# EXPLORING THE STRATEGIES COMPUTER-TECHNOLOGISTS NEED TO ESTABLISH A COMPUTER-REFRESH CYCLE IN RETAIL ORGANIZATIONS

**A Dissertation Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Computer Science**

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**Abstract**

Technology refresh cycle strategies have continued to emerge over the years, with organizations in many industries progressively leveraging a well-established information technology (IT) lifecycle management process to drive business optimization, enhance client engagement experiences, provide quality, enrich governance, support business goals and objectives that adequately position the business to meet 21st century innovation challenges, and achieve competitive advantage. However, in spite of the increase and success in the adoption of technology refresh strategies, research of the literature indicates that limited studies were conducted on offering strategies computer technologists need to establish a technology refresh cycle in retail organizations. This dissertation utilized a qualitative research method to examine the strategies computer technologists need to establish technology refresh cycles in retail organizations. As a result of this study, eight themes emerged that provided exploratory insights related to strategic adoption, transition, and implementation of technology refresh cycle strategies for technologists and information technology (IT) managers that are uncertain or hesitate to adopt these strategies in the retail industry. The themes for this study encompassed incident management, technology refresh strategies with cloud services, benefits of technology refresh cycle strategies, and cost. The outcome of the study suggested significant support for adopting, transitioning, and implementing technology refresh cycle strategies and a strong correlation with a competitive advantage in the 21st-century globalized economy. Additionally, the results strongly suggested that the adoption of technology refresh cycle strategies drives infrastructure scalability, security, stability, and sustainability.

## Dedication

God is great, all the time. With him, the impossible is possible. I want to thank the Almighty Father for holding my hands through the thin and thick of my life and making this journey a success.

I would modestly like to dedicate this dissertation to my mother (Sophia Hemans) who stood by me, never gave up, and sacrificed everything to make sure I shattered the odds, despite when many people doubted what you saw in me. I love you, mom.

To my eldest brother (John Mensah) who did everything to ensure that I stayed in school and fully embraced education as the highest accomplishment. You set the pace for me and for that, you are my hero. God bless you.

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## CHAPTER ONE

Strategies computer-technologists need to establish a computer refresh cycle in retail organizations has not yet been established (Mouritsen, 2013), especially with company leaders replacing their computers every three to five years. These skills have an essential effect in providing the knowledge, expertise, and ability to express apparent viewpoints of the effectiveness of any technology refresh and strategic technique implementations, as well as training (Altiris, 2006). Thus, computer technologists have many important responsibilities, including the development of a technology refresh strategy that manages infrastructure hardware life cycles and end of life software processes, that assist in gaining a competitive advantage. An asset tracking system should alert managers to what assets are due for retirement, where they reside, and the company data residing on the targeted devices (Mouritsen, 2013). The technology affects value activities and allows companies to gain a competitive advantage by exploiting changes in scope. In this study, the use of the computer technology refresh cycle as a strategic tool to drive infrastructure scalability, security, stability, and sustainability to gain a competitive advantage was examined. There must be high-quality components, smart redundancy (i.e., redundant systems with externally controlling hardware or software devices), and tested contingency plans. Khan and Valverde (2014) asserted that to run information technology (IT) as a fiscally responsible business, IT experts, computer technologists, and other functional areas must understand the use of technology assets and applications so that they can withstand regular audits on inventory and software compliance that impact competitive advantage.

The goal of this study was to understand the computer technology refresh cycle as a strategic tool to gain a competitive advantage in the 21st century, particularly in the retail industry. Gartner is a research firm that provides insight to member companies regarding

information technologies. Gartner research analysts have recommended a 4-year replacement cycle for desktop computers and a 3-year cycle for laptop (notebook) computers (Heine & Fiering, 2007). A technology refresh cycle is a strategic tool utilized to drive competitive advantage. Furthermore, obsolescence and technology replacement remains an ongoing issue for many organizations (Nguyen, Yeung, & Castanier, 2011). However, the strategies computer technologists need to establish a computer technology refresh cycle is convoluted by the different perceptions surrounding what a technology refresh cycle delivers to an organization's goals and objectives. In today's competitive business environment, systems acquisition and transitions can make or break an organization. It should be no surprise that some organizations continue to employ legacy systems long beyond the operational dates supported by hardware and software manufacturers, even into obsolescence. Parts manufacturers typically only support a limited lifecycle (Basahel, 2009) of a few years, which Fieldman and Sandborn (2007) indicated has been on a declining slope.

Organizations often struggle to maintain a technology refresh cycle strategy that manages infrastructure hardware life cycles and end of life software at appropriate levels of redundancy that provide high availability (Uptime Institute, 2017). Thus, information technology lifecycle management of hardware and software assets in an enterprise computing environment as a strategic tool needs to uncover strategies for establishing a computer technology refresh cycle, and in particular for a retