to track their request. Leaving relationships aside as this was not explored it can be said that the perception of the respondents is that the implementation of the Service Desk function has an impact on the how users view the service they deliver and to a lesser extent changed how they and

their teams are regarded. It appears to them that the presence of the Service Desk system and the visibility it brings engenders confidence in users and IT staff over time, encouraging frequency and wider use of technology and builds a greater regard for IT.

Perceptions of the impact of the Service Desk function and its relationship to use of technology in the classroom was the most surprising finding. Very few had any means of measuring classroom use and where they did even they noted this meant access, not usage. Nevertheless, two-thirds of participants believed that classroom use of technology had increased over the last 7 years. That this is most definitely a perception is seen by the fact that over twice as many who had no means of measuring classroom use thought that it had increased as compared to the few who nominated some measure of classroom use. Again, in the questions relating to the impact of the Service Desk function on this use over half the respondents with no way to measure this agreed that the introduction of a Service Desk had positively affected the use of technology in the classroom. This is an intriguing finding and one that should possibly be explored further, not only why this perception is stronger in those who do not have any means of measuring but why the majority of the group do not measure the use of technology in the classroom.

Implications for practice

The intention of this investigation was exploratory in that it sought to uncover whether there was any effect on a number of primarily intangible elements when IT user support was delivered through the mechanism of an ITIL-based Service Desk function. As such, the outcome of the research was not focussed on solutions, but rather on exposing and confirming widespread and shared challenges. One aim of this exploratory approach was to create recognition of the themes exposed in the findings as indicative of long-standing, entrenched and unquestionably genuine issues rather than ICT team folklore. In this way, these issues would be accepted, discussed, and means of mitigation considered at the beginning of any IT service delivery and support implementation or as part of any planning for continuous service improvement. Taking that into consideration, while the findings of this investigation are not sufficient to create a framework for optimal user support practices, though future research could build upon them to that end, they could be used as the basis for a guideline for practitioners embarking on or reviewing a Service Desk implementation or considering mechanisms for user support.

As noted by Onwuegbuzie and Leech (2006) mixed-methods research often involves an iterative progressive process that may lead to reformulating or refocusing the research question or questions particularly as themes emerge through analysis. During this investigation, an underlying motif of ITIL as a de rigueur accepted practice rather than a planned, measured and regularly

reviewed process was discernible. ITIL, along with other ITSM frameworks, has been widely adopted founded on the belief that implementing these processes will result in benefits to the organisation, though research into ITSM performance management frameworks has not found any correlation (Gacenga, 2013). This study found that the participants believed there had been beneficial impacts and perceptions had improved. This was due, primarily, to the belief that having a Service Desk function, or even Service Desk software for logging and tracking issues, helps give an impression of professionalism, structure and visibility, thereby creating feelings of confidence in users. Given the findings that most would implement an ITIL-based Service Desk function if they had a 'greenfields' opportunity and the reasons why, revolving around ideas such as it being a best practice framework that is widely adopted, well defined, thoroughly documented and a standard for IT, it may just be an unthinking acceptance of a Service Desk function as a required system rather than any conscious benefits. These beliefs did not translate into facts, however, as few participants used any form of metrics to evaluate the Service Desk function or to plan for continuous improvement. Occasionally basic metrics were used to help justify existing resources or petition for more but in every instance where any form of measurement was used they were the generic ones supplied by the systems, software or devices used rather than any adapted to their individual organisational contexts (Gacenga, 2013).

Summarising the conceptual areas arising from the findings it was found that:

1. The drivers for the implementation or continuation of use of the function were;
    a. Service improvement including availability, reliability, and a structured, proactive approach.
    b. Responding to feedback and perceptions of IT
    c. Responding to growth and change.
    d. Beliefs that it would bring generic benefits and was demonstrating best practice.
    e. Provide justification for the IT team or resources within the IT department.
2. Issues with implementing ITIL were;
    a. The framework was too complex
    b. Required too much time
    c. Required too many resources financially and staff wise.
    d. Required uniform adoption and support.
    e. Too process driven; too easy to get lost in the system to the detriment of supporting users.
    f. Needed retrofitting for the school environment (Interestingly this is something the FITS Foundation devoted itself to, yet all participants preferred to use the full ITIL framework instead perhaps a testament to its acceptance as the unquestioned de facto standard.)

3. Endemic avoidance of using the Service Desk processes was uncovered among users and IT staff with some of the reasons given being;
    a. Time – time taken to log a request and not having enough time to spend submitting a request
    b. Taking longer to resolve issues
    c. Issues getting lost in the system
    d. Issues too urgent
    e. More convenient to stop an IT team member and tell them the issue
    f. A significant preference for personal interaction face to face.
    g. VIP syndrome where staff think they are too important and above the system and require personal assistance. Note that some staff holding this opinion do not hold an executive position in the organisation.
    h. The belief by IT staff that many requests do not need to be logged because they are not important enough or are easily rectified.
    i. Qualified acceptance of requirement for function of service desk but a rejection of the processes required to be followed.
    j. Lack of commitment to the process on the part of the IT staff.
4. The use of metrics was inconsistent and inaccurate and there was a lack of reporting.

a. Most metrics were captured by the default configuration of the Service Desk software package used and there was a substantial rate of use of software for user support.
b. Except in two cases, measurement of classroom usage was via device and system access statistics therefore not relevant.
c. Few metrics were used and those that were used predominantly for justification purposes were basic ones such as numbers of call logged which, given that not one organisation reported all incidents being logged, were not accurate.
d. There was no general use of user satisfaction surveys or formal feedback systems.
e. Metrics were not used for service delivery improvement.
f. A negative correlation between using any means of measurement of classroom use and a belief this had increased over a 7-year period.

Situating these outcomes in the context of the groups' feelings about user support not being an easy task, though an essential one if technology is to be effectively used in schools; no one system providing a perfect solution and the importance of people, communication and building trust and confidence in IT systems and support staff, the need for simple but pertinent guidelines for practitioners is clearly relevant.

A body of academic literature exists that has examined ITIL/ITSM implementations, service delivery performance management frameworks, drivers and benefits, critical success factors and impacts on organisational performance. Within the commercial ITIL space, there is a great deal of official and unofficial guidance, best practice principles, blogs containing advice, tips, and pitfalls to be studied and of course certification to be acquired. The ITIL Practitioner 9 Guiding Principles (Axelos Global Best Practice, 2017) to be used in conjunction with the 9 Guiding Principles Navigator and help guide the ITIL Practitioner across the ITIL Lifecycle, provides worksheets which list the principles under each domain of Service Management including Service Operation. These give one example response on the checklist and then space for the practitioner to build upon these for each of the nine guiding principles. These are predicated on use by a trained ITIL practitioner and an environment where at least one if not more ITIL functions and process are already extant and in use. Though the principles themselves, as shown below in an image of an example checklist, are sound and easy to understand, an example of applying a systems-thinking approach, there is a place for a set of guidelines to precede these.

5 Service Operation

Guiding principle	Application (what we do)	Owner of the initiative	Outputs (tangible products)	Outcomes (benefits/drawbacks)
Focus on value	Operate and support your service for users and the customer, not for the technology solution. Think users, not IT.			
Design for experience	Be supportive, be friendly, be helpful. Support experience is often the most visible part of service experience.			
Start where you are	Follow the Pareto principle. Identify the most frequent and important user requests; incidents; events; errors. From those, work on the most impactful.			
Work holistically	Operate and support the service, not its components. Consider relationships, dependencies, shared components.			
Progress iteratively	Introduce automation, standard solutions and workarounds continually. Apply new operational capabilities to live services. Address users' feedback.			
Observe directly	Always combine monitoring with user surveys; don't limit feedback to support transactions, ask about the overall service experience.			
Be transparent	Report on service achievements within and beyond SLA (Service Level Agreement). Include users' feedback. Report on failures, learn from experience.			
Collaborate	Avoid siloed- thinking. Swarm for major incidents and problems. Collect feedback from users. Partner with suppliers. Provide feedback to all other lifecycle phases.	AXELOS EXAMPLE Incident Manager	AXELOS EXAMPLE Swarming records for the major incidents	AXELOS EXAMPLE Improved resolution time for major incidents (XX%/Mins); improved collaboration between the teams

Excerpt from ITIL Practitioner Guiding Principles Checklist page 10 (Axelos Global Best Practice, 2017)

This study has provided insights that have implications for IT professionals in an educational environment and may well possess relevance more broadly across the SME sector. Before implementing ITIL or another standard ITSM framework or a mixture or even before acquiring a sophisticated piece of software to manage the user support requests it may prove enlightening for the practitioner to undertake a process of considering the findings above and exploring the options in the context of their organisational environment and resources. To facilitate this process a prototype of a simple flowchart and workbook has been created which is based on the finding of this research investigation.

This chart lists the issues to be considered when planning to implement or change IT user support delivery processes, offering the practitioner an opportunity to record the drivers for change, the intended benefits while acknowledging the issues that could arise and documenting the decisions they make to mitigate or avoid these. The process of thinking through each of these categories and recording decisions could potentially help build policy and procedures around the function of IT user support delivery thereby making the activity a holistic exercise and a time-saving one as well. One outcome of this routine may well be a non-ITIL mode of user support is developed especially if there is some engagement with the non-IT staff about their preferences for technology support. Another beneficial outcome of using this checklist would be a justifiable decision on whether metrics were to be collected and if so how they would be reported, to whom and to what end. This then would form the basis for key performance indicators for the chosen mode of delivery and perhaps even for the use of technology systems within the organisation. Armed with these outputs the practitioner would be well placed to justify any required resources and demonstrate the ways in which they would measure evaluate and report on the implementation.

The results of this process could also be beneficially used to give a presentation to the staff body on the mode of user support decided upon as it is clear that a successful Service Desk function implementation requires uniform and universal adoption and support.

By presenting the rationale behind using this guideline along with the results, proposed policy and procedures prior to implementation or change, there is a greater probability of engendering acceptance of the function and its processes. Ensuring there is an easy method for gathering staff feedback which includes recognition of the comments and suggestions received and possible actions arising from them increases the probability of acceptance and use of the function when implemented. Finally, a well thought out strategy, policy, processes, and procedures increase the likelihood of both executive support and adherence by the IT team staff.

The chart (see Figure 5.2) is intended to provide a visual graphic representation of the research findings which are categorized into four topic areas that also reflect the stages of a typical implementation process:

1. Motivations for and planned outcomes of an IT user support delivery implementation.
2. Issues likely to be encountered during an implementation.
3. Methods and items of measurement and reporting formats and channels.
4. Post implementation and acceptance issues.

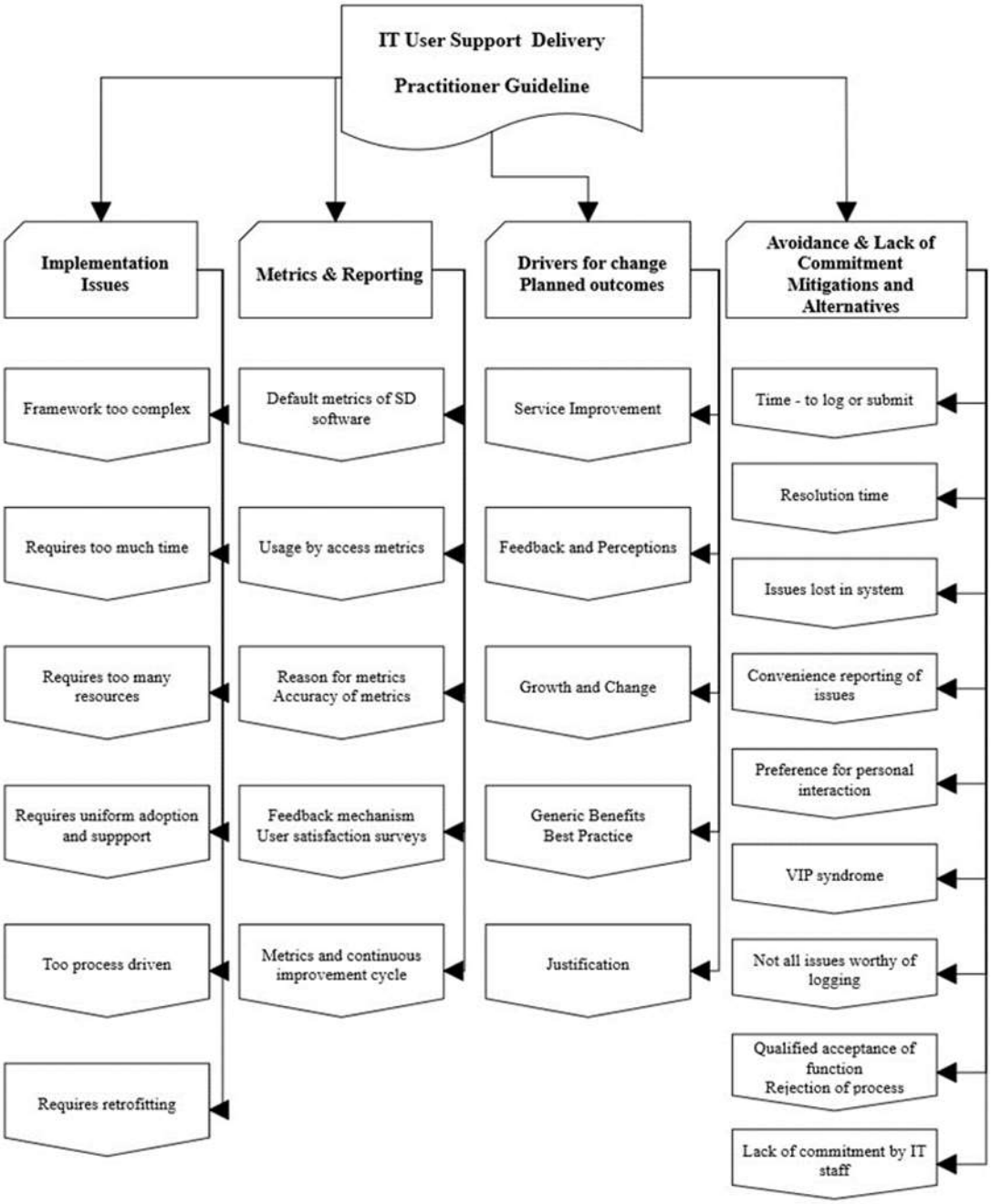


Figure 5.2 IT User Support – Practitioner Guideline Flowchart

In order to make the process of using the guidelines straightforward and uncomplicated a workbook has been provided in the appendix, which, when used with the guideline chart, helps to form a decision tree style process for the practitioner to follow. Rather than attempting to show the relationship of each element to each other in the manner of a decision tree which would rapidly become too complex, each main topic area has a set of related questions with an area for the practitioner to note their responses, aiming thereby to assist them in verbalizing then documenting their decisions to each of the issues raised in the guideline. Upon completion of the workbook questions, the practitioner should have a clearly documented matrix on which to base their decisions regarding the delivery of IT user support, whether an ITIL-based Service Desk function or another method, along with the basis for a user support policy document.

By uncovering the factors influencing the perceptions and use of an ITIL-based Service Desk function and by delivering a practical guideline and workbook, this study provides IT practitioners with a basis for appraising their mode of delivery of support and supports a simple decision-making process. Though most pertinent to the context of the sample group the study provides a practical perspective on user support management, giving insights for IT managers and organisations faced with the challenges of effectively delivering and supporting their ICT services.

The prototype practitioner guideline and workbook increase the contribution this study has made to professional practice by providing a means of appraising

and re-evaluating the desired outcomes of the mode of user support in light of the feelings, perceptions and management issues revealed through by the research.

Limitations

Assessment of the results and findings of this study need to be evaluated within the boundaries of its limitations and assumptions which are described in this section. The study used a parallel concurrent mixed-methods design based in a Pragmatic paradigm to conduct an exploratory enquiry. Using this approach relies on the mixing of quantitative and qualitative methods to overcome the perceived weaknesses of either single strand of analysis (Onwuegbuzie & Leech, 2004).

Limitations of qualitative research component include researcher prejudice and bias, observer effects, and writing about qualitative research so that readers can replicate the study whilst limitations of the quantitative section are that any results are not intended to be generalisable to the larger population of IT managers in schools. Rather the results and findings of the study are representative of the purposive sample group from whom the participants were drawn as every effort was made to ensure a high response rate so that there is confidence in the validity of the findings to the population chosen.
Issues related to the limitations of the survey questionnaire methodology are acknowledged and their minimisation addressed in chapter 3. Validation for the

purposeful choice of the sample group is presented earlier in this chapter. Another limitation of the study was that it was exploratory in nature and focussed on the perceptions of one specific group of respondents to elicit their views, feelings and understanding of the issue being studied.

Limitations of the questionnaire design and assumptions about the relative importance of questions and wording as well as limitations of the analysis are that these are the effort of the researcher and reflect their bias and perceptions with the result filtered through the lens of their worldview. The validity of the conclusions will be demonstrated if they are defensible to the professional practice communities for whom the research is produced and may potentially be used (Onwuegbuzie & Leech, 2004).

Contributions and further research

The aim of professional doctoral research in information and communication technology is to extend knowledge of the subject area and to identify, investigate and resolve problems within the IT profession and organisation (CSU, 2014), an aim that aligns with Pragmatic research in that it should offer practical outcomes and be relevant to a legitimate human issue (Martela, 2015).

To begin, the descriptive statistics provide useful information to the participants and the wider MITIE group of which they are members. These members often use the forum seeking data from others regarding team and user staff numbers,

number of devices supported, number of servers etc., and receive variable responses, so the collected statistics from the closed questions will be useful to compare their resources and responsibilities with others of similar attributes. These comparisons may well be used for planning purposes or for justifying increases in resourcing. Support for users, servers, devices, and various applications in many guises is discussed across the forum so the results from the study will be useful reference data in these discussions also. The descriptive statistics output, histograms and box and whisker plots have been included in the thesis appendix as it may be useful for MITIE members to review their own environment in relation to the variance between the members of the sample group.

Within the MITIE group, there are also special interest groups, one of which has been formed to discuss IT support in schools that is ITIL/FITS based specifically, for whom this study will have relevance. A practical contribution to this group of practitioners is the proto-type ICT User Support Practitioner Guideline and accompanying workbook. Documenting the findings of the research in this way brings to the fore many of the issues the typical IT Manager in the sample group described in their response and would grapple with on a daily basis. Working through the questions posed in the workbook with the accompanying visual guideline along with their team members will assist them in determining whether the mode of user support delivery is the best suited to their organisational context and provide a fertile basis for discussion and decision making.

Not only of relevance to the sample group but to a wider audience of IT support professionals in smaller SMEs where the IT team is internal, and resources are limited, are the findings on perception, acceptance and avoidance of the Service Desk function and processes. These have the potential to offer insights into issues faced by IT professionals and stimulate discussion on other modes of offering assistance apart from the de facto ITIL framework. This study can serve as a source of validation to IT Managers who face similar problems by demonstrating that they are not unique in their experiences. Finally, it has the potential to stimulate appraisal of the benefits of accepted modes of user support within an IT service delivery model and focus attention on the mechanism by which those benefits may be realised. The findings on the collection and means of metrics can inform professional practice by providing clarity on the strategies and resources required to ensure accurate quantifiable data and produce useful reports.

This exploratory study addresses gaps in the literature by adding to the body of literature on ITIL in SMEs around drivers, benefits, and issues. It also particularly enhances the sparse body of literature on IT support in schools and user perceptions. Areas for further research include investigating the use of metrics as a key factor in service improvement and the extent to which this is recognised and utilised and why or why not. Another area of focus revolves around the quantifiable measurement of classroom technology use and why this is rarely captured and analysed within the groups' organisations given the ongoing investment and resources devoted to technology. Examining why the

perceptions of the increased use of technology in class are stronger in those who do not have any means of measuring this is yet another fruitful avenue for investigation. Other topics worth exploring are looking at how the users of the IT service delivered within their SME organisation might prefer to obtain support for their use of technology in their professional roles alongside which, if any, alternate strategies the IT professionals might implement given sufficient resources. Finally, the frequency of avoidance of the Service Desk processes, by users and IT staff, and the response of IT Managers to this behaviour in other educational or professional SMEs would make an interesting and useful topic for investigation. While the results of this investigation were never intended to be generalisable to other SME organisations experience this research has the potential to add to that existing on ITIL service desk implementations in SME organisations in other industry sectors, especially not-for-profit organisations, and may provide data to support further investigation of the outcome of SMEs service processes as described in the standard AS 8018 - 2004 which could be of benefit to the enterprises, their customers and the wider industry. As has been noted earlier there has been a call for further research on this topic that adopts a broader approach in the design of the investigation (Cruz-Hinojosa & Gutiérrez-de-Mesa, 2016). Similarly, the need for further research with a deeper and cross-industry approach has also been deemed necessary (Cruz-Hinojosa & Gutiérrez-de-Mesa, 2016; B C Potgieter et al., 2005; Shang & Lin, 2010).This research study has the potential to be a small part of that broader and cross-industry approach, adding its findings to the limited body of research on ITIL in SMEs.

References

ACARA. (2011). NAP - Sample Assessments - ICT Literacy. Retrieved from http://www.nap.edu.au/NAP_Sample_Assessments/About_each_domain/ICT_Literacy/index.html

ACARA. (2012). *National Assessment Program – ICT Literacy Years 6 & 10 Report 2011*. Australian Curriculum, Assessment and Reporting Authority Retrieved from http://www.nap.edu.au/_Documents/PDF/NAP%20ICTL%202011%20Public%20Report%20Final.pdf.

ACARA. (2015). *National Assessment Program ICT Literacy Years 6 and 10 Report 2014*. Australian Curriculum and Assessment Reporting Authority Retrieved from http://www.nap.edu.au/verve/_resources/D15_8761__NAP-ICT_2014_Public_Report_Final.pdf.

Achterstraat, P. (2007). *Using Computers in Schools for Teaching and Learning Department of Education and Training Follow-up of 2000 Performance Audit*. Sydney: The Audit Office of New South Wales Retrieved from http://www.audit.nsw.gov.au/publications/reports/performance/2007/computers_schools/computers-contents.htm.

Ainley, J., & Searle, D. (2005). *Students in a Digital Age: Some Implications of ICT for Teaching and Learning*. Curriculum Corporation Retrieved from http://www.icttaskforce.edna.edu.au/icttaskforce/webdav/site/icttaskforcesite/users/root/public/Students_digital_age.pdf.

AIS NSW. (2016). School Statistics. Retrieved from https://www.aisnsw.edu.au/About/Pages/Statistics.aspx

Anderson, T. (2013). Research Paradigms: Ontology's, Epistemologies & Methods Slideshare.

Anthes, G. (2008, July 22). How to Get More out of ITIL with Version 3. Advice from users who have been around the track. *Computerworld*, 28-31.

APM Group Ltd. (2007). ITIL. Retrieved from http://www.itil-officialsite.com/home/home.asp

Axelos Global Best Practice. ITIL Value Proposition. Retrieved from https://www.axelos.com/Corporate/media/Files/Misc%20Qualification%20Docs/ITIL_Value_Proposition-(1).pdf

Axelos Global Best Practice. Key Benefits of ITIL Retrieved from https://www.axelos.com/best-practice-solutions/itil/key-benefits-of-itil

Axelos Global Best Practice. (2013). About Axelos. Retrieved from https://www.axelos.com/about-axelos

Axelos Global Best Practice. (2017). ITIL Practitioner Guiding Principles Checklist. Retrieved from https://www.axelos.com/Corporate/media/Files/ITIL-Practitioner-Guiding-Principles-Checklist.pdf

Axios Systems. (2008). ITIL Adoption Surges Despite Confusion. Retrieved from http://www.axiossystems.com/six/en/corporate/news/detail.php/211

Baer, T. (2008). IT adopts a service mentality. *Manufacturing Business Technology*, *26*(3), 44-46.

Bauer, J., & Kenton, J. (2005). Toward Technology Integration in the Schools: Why It Isn't Happening. *Journal of Technology & Teacher Education, 13*(4), 519-546.

Beachboard, J., Conger, S., Galup, S. D., Hernandez, A., Probst, J., & Venkataraman, R. (2007). AMCIS 2007 Panel on IT Service Management: IT Service Management in the IS Curriculum. *Communications of AIS, 2007*(20), 555-566.

BECTA. (2003). *What the research says about ICT support in schools*. Retrieved from http://webarchive.nationalarchives.gov.uk/20110219150409/https://www.education.gov.uk/publications/eOrderingDownload/15010MIG656.pdf

BECTA. (2005). FITS case study: Professional ICT management in Bolton schools. Retrieved from http://publications.becta.org.uk/display.cfm?resID=25913

BECTA. (2006). Evaluation of the Framework for ICT Technical Support (FITS). Retrieved from http://webarchive.nationalarchives.gov.uk/20110219150409/http://www.becta.org.uk/upload-dir/downloads/page_documents/research/evaluation_fits_jan06.pdf

BECTA. (n.d.). FITS - Role of Technical Support. Retrieved from http://webarchive.nationalarchives.gov.uk/20110219150409/http://becta.org.uk/tsas/index.cfm?refsect=ntss&bcsect=default&sect=fits&id=tt5091

Bell, B. (2006). Basic Research and Applied Research. Retrieved from http://www.psychologyandsociety.com/basicandappliedresearch.html

The Benefits of ITIL. (2008, August 2008). Retrieved from http://www3.pinkelephant.com/articles/TheBenefitsOfITILv26.pdf

Betcher, C. (2002). Things that make a difference. *ICTPD.NET*. Retrieved from http://ictpd.net/2008/08/things-that-make-a-difference/

Bian, H. (Producer). (2013, March 2017). Mixed Methods Research. Retrieved from http://core.ecu.edu/ofe/StatisticsResearch/mixed%20methods%20new.pdf).

Biersdorff, K. K. (2009). How many is enough? The quest for an acceptable survey response rate. Retrieved from https://kkbiersdorff.wordpress.com/2009/09/16/how-many-is-enough/

Bishop-Clark, C., Dietz-Uhler, B., & Fisher, A. (2007). The Effects of Personality on Web-based Distance Learning. *Educational Technology Systems, 35*(4), 491-506.

Brown, C. V. (2003). Performance Metrics for IT Human Resource Alignment. *Information Systems Management, 20*(4), 36-42.

Burke Johnson, R. (2014). *Mixed Methods Research Design and Analysis With Validity: A Primer* Retrieved from http://www.ph-weingarten.de/zesa/Prof._Dr._Burke_Johnson_Mixed_Methods_PRIMER.pdf

Burke Johnson, R., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher, 33*(7), 14-26.

Burke Johnson, R., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research, 1*(2), 112-133. doi:doi:10.1177/1558689806298224

Butler, D. L., & Sellbom, M. (2002). Barriers to Adopting Technology for Teaching and Learning. *Educause Quarterly, 2*, 22-28.

Carmichael, P., & Procter, R. (2006). Are we there yet? teachers, schools and electronic networks. *The Curriculum Journal, 17*(2), 167-186.

Cater-Steel, A., & Tan, W.-G. (2005). *Implementation of IT Infrastructure Library (ITIL) in Australia: Progress and success* Paper presented at the IT Governance International Conference Auckland, New Zealand.

Cater-Steel, A., Tan, W.-G., & Toleman, M. (2009). *Using Institutionalism as a lens to Examine ITIL Adoption and Diffusion.* Paper presented at the 20th Australasian Conference on Information Systems Melbourne, Australia.

Cater-Steel, A., & Toleman, M. (2007). Education for IT Service Management Standards *International Journal of IT Standards & Standardization Research, 5*(2), 27-41.

Cater-Steel, A., Toleman, M., & Tan, W.-G. (2006). *Transforming IT Service Management - the ITIL Impact*. Paper presented at the 17th Australasian Conference on Information Systems, Adelaide, Australia.

Cervone, F. (2008). ITIL: a framework for managing digital library services. *OCLC Systems & Services International digital library perspectives, 24*(2), 87-90. doi: https://doi.org/10.1108/10650750810875430

Chambers, S. M., Hardy, J. C., Smith, B. J., & Sienty, S. F. (2003). Personality Indicators and Emergency Permit Teachers' Willingness to Embrace Technology. *Journal of Instructional Psychology, 30*(3), 185-188.

Chen, W., & Hirschheim, R. (2004). A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information Systems Journal*(14), 197–235.

Cohen, L., & Manion, L. (2000). *Research methods in education* (5 ed.). Abingdon, OXON, UK: Routledge.

Collins, K., Onwuegbuzie, A. J., & Jiao, Q. G. (2007). A Mixed Methods Investigation of Mixed Methods Sampling Designs in Social and Health Science Research. *Journal of Mixed Methods Research, 1*(3).

Condie, R., Munro, B., Seagraves, L., & Kenesson, S. (2006). *The impact of ICT in schools –a landscape review*. Retrieved from http://webarchive.nationalarchives.gov.uk/20101017100205/http://research.becta.org.uk/upload-dir/downloads/page_documents/research/impact_ict_schools.pdf

Creswell, J. (2009). *Research Design Qualitative, Quantitative and Mixed Methods Approaches* (3rd ed.). Thousand Oaks, California: Sage Publications Inc.

Creswell, J., & Clark, V. (2010). *Designing and Conducting Mixed Methods Research* (2nd ed.). Thousand Oaks, California: Sage Publications Inc.

Creswell, J. W., & Plano Clark, V. L. (2011). Choosing a Mixed Methods DesignDesigning and Condcuting Mixed Methods Research (2nd ed., pp. 488). Thousand Oaks, California: Sage Publications Inc. Retrieved from https://www.sagepub.com/sites/default/files/upm-binaries/35066_Chapter3.pdf.

Cruz-Hinojosa, N. J., & Gutiérrez-de-Mesa, J. A. (2016). Literature review of the situation research faces in the application of ITIL in Small and Medium Enterprises. *Computer Standards & Interfaces, 48*(Supplement C), 124-138. doi:https://doi.org/10.1016/j.csi.2016.05.001

CSU. (2014). Doctor of Information Technology. Retrieved from http://www.csu.edu.au/courses/doctor-of-information-technology

Cuban, L. (1993). Computers Meet Classroom: Classroom Wins. *Teachers College Record, 95*(2), 185-210.

Dede, C. (2007). Reinventing the Role of Information and Communication Technologies in Education. In L. Smolin & K. Lawless (Eds.), *Information and Communication Technologies: Considerations of Current Practice for Teachers and Teacher Educators* (pp. 11-37). Hoboken, New Jersey: Wiley-Blackwell

DEEWR. (2008a). Digital Education Revolution - Overview. Retrieved from http://www.digitaleducationrevolution.gov.au/about.htm

DEEWR. (2008b). ICT infrastructure technical management. Retrieved from http://www.digitaleducationrevolution.gov.au/resources/guide/post/default.htm

DEEWR. (2011a). Digital Education Revolution Retrieved from http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/Pages/default.aspx

DEEWR. (2011b). The ICT Innovation Fund. Retrieved from http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/DigitalStrategyforTeachers/Pages/ICTInnovationFund.aspx

DEEWR. (2011c). National Secondary School Computer Fund. Retrieved from http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/ComputerFund/Pages/NationalSecondarySchoolComputerFundOverview.aspx

DEEWR. (2012). Computers for all Australian students in 2012 *Ministers' Media Centre Education, Employment and Workplace Relations portfolio.* Retrieved from http://ministers.deewr.gov.au/garrett/computers-all-australian-students-2012

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2005). *The Discipline and Practice of Qualitative Research* (3rd ed.). Thousand Oaks, California: Sage Publications Inc.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, Mail and Mixed-mode Surveys, The Tailored Design Method* (3rd ed.). Hoboken, New Jersey: John Wiley & Sons Inc.

Dillon, A., & Morris, M. (1996). User Acceptance of Information Technology: Theories and Models. *Annual Review of Information Science and Technology, 31*, 3-32.

Dorfman, P. (2008). ITIL 3: Executive validation for KM. (Cover story). *KM World, 17*(2), 1-17.

Draugalis, J. R., Coons, S. J., & Plaza, C. M. (2008). Best Practices for Survey Research Reports: A Synopsis for Authors and Reviewers. *American Journal of Pharmacy Education, 72*(1), 11.

Dugmore, J., & Taylor, S. (2008). ITIL® V3 and ISO/IEC 20000. Retrieved from http://www.best-management-practice.com/gempdf/ITIL_and_ISO_20000_March08.pdf

Dwyer, D. C. (1995). *Changing the Conversation about Teaching, Learning and Technology ~A Report on 10 Years of ACOT Research~*. Retrieved from http://images.apple.com/education/k12/leadership/acot/pdf/10yr.pdf

Ertmer, P. A. (1999). Addressing First and Second-Order Barriers to Change: Strategies for Technology Integration. *Educational Technology Research & Development 47*(4), 47-61.

Ertmer, P. A. (2005a). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.

Ertmer, P. A. (2005b). Teacher Pedagogical Beliefs: The Final Frontier in Our Quest for Technology Integration? *ETR&D, 53*(4), 25-39.

Ertmer, P. A., Addison, P., Lane, M., Ross, E., & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. *Journal of Research on Computing in Education, 32*(1), 54.

Ertmer, P. A., & Ottenbreit-Leftwich, A. (2013). Removing obstacles to the pedagogical changes required by Jonassen's vision of authentic technology-enabled learning. *Computers & Education, 64*, 175-182. doi:http://dx.doi.org/10.1016/j.compedu.2012.10.008

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423-435. doi:http://dx.doi.org/10.1016/j.compedu.2012.02.001

Fabry, D., & Higgs, J. (1997). Barriers to the Effective Use of Technology in Education: Current Status. *Journal of Educational Computing Research, 17*(4), 385-389.

Feilzer, M. Y. (2010). Doing Mixed Methods Research Pragmatically: Implications for the Rediscovery of Pragmatism as a Research Paradigm. *Journal of Mixed Methods Research, 4*(6).

FITS Foundation. (2011). Framework for ICT Technical Support. Retrieved from http://www.thefitsfoundation.org/thefitsfoundation/

FITS Foundation. (2016). Get The Most! From Your Technical Support. In T. F. Foundation (Ed.): The FITS Foundation.

FluidSurveys. (2014). Response Rate Statistics for Online Surveys -What Numbers Should You be Aiming For? Retrieved from http://fluidsurveys.com/university/response-rate-statistics-online-surveys-aiming/

Fogelman, K., & Comber, C. (2007). Surveys and Sampling. In A. R. Briggs & M. Coleman (Eds.), *Research Methods in Educational Leadership and Management* (2nd ed., pp. 125-141). City Road, London: SAGE Publications Ltd.

Fronheiser, R. (2006). *ITIL Capacity Management - More than Charts over Coffee*. Paper presented at the 32nd International Computer Measurement Group Conference, Reno, Nevada.

Gacenga, F. N. (2013). *A Performance Measurement Framework for IT Service Management.* (Doctor of Philosophy), University of Southern Queensland. Retrieved from https://eprints.usq.edu.au/23774/1/Gacenga_2013_whole.pdf

Gacenga, F. N., Cater-Steel, A., & Tan, W.-G. (2011). *Towards a Framework and Contingency Theory for Performance Measurement: A Mixed-Method Approach*. Paper presented at the Pacific Asia Conference on Information Systems (PACIS) 2011, Brisbane. http://aisel.aisnet.org/pacis2011/

Gacenga, F. N., Cater-Steel, A., & Toleman, M. (2010). An International Analysis of IT Service Management Benefits and Performance Measurement. *Journal of Global Information Technology Management, 13*(4), 28-28-63.

Galup, S. D., Dattero, R., Quan, J. J., & Conger, S. (2007). *Information Technology Service Management: An Emerging Area for Academic Research and Pedagogical Development*. Paper presented at the ACM-SIGMIS-CPR'07, St. Louis, Missouri, USA.

Galup, S. D., Dattero, R., Quan, J. J., & Conger, S. (2009). An Overview of IT Service Management. *Communications of the ACM, 52*(5), 124-127.

Gershon, P. (2008). *Review of the Australian Government's Use of Information and Communication Technology*. Canberra Retrieved from www.finance.gov.au/publications/ICT-Review/index.html.

Gobo, G. (2004). Sampling, representativeness and generalizability. In C. Seale, G. Gobo, J. F. Gubrium, & D. Silverman (Eds.), Qualitative research practice. City Road, London: Sage Publications Ltd. Retrieved from http://ggobors.ariel.ctu.unimi.it/repository/ggobors/sage2004.pdf.

Gov.UK. (n.d.). Building Schools for the Future factsheet. Retrieved from http://www.number10.gov.uk/output/Page5801.asp

Grainger, R., & Tolhurst, D. (2005). *Organisational Factors Affecting Teachers' Use and Perception of Information & Communications Technology*. Paper presented at the South East Asian Regional Computer Confederation (SEARCC), Sydney, Australia.

Granger, C. A., Morbey, M. L., Lotherington, H., Owston, R. D., & Wideman, H. H. (2002). Factors contributing to teachers' successful implementation of IT. *Journal of Computer Assisted Learning, 18*(4), 480-488. doi:doi:10.1046/j.0266-4909.2002.00259.doc.x

Greenfield, T. (2016, 18/02/2016). FITS Is Making A Difference. Retrieved from http://www.thefitsfoundation.org/

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. D. Y. S. Lincoln (Ed.), *Handbook of Qualitative Research* (pp. 105 - 117). Thousand Oaks, California: Sage Publications Inc.

Harcourt, T. (2000). Sydney, Dublin or Tel Aviv - who's next in the Knowledge Economy? Retrieved from http://www.austrade.gov.au/Sydney-Dublin-or-Tel-Aviv-Who-s-next-in-the-Knowledge-Economy-/default.aspx

Harper, B., & Milman, N. B. (2016). One-to-One Technology in K–12 Classrooms: A Review of the Literature From 2004 Through 2014. *Journal of Research on Technology in Education, 48*(2), 129-142. doi:10.1080/15391523.2016.1146564

Hayes, D. (2006). Making all the flashy stuff work: the role of the principal in ICT integration. *Cambridge Journal of Education, 36*(4), 565-578.

Hevner, A. R., Ram, S., March, S. T., & Park, J. (2004). Design Science in Information Systems Research. *MIS Quarterly, 28*(1), 75-105.

Hirschheim, R. A. (1992). Information Systems Epistemology: An Historical Perspective. In R. Galliers (Ed.), *Information Systems Research: Issues, Methods and Practical Guidelines* (pp. 28-60). London, UK: Blackwell Scientific Publications.

Hochstein, A., Zarnekow, M., & Brenner, W. (2005a, 29 March-1 April 2005). *ITIL as common practice reference model for IT service management: Formal assessment and implications for practice.* Paper presented at the 2005 IEEE International Conference on e-Technology, e-Commerce and e-Service, Hong Kong, China.

Hochstein, A., Zarnekow, R., & Brenner, W. (2004). ITIL as common practice reference model IT service management - Formal evaluation and implications for practice. *WIRTSCHAFTSINFORMATIK, 46*(5), 382-389.

Hochstein, A., Zarnekow, R., & Brenner, W. (2005b, June 13-15). *Evaluation of service-oriented IT management in practice.* Paper presented at the 2005 International Conference on Services Systems and Services Management, Chongqing, China.

Hodas, S. (1993). Technology Refusal and the Organizational Culture of Schools. *Education Policy Analysis Archives, 1*(10), 21.

Hoepfl, M. C. (1997). Choosing Qualitative Research: A Primer for Technology Education Researchers. *Journal of Technology Education, 9*(1).

Hollohan, R. (Producer). (2014, 11 November 2016). Mixed Methods (Convergent Parallel). Retrieved from https://prezi.com/j9sa5hyawlop/mixed-methods-convergent-parallel/

Hookway, C. (2013, May 11, 2016). Pragmatism. *TheStanford Encyclopedia of Philosophy.* Summer 2016. Retrieved from https://plato.stanford.edu/archives/sum2016/entries/pragmatism/

Hough, M. (2007). *Leading a Digital School - a Conference for School Leaders - Acquiring the Skills and Understanding*. Paper presented at the Leading a Digital School, Maroochydore, Queensland.

Howard, S. K., Chan, A., & Caputi, P. (2015). More than beliefs: Subject areas and teachers' integration of laptops in secondary teaching. *British Journal of Educational Technology, 46*(2), 360-369. doi:10.1111/bjet.12139

Howe, K., & Eisenhart, M. (1990). Standards for Qualitative (and Quantitative) Research: A Prolegomenon *Educational Researcher, 19*(4), 2-9.

Hu, P. J.-H., Clark, T. H. K., & Ma, W. (2003). Examining technology acceptance by school teachers: a longitudinal study. *Information and Management, 41*(2), 227-241.

Hubbert, E., O'Donnell, G., Kane, C., & Yates, S. (2008). Inquiry Spotlight: ITIL, Q4 2008. *Forrester Research.* Retrieved from http://www.forrester.com/rb/Research/inquiry_spotlight_itil%2C_q4_2008/q/id/47029/t/2

Iden, J. (2009). Implementing IT Service Management: Lessons Learned from a University IT Department. In C.-S. Aileen (Ed.), *Information Technology Governance and Service Management: Frameworks and Adaptations*. Hershey, PA, USA: IGI Global.

Iden J, & Langeland L. (2010). Setting the stage for a successful ITIL-adoption: A Delphi study of IT-experts in the Norwegian armed forces. *Information Systems Management, 27*(103).

Inan, F. A., & Lowther, D. L. (2010). Laptops in the K-12 classrooms: Exploring factors impacting instructional use. *Computers & Education, 55*(3), 937-944. doi:http://dx.doi.org/10.1016/j.compedu.2010.04.004

Information Technology Infrastructure Library (ITIL) Guide. (2017). Retrieved from http://www.itinfo.am/eng/information-technology-infrastructure-library-guide/

ITIL Central. (2005). A Short History of ITIL. Retrieved from http://itsm.fwtk.org/History.htm

ITIL Quick Guide. (2017). *Learn ITIL.* Retrieved from https://www.tutorialspoint.com/itil/itil_quick_guide.htm

JAPONITE. (2001). *A report on the employment of IT technicians in schools*. Joint Advisory Panel on Information Technology.

Jebeile, S., & Reeve, R. (2007). Explaining Intention to Use an Information Technology Innovation: An Empirical Comparison of the Perceived Characteristics of Innovating and Technology Acceptance Models. *Australasian Journal of Information Systems, 15*(1), 137-151.

Jia, R., Reich, B. H., & Pearson, J. M. (2008). IT Service Climate: An Extension to IT Service Quality Research. *Journal of the Association for Information Systems, 9*(5), 294-320.

Jing, L. E. I. (2010). Conditions for Ubiquitous Computing: What Can Be Learned from a Longitudinal Study. *Computers in the Schools, 27*(1), 35-53. doi:10.1080/07380560903536264

John, P. (2005). The sacred and the profane: subject, culture, pedagogical practice and teachers' perceptions of the classroom uses of ICT. *Educational Review, 57*(4), 471-490.
John, W. R. (2003). Stepping Out of the Box: Rethinking the Failure of ICT to Transform Schools. *Journal of Educational Change, 4*(4), 323-344.
Johnson, M., Hately, A., Miller, B., & Orr, R. (2007). Evolving standards for IT service management. *IBM Systems Journal, 46*(3), 583-597.
Jones, A. (2004a). *A Review of the Research Literature on Barriers to the Uptake of ICT by Teachers*. Retrieved from http://partners.becta.org.uk/page_documents/researc/barriers.pdf
Jones, A. (2004b). *A review of the Research Literature on Barriers to the Uptake of ICTT by Teachers*. Retrieved from
Joslyn, C. (2000). Principia Cybernetica Web. *Principia Cybernetica.* Retrieved from http://pespmc1.vub.ac.be/ASC/TECHNOLOGY.html
Karthikeyan, P., & Manjula, K. A. (2010). Research Framework:Paradigms in Information Science Research. *Global Journal of Management and Business Research, 10*(5).
Keel, A. J., Orr, M. A., Hernandez, R. R., Patrocinio, E. A., & Bouchard, J. (2007). From a technology-oriented to a service-oriented approach to IT management. *IBM Systems Journal, 46*(3), 549-564.
King, J. (2012). The Upside of Shadow IT. *Information Age, July/August 2012*, 24.
Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education, 59*(4), 1109-1121. doi:http://dx.doi.org/10.1016/j.compedu.2012.05.014
Krueger, K. (2006). Singapore's Leadership on ICT in Education. Retrieved from http://www.cosn.org/MT/mt-tb.cgi/26
Lahtela, A., & Jäntti, M. (2010). *Improving IT Service Management Processes: A Case Study on IT Service Support.* Paper presented at the 17th European Conference, EuroSPI 2010 Systems, Software and Services Process Improvement, Grenoble, France.
Lamshed, R. (2009). *Hot topic: ICT teaching and learning support services* Dulwich, SA: Education.au Limited Retrieved from http://www.educationau.edu.au/jahia/webdav/site/myjahiasite/shared/SICTAS/SICTAS_HT_ictsupport.pdf.
Levin, T., & Wadmany, R. (2006). Teachers' Beliefs and Practices in Technology-based Classrooms: A Developmental View. *Journal of Research on Technology in Education, 39*(2), 157 -181.
Lim, C. P., & Khine, M. S. (2006). Managing Teachers' Barriers to ICT Integration in Singapore Schools. *Journal of Technology & Teacher Education, 14*(1), 97-125.
Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, California: Sage Publications Inc.
Lloyd, M., & Albion, P. (2005). *Mistaking the Tool for the Outcome: Using Activity System Theory to Understand the Complexity of Teacher Technophobia.* Paper presented at the Proceedings Society for

Information Technology and Teacher Education International Conference (SITE), Phoenix, Arizona. http://eprints.qut.edu.au/archive/00003847

Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues In Educational Research, 16*(2), 193 - 205.

Marian, D. (2016). The Correspondence Theory of Truth *The Stanford Encyclopedia of Philosophy.* Fall 2016. Retrieved from <https://plato.stanford.edu/archives/fall2016/entries/truth-correspondence/>.

Marrone, M. (2009). ITIL: State of the Nation Survey Findings. Retrieved from http://www.hornbill.com/campaigns/itil-state/_files/ITIL-State-of-the-Nation-Survey.pdf

Marrone, M. (2010). *Searching for Mechanisms of Knowledge Integration in IT Operational Frameworks: The Case of ITIL.* Paper presented at the Proceedings of SIGSVC Workshop 31st International Conference on Information Systems, St Louis, Missouri, USA.

Marrone, M., Gacenga, F., Cater-Steel, A., & Kolbe, L. (2014). IT Service Management: A Cross-national Study of ITIL Adoption. *Communications of the Association for Information Systems, 34*.

Marrone, M., Gacenga, F. N., Cater-Steel, A., & Kolbe, L. M. (2014). IT Service Management: A Cross-national Study of ITIL Adoption. *Communication of the Association for Information Systems, 34*(1).

Marrone, M., & Kolbe, L. M. (2010a, 23 - 25 February, 2010). *Providing More than Just Operational Benefits: An Empirical Research* Paper presented at the Multikonferenz WIRTSCHAFTSINFORMATIK 2010, Göttingen, Germany

Marrone, M., & Kolbe, L. M. (2010b). Uncovering ITIL claims: IT executives' perception on benefits and Business-IT alignment. *Information Systems and E-Business Management, 9*(3), 363-380. doi:10.1007/s10257-010-0131-7

Marrone, M., & Kolbe, L. M. (2011a). Impact of IT Service Management Frameworks on the IT Organization. An Empirical Study on Benefits, Challenges, and Processes. *WIRTSCHAFTSINFORMATIK, 53*(1), 5-19. doi:10.1007/s11576-010-0257-8

Marrone, M., & Kolbe, L. M. (2011b). Impact of IT Service Management Frameworks on the IT Organization. *Business & Information Systems Engineering, 3*(1), 5-18. doi:10.1007/s12599-010-0141-5

Martela, F. (2015). Fallible Inquiry with Ethical Ends-in-View: A Pragmatist Philosophy of Science for Organizational Research. *Organization Studies, 36*(4), 537-563.

McBride, N. (2009). A Model for IT Service Strategy. In C.-S. Aileen (Ed.), *Information Technology Governance and Service Management: Frameworks and Adaptations*. Hershey, PA, USA: IGI Global.

MCEECDYA. (2010). *National Assessment Program – ICT Literacy Years 6 & 10 Report 2008*. Curriculum Corporation Retrieved from www.mceecdya.edu.au/verve/_resources/NAP-ICTL_2008_report.pdf.

MCEETYA. (1999). *The Adelaide Declaration on National Goals for Schooling in the Twenty-First Century*. The Secretary, MCEETYA Retrieved from http://www.mceetya.edu.au/mceetya/nationalgoals/natgoals.htm.

MCEETYA. (2005a). *Building a Knowledge Culture An Education and Training Action Plan for the Information Economy*. Curriculum Corporation Retrieved from http://www.aictec.edu.au/aictec/webdav/site/standardssite/shared/Action_Plan_2005_2006.pdf.

MCEETYA. (2005b). *National Assessment Program Information and Communication Technology Literacy 2005 Years 6 and 10 An Assessment Domain for ICT Literacy*. Retrieved from http://www.mceetya.edu.au/verve/_resources/ict_assessment_domain_file.pdf.

MCEETYA. (2007). *National Assessment Program – ICT Literacy Years 6 & 10 Report 2005*. Curriculum Corporation Retrieved from http://www.curriculum.edu.au/verve/_resources/NAP_ICTL_2005_Years_6_and_10_Report.pdf.

MCEETYA. (2008a). *Digital education - making change happen*. Retrieved from www.aictec.edu.au/aictec/webdav/site/standardssite/shared/Digital_Education_Framework_Draft.pdf -.

MCEETYA. (2008b). *Joint Ministerial Statement on Information and Communications Technologies in Australian Education and Training: 2008-2011*. Retrieved from http://www.aictec.edu.au/aictec/webdav/site/standardssite/shared/JMS%20on%20ICT%20in%20Australian%20Education%20and%20Training.pdf.

McIntosh, D. (2012). Need for Change. *Information Age, July/August 2012*, 10.

McKenzie, J. (1998). Creating Learning Cultures with Just-in-Time Support Retrieved from http://staffdevelop.org/adult.html

McNaughton, B., Ray, P., & Lewis, L. (2010). Designing an evaluation framework for IT service management. *Information & Management, 47*(4), 219-225. doi:10.1016/j.im.2010.02.003

Merriam-Webster. (2005). Merriam-Webster Online Dictionary. Retrieved from http://www.merriam-webster.com/dictionary/teach

Mertens, D. M. (2005). *Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches.* (2nd ed.). Thousand Oaks, California: Sage Publications, Inc.

Millea, J., & Galatis, H. (2009). collaboration in teaching & learning Retrieved from http://www.educationau.edu.au/jahia/webdav/site/myjahiasite/shared/SICTAS/2009_SICTAS_CTL.pdf

Mohamed, M. S., Ribiere, V. M., O'Sullivan, K. J., & Mohamed, M. A. (2008). The re-structuring of the information technology infrastructure library (ITIL) implementation using knowledge management framework.

VINE: The journal of information and knowledge managment systems, 38(3), 315-333.
Morgan, D. L. (2007). Paradigms Lost and Pragmatism Regained. *Journal of Mixed Methods Research, 1*(1), 48-76. doi:10.1177/2345678906292462
Mosesa, P., Bakarb, K. A., Mahmudb, R., & Wong, S. L. (2011, 17-20 December 2011). *ICT infrastructure, technical and administrative support as correlates of teachers' laptop use.* Paper presented at the UKM Teaching and Learning Congress 2011, Pulau Pinang, Malaysia
Moss, M. L. (n.d.). Anthropology 150 - Glossary. Retrieved from http://darkwing.uoregon.edu/~mmoss/GLOSSARY.HTM
Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. *Computers & Education, 51*(4), 1523-1537. doi:http://dx.doi.org/10.1016/j.compedu.2008.02.003
Mumtaz, S. (2000). Factors affecting teachers' use of information and communication technology: a review of the literature. *Journal of Information Technology for Teacher Education, 9*(3), 319-341.
Murray, J., & Phillips, G. (2000, 21 October 2000). Technology in Learning and Teaching (TILT) and TILT PLUS. Retrieved from http://nw2000.flexiblelearning.net.au/talkback/p128.htm
NCREL. (2006, 8 April, 2007). E-Learning Synthesis: Instructional Technology Systems. Retrieved from http://www.ncrel.org/tech/elearn/techsys.htm
Neal, D. (2008, 6 November 2008). Are best practises overrated? *Computing, 29*, 3.
Newhouse, C. P. (2014). Learning with portable digital devices in Australian schools: 20 years on! *Australian Educational Research, 41*, 471-483. doi:10.1007/s13384-013-0139-3
Northern California ITSMF. (n.d.). A History of ITIL and itSMF. Retrieved from http://www.norcalitsm.com/history.htm
Norton, S., McRobbie, C. J., & Cooper, T. J. (2000). Exploring Secondary Mathematics Teachers' Reasons for Not Using Computers in Their Teaching: Five Case Studies. *Journal of Research on Computing in Education, 33*(1), 87.
Nov, O., & Ye, C. (2008). Users' Personality and Perceived Ease of Use of Digital Libraries: The Case for Resistance to Change. *Journal of the American Society for Information Science and Technology, 59*(5), 845-851.
NSW Audit Office. (2000). *Computers in Schools*. Retrieved from http://www.audit.nsw.gov.au/publications/reports/performance/2000/education/introduction.html.
NSW Department of Education and Training. (2009). One-to-one computing: literature review. Retrieved from https://www.det.nsw.edu.au/policiesinter/category.do?level=Schools
NSW DET. (2002). 11,250 More computers on the way to NSW schools. Retrieved from https://www.det.nsw.edu.au/newsroom/yr2002/jun/new_computer.htm

Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: what can be done? *Assessment & Evaluation in Higher Education, 33*(3), 301-314.

The NVivo Guide to Mixed Methods. (n.d.). Retrieved from https://qsrinternational.com/MediaLibraries/QSR/QSR-Media/NVivo-guide-to-mixed-methods_Final.pdf

OECD. (2015). *Students, Computers and Learning*. Paris, France: OECD Publishing.

OECD. (2016). *Skills Matter: Further Results from the Survey of Adult Skills* Paris: OECD Publishing.

Ofsted. (2004). *ICT in schools 2004: The impact of government initiatives five years on*. (HMI 2050). Ofsted Publications Centre Retrieved from http://ofsted3.openanswers.com/Ofsted-home/Publications-and-research/Browse-all-by/Education/Curriculum/Information-and-communication-technology/Primary/ICT-in-schools-2004-the-impact-of-government-initiatives-five-years-on.

OGC. (2009). ITIL. Retrieved from http://webarchive.nationalarchives.gov.uk/20091003081024/http://www.ogc.gov.uk/guidance_itil_4672.asp

OGC Mandate for Change Project requirements for an update to the ITIL® core publications. (2009). Retrieved from http://www.itilnews.com/uploaded_files/ITIL_Mandate_for_Change_0909.pdf

Onwuegbuzie, A. J., & Collins, K. (2007). A Typology of Mixed Methods Sampling Designs in Social Science Research *The Qualitative Report, 12*(2), 281-316.

Onwuegbuzie, A. J., & Leech, N. L. (2004). Enhancing the Interpretation of "Significant" Findings: The Role of Mixed Methods Research. *The Qualitative Report, 9*(4), 770-792.

Onwuegbuzie, A. J., & Leech, N. L. (2006). Linking Research Questions to Mixed Methods Data Analysis Procedures. *The Qualitative Report, 11*(3), 474-498.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research, 2*(1), 1-28.

Orlikowski, W. J., & Gash, D. C. (1993). Technological Frames: Making Sense of Information Technology in Organizations. *ACM Transactions on Information Systems*.

Ottenbreit-Leftwich, A. T., Glazewski, K. D., Newby, T. J., & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: Addressing professional and student needs. *Computers & Education, 55*(3), 1321-1335. doi:http://dx.doi.org/10.1016/j.compedu.2010.06.002

Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods* (Third ed.). Thousand Oaks, California: Sage Publications Inc.

Patton, M. Q. (2015). *Qualitative Research & Evaluation Methods: Integrating Theory and Practice* (Fourth ed.). Thousand Oaks, California: Sage Publications Inc.

Pollard, C., & Cater-Steel, A. (2009). Justifications, Strategies, and Critical Success Factors in Successful ITIL Implementations in U.S. and Australian Companies: An Exploratory Study. *Information Systems Management, 26*(2), 164-175. doi:10.1080/10580530902797540

Potgieter, B. C. (2004). *Change and innovation we expect of ICT teaching staff* Paper presented at the Proceedings of the sixth conference on Australasian computing education - Volume 30 Dunedin, New Zealand

Potgieter, B. C., Lew, C., & Botha, J. H. (2005). *Evidence that use of the ITIL framework is effective.* Paper presented at the 18th Annual Conference of the National Advisory Committee on Computing Qualifications, Tauranga, NZ.

Praeg, C. P., & Schnabel, U. (2006). *IT-Service Cachet – Managing IT-service performance and IT-service quality* Paper presented at the 39th Hawaii International Conference on System Sciences Hawaii.

Pultorak. *introducing ITIL® 2011 Edition Key Facts for Practitioners*. Retrieved from Seattle, WA https://www.scribd.com/document/91632270/Pultorak-ITIL-2011-Edition-Key-Facts-for-Practitioners-Final

Pultorak. (n.d.). *introducing ITIL® 2011 Edition Key Facts for Practitioners*. Retrieved from Seattle, WA https://www.scribd.com/document/91632270/Pultorak-ITIL-2011-Edition-Key-Facts-for-Practitioners-Final

Queensland Government Statistician's Office. (2017). *Survey methods*. Retrieved from http://www.qgso.qld.gov.au/about-statistics/survey-methods/.

Ratcliffe, D. (2004). *The World of IT Service Management - the Past, Present & Future of ITIL*. Paper presented at the itSMF LIG Meeting, Houston.

Robertson, J. W. (2003). Stepping Out of the Box: Rethinking the Failure of ICT to Transform Schools. *Journal of Educational Change, 4*, 323-344.

Rodriguez, G., & Knuth, R. (2000). Critical Issue: Providing Professional Development for Effective Technology Use. Retrieved from http://ncrel.org/sdrs/areas/issues/methods/technlgy/te1000.htm

Rolfe, G. (2004). Validity, trustworthiness and rigour: quality and the idea of qualitative research. *Journal of Advanced Nursing, 53*(3), 304-310.

Rooney, D. (1996). A Contextualising, Socio-Technical Definition of Technology: Learning from Ancient Greece and Foucault. Retrieved from http://www.acro.edu.au/rooneySOCIOTECH.pdf

Scheeruhn, H.-J., Reinboth, C., & Habel, T. (2006). *The Use of ITIL for Process Optimisation in the IT Service Centre of Harz University, exemplified in the Release Management Process.* Retrieved from Wernigerode, Germany: https://arxiv.org/ftp/arxiv/papers/0705/0705.2351.pdf

Scrimshaw, P. (2004). *Enabling Teachers to Make Successful Use of ICT*. Retrieved from http://webarchive.nationalarchives.gov.uk/20040117052759/http://www.becta.org.uk/page_documents/research/enablers.pdf

Sekaran, U., & Bougie, R. (2013). *Research method for business: A skill building approach* (6th ed.). Chichester, West Sussex, United Kingdom: John Wiley & Sons Ltd.

Shackleton, P., & Bentley, J. (2008). *On the Road to ITIL: Certification in an Australian undergraduate degree.* Paper presented at the Information Systems Education Conference 2008, Phoenix.

Shang, S. S. C., & Lin, S.-F. (2010). Barriers to Implementing ITIL - A Multi-Case Study on the Service-based Industry. *Contemporary Management Research, 6*(1), 53-72.

Smith, B., Munday, R., & Windham, R. (1995). Prediction of teachers' use of technology based on personality type. *Journal of Instructional Psychology, 22*(3).

Somekh, B., & Lewin, C. (2005). *Research Methods in the Social Sciences*. Thousand Oaks, California: Sage Publications Inc.

Spremic, M., Zmirak, Z., & Kraljevic, K. (2008, 23-26 June 2008). *IT and business process performance management: Case study of ITIL implementation in finance service industry.* Paper presented at the Information Technology Interfaces, 2008. ITI 2008. 30th International Conference on Information Technology Interfaces Cavtat/Dubrovnik, Croatia.

Sulla, N. (1998). Winning Teachers Over - How you can battle resistance to technology and win. *Electronic School*(March 1998).

Sung Hee, P., & Ertmer, P. A. (2007). Impact of Problem-Based Learning (PBL) on Teachers' Beliefs Regarding Technology Use. *Journal of Research on Technology in Education, 40*(2), 247-267.

Tashakkori, A., & Teddlie, C. (2003). Major Issues and Controversies in the Use of Mixed Methods in the Social and Behavorial Sciences. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social & behavioral research* (pp. 912). Thousand Oaks, California: Sage Publications Inc.

Tearle, P. (2003). ICT implementation: what makes the difference? *British Journal of Educational Technology, 34*(5), 567-583.

Tearle, P. (2004a). *Final Report February 2004*. Retrieved from https://pdfs.semanticscholar.org/a1cb/c410f1944cbab25e820676c7fd6bb240b78f.pdf

Tearle, P. (2004b). A Theoretical and Instrumental Framework for Implementing Change in ICT in Education. *Cambridge Journal of Education, 34*(3).

Technology Counts 2007: Looking Back, Looking Ahead. (2007). *A Digital Decade. Education Week:* . Vol. 26, Issue 30. Retrieved from http://www.edweek.org/ew/articles/2007/03/29/30intro.h26.html?qs=Education+Week:+Technology+Counts+2007:+Looking+Back,+Looking+Ahead.

Teddlie, C., & Tashakkori, A. (2006). A General Typology of Research Designs Featuring Mixed Methods. *RESEARCH IN THE SCHOOLS, 13*(1), 12-28.

Teddlie, C., & Tashakkori, A. (2009). *Foundations of Mixed Methods Research*. Thousand Oaks, California: Sage Publications Inc.

Teddlie, C., & Yu, F. (2007). Mixed Methods Sampling: A Typology With Examples. *Journal of Mixed Methods Research, 1*(1), 77-100. doi:10.1177/2345678906292430

Thayer, H. S., & Rosenthal, S. B. (2009, 6-4-2009). Pragmatism. *Philosophy*. Retrieved from https://www.britannica.com/topic/pragmatism-philosophy/Evaluation-of-pragmatism

The Cabinet Office. (2011). *ITIL 2011 Summary of Updates*. Norwich, Norfolk: The Stationery Office Limited Retrieved from https://www.itsmf.ca/documents/show.php/19139/ITIL_2011_Summary_of_Updates.pdf.

Thibodeau, P. (2007). ITIL Gets The Hard Sell-By IT Execs. *Computerworld, 41*(41), 14-18.

Tiong, C. I., Cater-Steel, A., & Tan, W.-G. (2009). Measuring Return on Investment from Implementing ITIL: A Review of the Literature. In C.-S. Aileen (Ed.), *Information Technology Governance and Service Management: Frameworks and Adaptations*. Hershey, PA, USA: IGI Global.

Tongco, M. D. C. (2007). Purposive Sampling as a Tool for Informant Selection. *Ethnobotany Research and Applications, 5*, 147-158.

Veal, A. J. (2005). *Business Research Methods. A Managerial Approach* (2nd ed.). South Melbourne, Victoria, Australia: Pearson Addison Wesley.

Venkatesh, V. (2000). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. *Information Systems Research, 11*(4), 342.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science, 46*(2), 186.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information technology: Toward A Unified view. *MIS Quarterly, 27*(3), 425-478.

Verghis, P. (2006). Beyond ITIL: the Cultural Dynamics of IT Service Management, 16. Retrieved from http://www.verghisgroup.com/wp-content/uploads/2008/02/phil-verghis-cultural-booklet.pdf

Walsham, G. (1995). Interpretive case studies in IS research: nature and method. *European Journal of Information Systems, 4*(2), 74-81.

What are the top 5 benefits of using ITIL? (2017). Retrieved from http://www.connectsphere.com/resource/articles/top-5-benefits-of-using-itil

Wiersma, W. (n.d.). The Validity of Surveys: Online and Offline Retrieved from http://papers.wybowiersma.net/abstracts/Wiersma,Wybo,The_validity_of_surveys_online_and_offline.pdf

Wui-Ge, T., Cater-Steel, A., & Toleman, M. (2009). Implementing IT Service Management: A Case Study Focusing on Critical Success Factors. *Journal of Computer Information Systems, 50*, 1-12.

Zakopoulos, V. (2005). An Evaluation of the Quality of ICT Teaching within an ICT-rich Environment: The Case of Two Primary Schools. *Education and Information Technologies, 10*(4), 323-340.

Zhao, Y. (2008). What Knowledge Has the Most Worth? *School Administrator, 65*(2), 20.

Zhao, Y., & Cziko, G. (2001). Teacher adoption of technology. *Journal of Technology & Teacher Education, 9*(1), 5-30.

Zhao, Y., & Frank, K. A. (2003). Factors Affecting Technology Uses in Schools: An Ecological Perspective. *American Educational Research Journal*, 62. Retrieved from https://www.msu.edu/user/kenfrank/papers/Factors%20affecting%20technology%20uses%20in%20schools.pdf

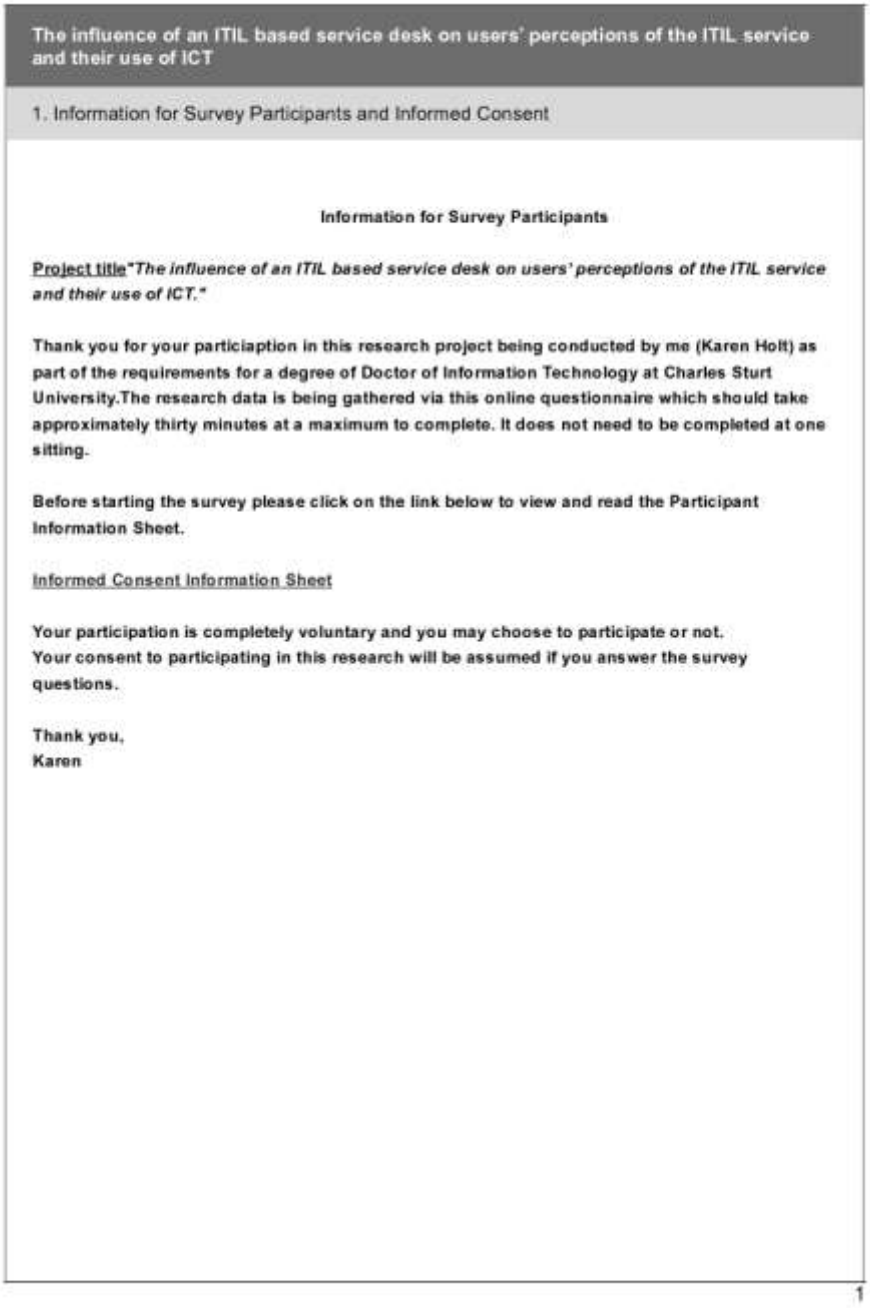
Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). Conditions for Classroom Technology Innovations. *Teachers College Record, 104*(3), 34. Retrieved from http://homepage.mac.com/uumangay/.Public/38_10850.pdf

Zheng, B., Warschauer, M., Lin, C.-H., & Chang, C. (2016). Learning in One-to-One Laptop Environments: A Meta-Analysis and Research Synthesis. *Review of Educational Research, XX*(X), 1-33. doi:10.3102/0034654316628645

Zuber, E. N., & Anderson, J. (2013). The initial response of secondary mathematics teachers to a one-to-one laptop program. *Mathematics Education Research Journal, 25*(2), 279-298.

Appendix

Survey Questionnaire – Survey Monkey



The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

1. Information for Survey Participants and Informed Consent

Information for Survey Participants

Project title ***"The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT."***

Thank you for your particiaption in this research project being conducted by me (Karen Holt) as part of the requirements for a degree of Doctor of Information Technology at Charles Sturt University.The research data is being gathered via this online questionnaire which should take approximately thirty minutes at a maximum to complete. It does not need to be completed at one sitting.

Before starting the survey please click on the link below to view and read the Participant Information Sheet.

Informed Consent Information Sheet

Your participation is completely voluntary and you may choose to participate or not.
Your consent to participating in this research will be assumed if you answer the survey questions.

Thank you,
Karen

1

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

2.

1. What is your gender?

- Female
- Male
- Prefer not to answer

2. Which category below includes your age?

- 18 - 33
- 34 - 49
- 50 - 65
- 66+
- Prefer not to answer

3. Do you work in the IT area of your organisation?

- Yes
- No

4. What is your job title?

5. What is your professional background?

Other (please specify)

2

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

3.

6. Do you manage a team of IT staff or are you a team member?

- Manage
- Team member

7. How many IT staff in the team?

8. Are any staff dedicated to user support and/or service desk/help desk duties?

- Yes
- No

9. If you answered yes to Q8, how many staff?

10. If you answered no to Q8, who supports the organisation's users?

11. How many users do you support?

12. How many user devices do you support?

13. How many servers (physical and virtual) do you support?

14. Describe your organisation.

Staff numbers	
Student numbers	
Location	
State	

3

15. School type

- [ ] Government
- [ ] Private
- [ ] Faith based
- [ ] Non-demoninational
- [ ] K - 2
- [ ] K - 6
- [ ] K - 12
- [ ] 7 - 12
- [ ] Senior college
- [ ] Day
- [ ] Boarding
- [ ] Day and boarding
- [ ] Other

4

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

4.

16. Annual IT budget

Operational expenditure

Capital expenditure

17. Have you heard of ITIL or FITS?

- Yes
- No

18. Do you or any of the IT team have any ITIL qualification or have studied or attended ITIL training?

- [ ] Yes - qualification ITIL v2
- [ ] Yes - qualification ITIL v 3
- [ ] Yes - other qualification
- [ ] No - qualification
- [ ] Yes - study/course
- [ ] No - study/course

Other (please specify)

19. Do you or your organisation look for ITIL knowledge, experience, training or certification when employing IT staff?

- Yes
- No

20. Have you implemented an ITIL or FITS based Service Desk process at your organisation?

- Yes
- No
- Intending to/planning

5

21. How long ago did you implement the Service Desk function?

- < 6 months
- 6 - 12 months
- 1 - 2 years
- 3 -5 years
- > 5 years
- No Service Desk

22. How was the implementation carried out?

- Business case, budget funded, project manager - external consultancy involvement
- Business case, budget funded, project manager - no external consultancy
- Informal ICT team project, planned, not funded
- Ad hoc evolution within ICT team, not a project, not planned, not funded
- Not applicable - no implementation of Service Desk

6

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

5.

23. What were the drivers for the Service Desk implementation?

24. Do you use software to manage the Service Desk process and function?

Yes: ITIL based Name:

Yes: Non-ITIL based Name:

No: Email and/or telephone

No: Other - please specify

25. Do you use metrics to measure service delivery, service desk performance or IT usage?

- Yes
- No

26. If you answered yes to Q25, please tick which metrics are used from the list below (choose all that apply).

- Number of calls received
- Number of calls missed
- Number of calls logged
- Percentage number of incidents compared to incoming calls
- Percentage number of repeat calls for the same incident
- Percentage of incidents resolved by the help desk

7

- [ ] Percentage of operations support requests closed
- [ ] The elapsed time to follow up and resolve issues
- [ ] Mean time to achieve incident resolution
- [ ] Number of calls escalated
- [ ] Results of customer satisfaction surveys
- [ ] Number of complaints and compliments
- [ ] Actual spend against budget
- [ ] Percentage of incidents defined as problems
- [ ] Number of problems logged
- [ ] Percentage of problems escalated
- [ ] Number of problems fixed
- [ ] Resolution times with respect to service level agreements
- [ ] Number of problems outstanding
- [ ] Hardware, software and help desk support, response and performance
- [ ] Agreed service hours, per service
- [ ] Total down time per service
- [ ] Response times per incident
- [ ] Time taken to repair per incident
- [ ] Actual availability
- [ ] Reliability compared to expectations
- [ ] Utilisation statistics
- [ ] Business usage trends
- [ ] Network usage trends
- [ ] Historical data on incidents, problems, emergencies and disasters
- [ ] Other (please specify)

8

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

6.

27. If you answered no to Q25, how do you measure service delivery, performance of the service desk or IT usage?

- ( ) We don't measure or report on any of those areas
- ( ) We use different criteria to measure and/or report on some or all of those areas

Please describe your criteria

28. Do you require all requests for any service offered by ICT to be logged via the service desk either by a web interface, phone or email?

- ( ) Yes
- ( ) No

29. If you answered yes to Q28, do any staff regularly try to go around the service desk process and seek assistance in other ways?

1: Yes: How many and how often?

2: How do you handle these requests and the users who try to avoid the service desk process?

3: Do you try to minimise the number of requests that are outside the service desk process?

9

30. If you answered no to Q28, what are your reasons for not using a mechanism for logging service desk requests?

31. Please describe how the ICT staff accepted the adoption of the Service Desk processes. Were they supportive of the Service Desk function and the process?

32. Do IT staff ensure all requests are logged?

- Yes
- No

Why or Why not?

10

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

7.

33. Are all the users supportive of the Service Desk process for obtaining support and assistance?

Yes: Why? Please list reasons

No: Why Not? Please list reasons

34. Do you have any means of measuring the use of technology in teaching in the classroom?

- Yes
- No

35. If you answered yes to Q34, please describe how you measure this.

36. Can you show through metrics or do you think from your experience that the use of ICT in teaching in the classroom has;

- Increased over the last seven years
- Decreased over the last seven years
- Stayed much the same as it was seven years ago

37. Did the implementation of the Service Desk function and process have any effect on the use of ICT in the classroom?

- Yes - a positive effect
- Yes - a negative effect
- No - no effect at all
- N/A - Service Desk function not implemented

11

38. In what way has the use of ICT in teaching in the classroom been affected by the Service Desk function and process?

39. Has the implementation of a Service Desk function had an effect on other uses of technology in your organisation?

40. If you had the opportunity for a green field implementation would you use an ITIL based Service Desk function and process for user support and requests?

Yes. Why?

No. Why not?

If no, what would you do instead?

41. Do you think or feel that the users' perceptions of the IT service you deliver and of the IT team in general was or is impacted at all by the Service Desk process?

The influence of an ITIL based service desk on users' perceptions of the ITIL service and their use of ICT

8.

42. Do you currently use or have you implemented in the past any other ITIL functions and processes?

- Yes, currently.
- Yes, in the past
- No

If yes whether now or in the past, please list which functions and processes were implemented.

43. Do you think that the Service Desk function is the primary interface (point of contact) between the IT team and the organisation's users?

- Yes
- No

Regardless of your answer above please elaborate on what you think is the primary interface?

44. Do you think that the role of the IT Service Desk is to increase the use of technology or help users use technology better or in more innovative ways?

Yes. Please comment.

No. Please comment.

13

45. Please describe your feelings about user support in general and ITIL in particular

14

Descriptive and exploratory statistical test results from SPSS

Tests of Normality

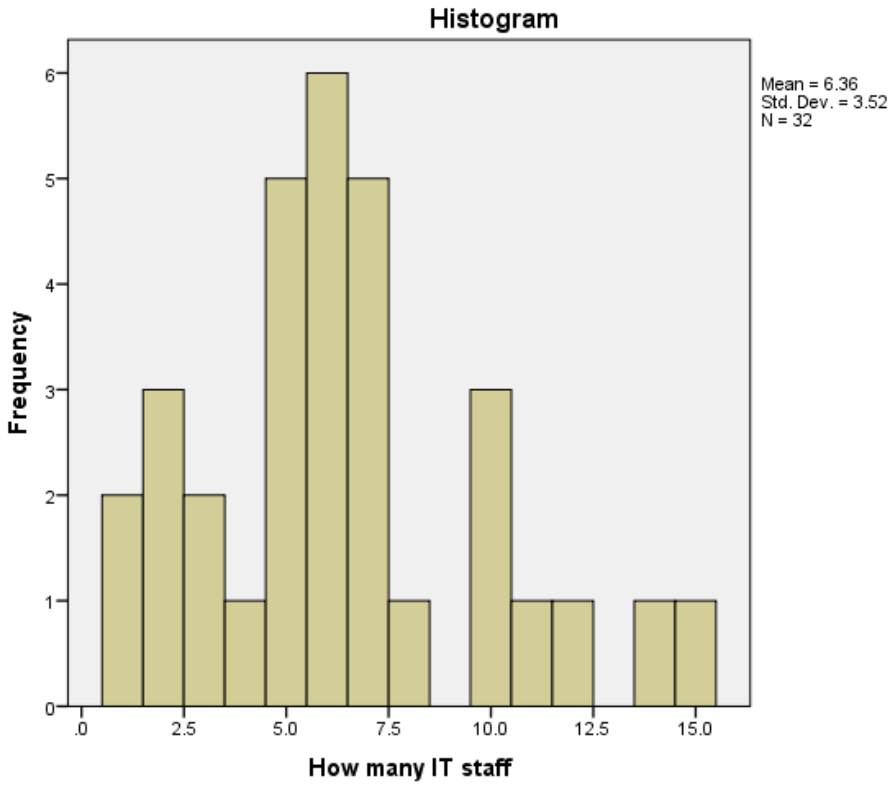
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
How many IT staff	.178	3	.0	.943	3	.0
	78	2	11	43	2	90
User devices supported	.140	3	.1	.957	3	.2
	40	2	13	57	2	30
Servers supported	.175	3	.2	.943	3	.0
	16	2	00*	31	2	41
Staff numbers	.253	3	.0	.806	3	.0
	80	2	00	91	2	00
Student numbers	.196	3	.0	.944	3	.0
	96	2	03	44	2	94
Annual IT budget-OPEX	.200	3	.0	.891	3	.0
	00	2	02	91	2	04
Annual IT budget-CAPEX	.220	3	.0	.881	3	.0
	20	2	00	01	2	00

*. This is a lower bound of the true significance.

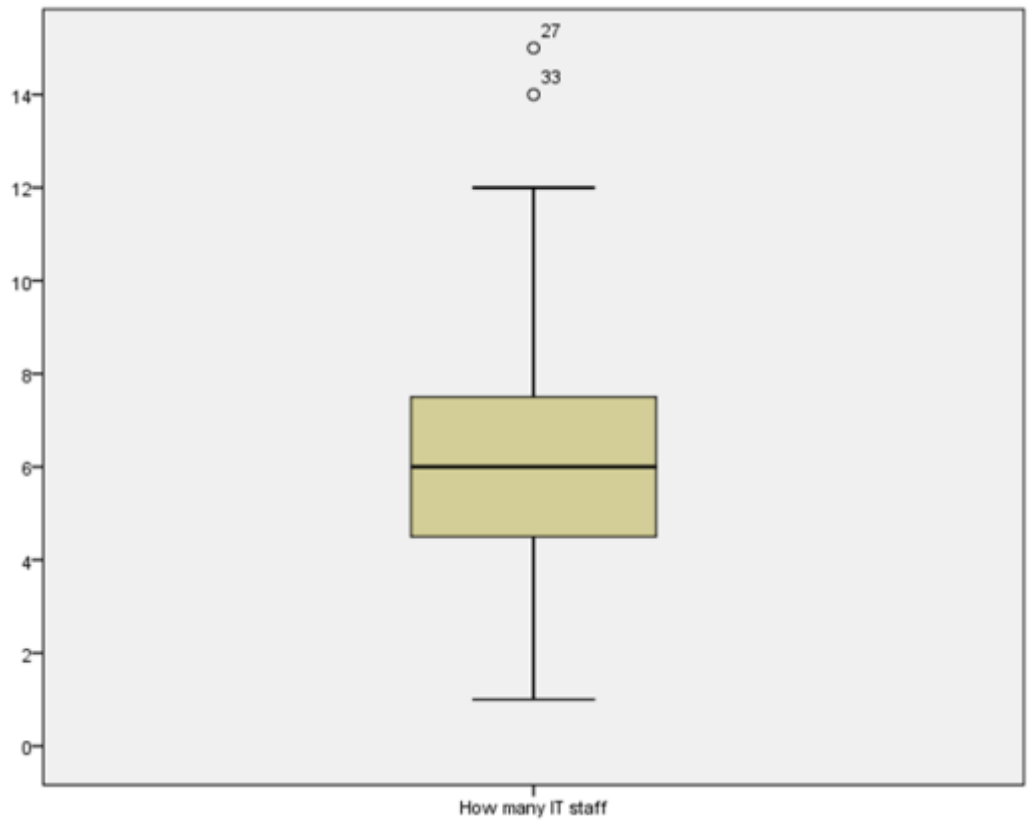
a. Lilliefors Significance Correction

Tabular results - Tests of Normality

How many IT staff

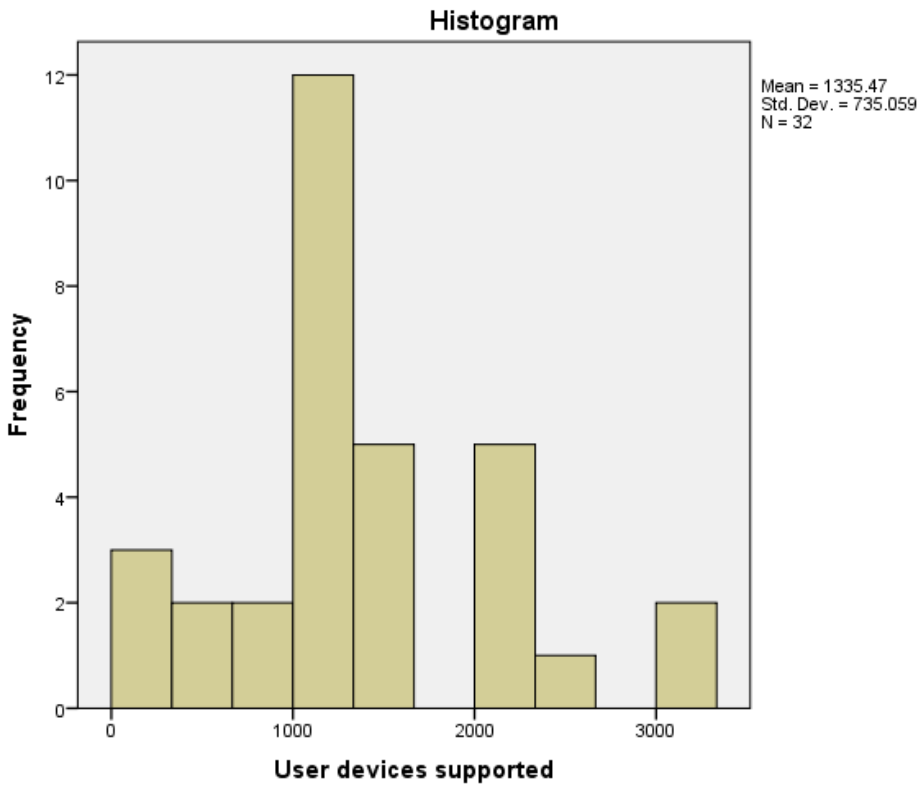


Histogram: How many IT staff

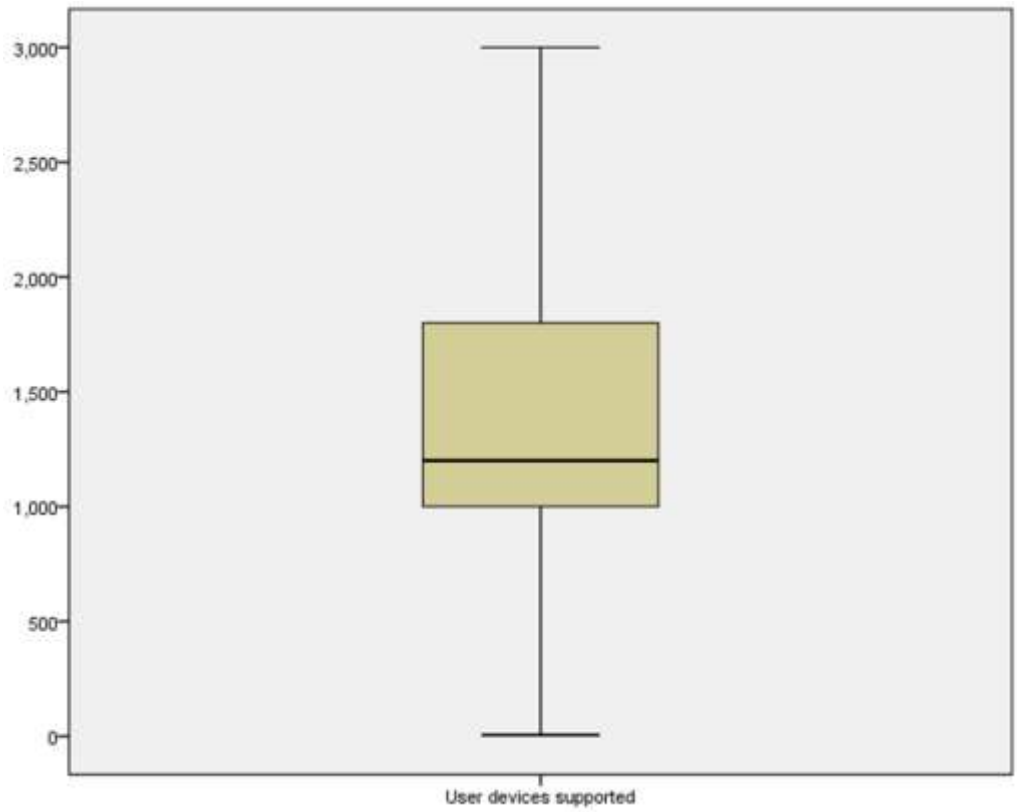


Box and whisker plot: How many IT staff

User devices supported

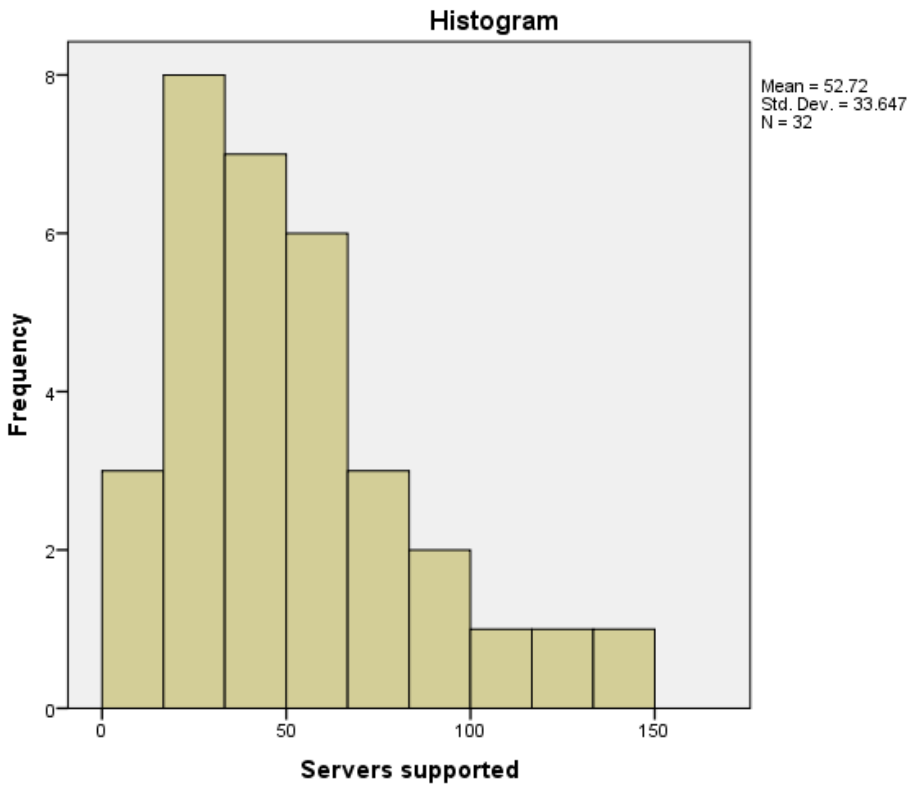


Histogram: User devices supported

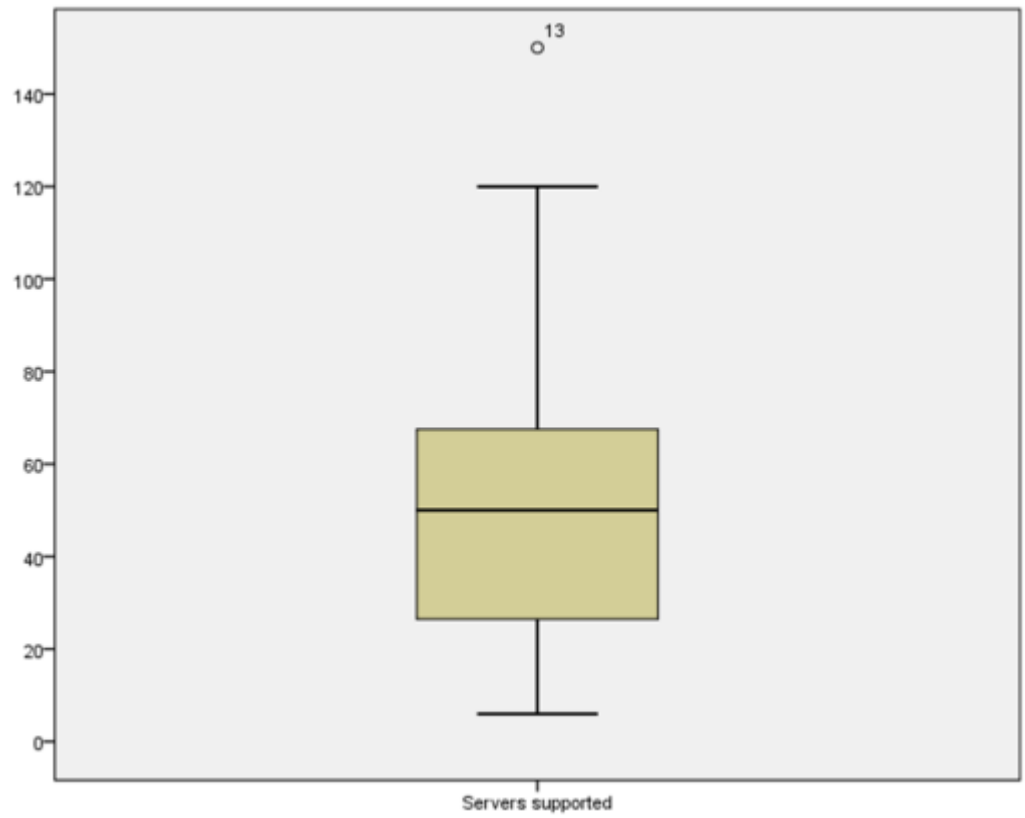


Box and whisker plot: User devices supported

Servers supported

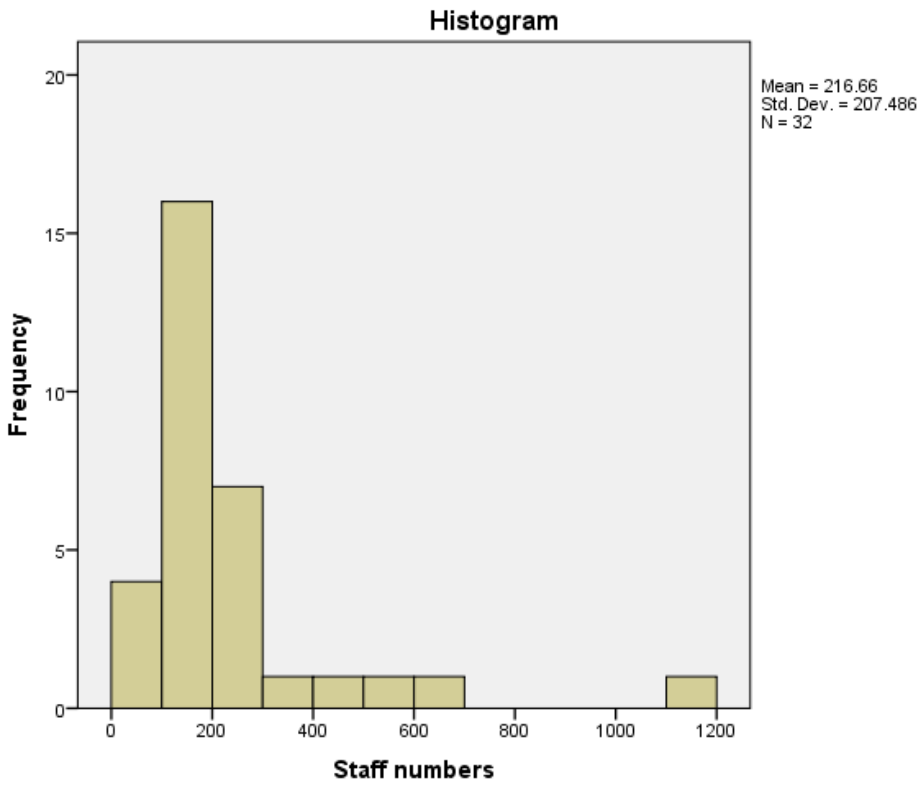


Histogram: Servers supported

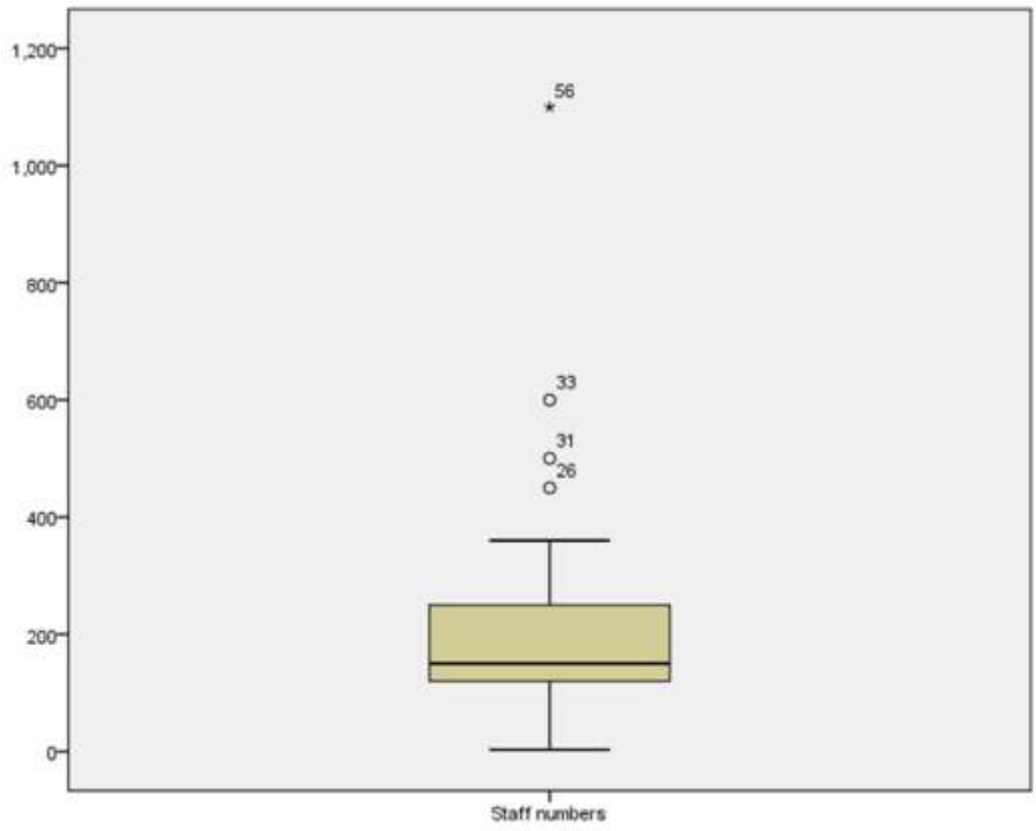


Box and whisker plot: Servers supported

Staff numbers

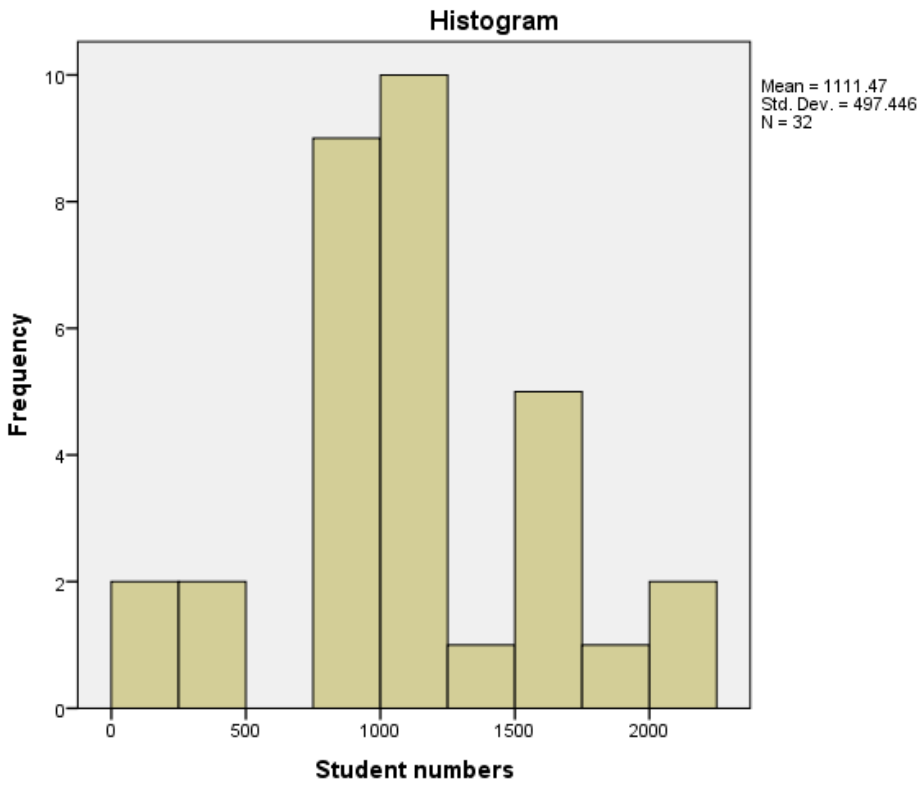


Histogram: Staff numbers

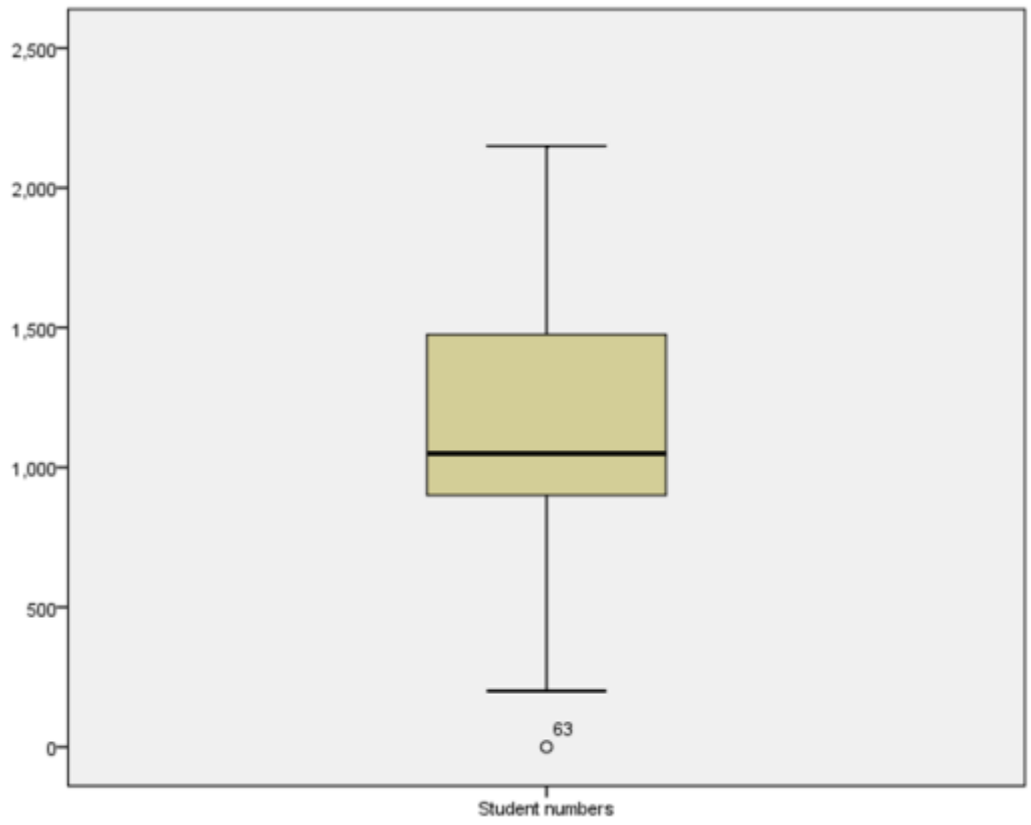


Box and whisker plot: Staff numbers

Student numbers

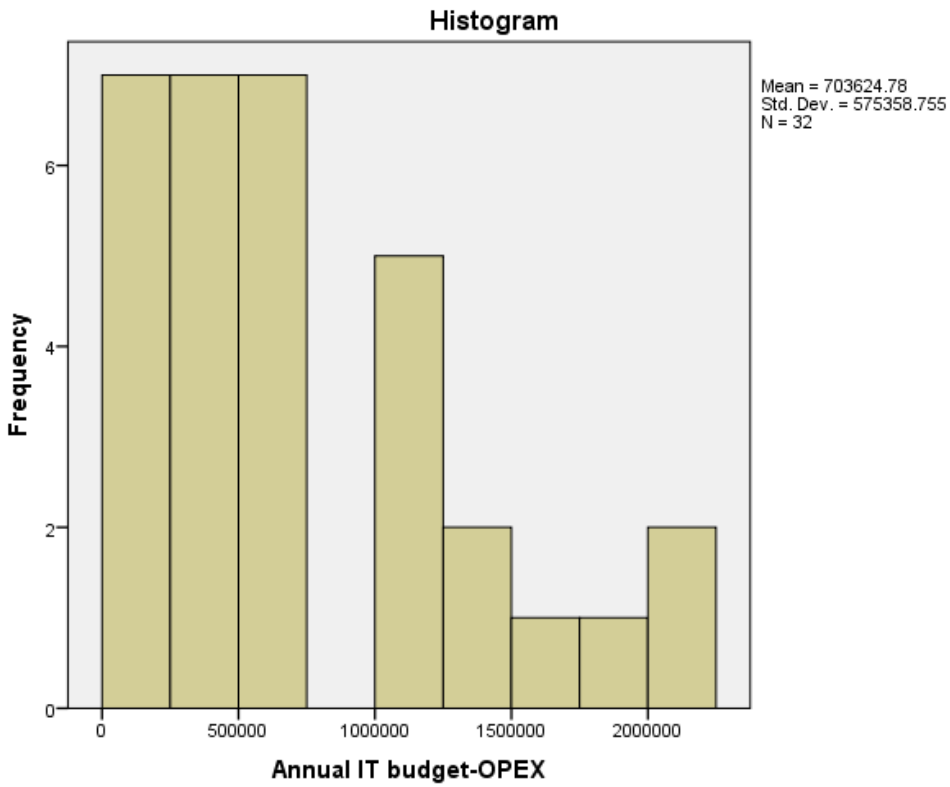


Histogram: Student numbers

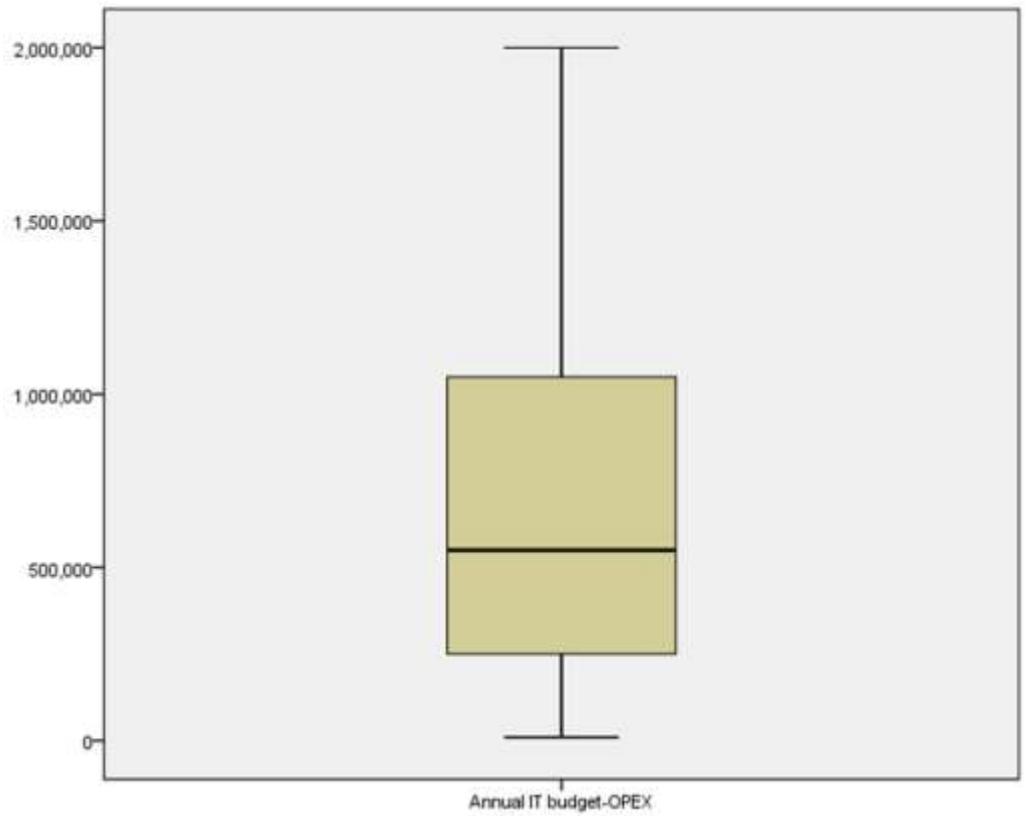


Box and whisker plot: Student numbers

Annual IT budget-OPEX

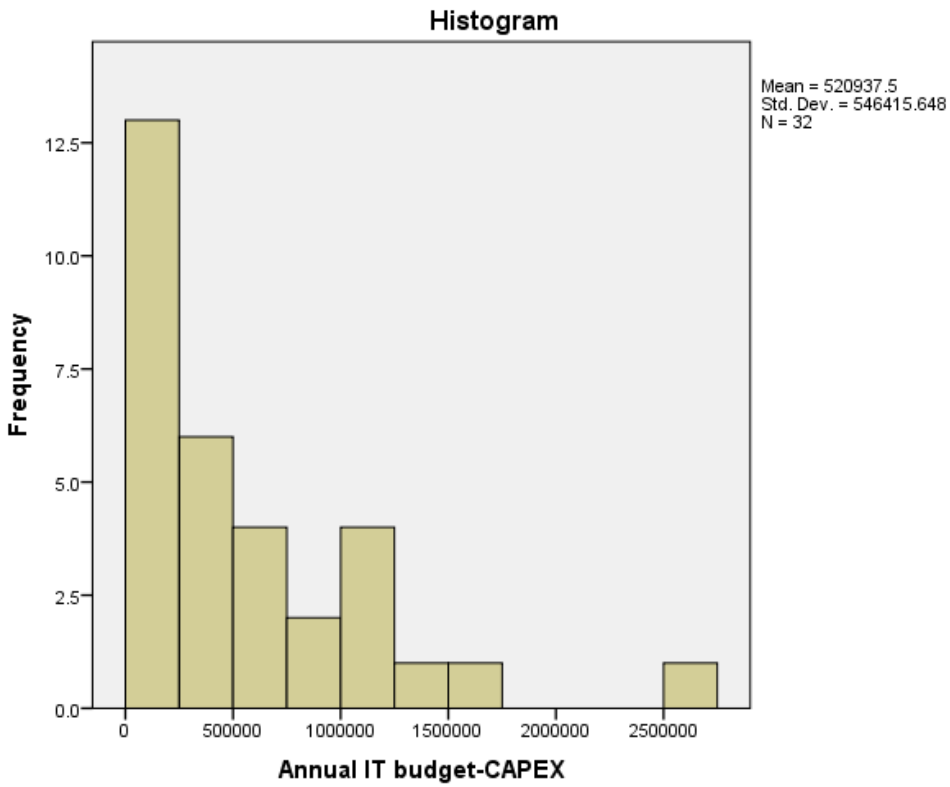


Histogram: Annual IT budget-OPEX

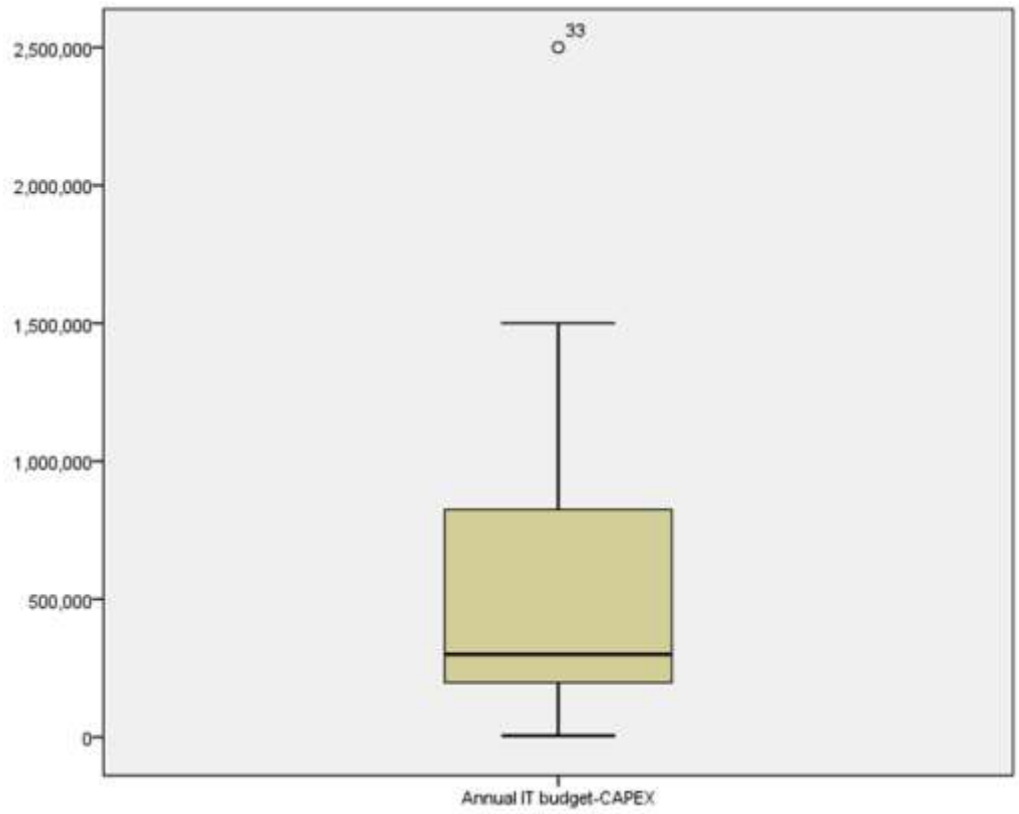


Box and whisker plot: Annual IT budget-OPEX

Annual IT budget-CAPEX



Histogram: Annual IT budget-CAPEX



Box and whisker plot: Annual IT budget-CAPEX

IT User Support Delivery

Practitioner Guideline Workbook

1. Drivers and planned outcomes

What are the reasons for this implementation or evaluation of a method for IT user support? Consider the categories below and write down whether each one is a factor in your context.

If it is one of the drivers for change then also write down how you will measure that this outcome has been achieved and within what approximate time frame.

1a. Service Improvement. This includes reliability, availability and upgraded services.

1b. Feedback and Perceptions. This covers user and management perceptions of the IT support they receive and the services delivered.

1c. Growth and change. This includes anticipated increases in user or device numbers, infrastructure upgrades or significant technology systems change or implementation; e.g. school administration system or one to one laptop programme,

1d. Best Practice. This encompasses areas such as formalisation of ad hoc processes and instigation of de facto standards.

1e. Justification. Is this implementation due to the need to validate IT resources or staff or otherwise support IT department objectives?

2. Implementation Issues

Listed below are some of the common issues experienced during and after implementations. Take a little time to think about each one and then write down whether you consider this will impact you and if so what strategies you will instigate to avoid or mitigate the issue.

2a. ITIL or other framework is too complex. Does the preferred ICT user support framework require a steep learning curve, upskilling of staff, certification or acquisition of more resources to support its optimal use?

2b. Time requirement. What is the expected time allotment for the correct use of the system? This means for the user submitting a request as well as for the IT team in logging, escalating, responding to, documenting and closing requests. Also, time overheads in the management of the system and in configuration and reporting.

2c. Resource requirement. Will the implementation or change require more resources? This could be human resources as in more staff; financial resources such as an investment in software and ongoing maintenance and support or infrastructure resources such as servers.

2d. Adoption and support. Will this implementation be supported by the management and accepted by the users? What impediments to uniform and universal adoption can you see? How will you deal with those? What strategies can you devise to avoid these in the first instance?

2e. Is the system too procedural and process driven? Is there flexibility in the system or the ability to start with small and discrete components and build on these or is the system inflexible and only work in a certain way? How will you ensure that the system processes are followed exactly as they are designed? How will you know that they are?

2f. Requires retrofitting. Does the proposed system fit the organisational culture and environment or will it need changing or tweaking? If so will this impact the integrity of the system and its outputs? Will the changes require extra resources such as consultants and cost money? Does the system need changing or is it the current organisational practices?

3. Metrics and Reporting

In order to initiate a cycle of continuous service improvement, it is important that measurements of service delivery and other metrics are captured, analysed and reported. However. this can be a resource-heavy task so which metrics to use and for what purposes requires careful thought and planning. Equally important is the reporting output from the metrics and for whom these reports are produced. Consider the topics below and write your responses from which a strategy for measuring and reporting should begin to emerge.

3a. Default metrics of Service Desk software or context-specific metrics. Will the default metrics provided by the Service Desk system be used or will they be customized, reduced or configured to the organisational context? Will other metrics outside the system be captured and will these need to be integrated with the system metrics?

3b. Use of metrics to measure technology usage. Will metrics of any form to be used to try to measure the use of technology in any particular area or function? If so how will it be determined that the metrics are measuring use, not just access? How will that be defined? Will tRend analysis be undertaken? To whom will these metrics be reported and what is their purpose? Are there other ways of measuring that may be more appropriate?

3c. Reasons for collecting metrics and accuracy. Have all the reasons for collecting metrics been defined and mapped to the appropriate metric or set of metrics? Do the metrics provide insights and are they able to be analysed and reported on? How will it be ensured that the metrics have accurately captured the data? For example, if the data is not input (requests not logged for example) then the output will not accurately reflect the environment.

3d. Feedback and user satisfaction. How will user feedback be captured and reported? What sort of feedback will be captured? Will user satisfaction as opposed to feedback on the system or service delivery be captured also? If so, how and how will both be used?

3e. Continuous improvement cycle. Is it intended that metrics will be captured, analysed and then incorporated into a cycle of continuous improvement for the IT services and user support? Which metrics should then be captured and how will they inform service improvement? Will there be a cycle of reporting periods, for example, quarterly or annually?

4. Post implementation issues – avoidance and lack of commitment – and potential alternatives.

Even with pre-planning, there are often many post-implementation issues. While some have been addressed above in order to devise strategies to mitigate their occurrence a list of commonly experienced problems is presented below. Consider each one and then write down ways these can be removed or reduced or otherwise handled. Some of these issues are specific to the users being supported and some relate to the IT team. Use the Practitioner Guideline chart to move through the listed issues and then write down ideas, strategies and procedures for mitigation in the areas below which summarise some of the points into related categories.

4a. Time. This can be the time taken in using the system for the person requesting assistance as well as the time needed by the IT staff to manage the requests in the system on top of addressing the request itself. How will you ensure your team have sufficient time resources to use the system fully, proactively and in real time rather than retrospectively or not at all? What configurations can be made to shorten the time taken to lodge a request or are there the resources available to devote IT staff time to that on behalf of the user?

4b. Resolution time and requests overlooked. There can be perceptions of systems lengthening resolution times and of incidents being forgotten or overlooked once lodged. How will you combat this? Will there be SLAs which are reported on back to the staff as well as the management? Will there be request tracking with escalation available for users?

4b. Personal interaction, convenience logging and VIP syndrome. There is often a distinct preference on the part of users to have personal interaction when needing IT support. People will approach IT staff members directly phone them or otherwise by-pass the system. Executives, senior management and the staff that support them often think that as VIPs they are above the system and can go directly to an IT team member to access assistance. What strategies will be put in place to deal with these issues? Will there be some staff who will be permitted to bypass the official processes? How will other user requests that do not use the system be dealt with? Will those users be helped to use the system or penalized?

4c. Lack of commitment by IT staff. Are the IT staff fully committed to the system and do they understand how and when to use it? For example, will they be allowed to judge some requests and incidents as not needing to be logged or will they be expected to log all in a timely manner? Will they have the resources required to do this and how will they be managed if they don't? Were the IT staff involved in the process of implementing the system and are they evangelists for it to the wider staff body?

4d. Qualified acceptance of function but a rejection of processes. Staff both IT staff and users may generally be aware of the need to have a formal system and some of the potential benefits, but baulk at using the system processes. Are there ways to make the process of using the system easier and quicker? Is the system transparent and is it quick to load and respond? Does it require too many clicks? Are there multiple entry points? A web portal, email, a phone call to a dedicated person who will log the request.

4e. Alternative methods of support. There are many ways of supporting people in their use of technology as well as supporting the IT systems that deliver the service. Building confidence and trust is a key factor in the success or otherwise of an implementation and overall perceptions of service delivery. Have you considered other mechanisms in the context of all your organisation's resources to manage both service delivery and user support? Some considerations are; outsourcing of one or other or both; access to dedicated IT staff for one to one support or training; a dedicated 'face' always available in person or by phone or email to log the requests, monitor them and communicate with the requester or even IT staff dedicated to one business function or department so each has their own well-known support person to turn to when needed. Write down some alternatives that may be accessible to you and compare and contrast with the de facto and standard means of delivering the Service Desk function.

5. Policies, plans and procedures.

Having progressed through each of these categories a summary of decisions can now be documented. Write down the options considered, the decisions made, the resources required, the strategies to be implemented and any obstacles to be overcome. From this, a justification for the chosen path can be prepared and presented and a policy for the use and evaluation of the Service Desk function can be established.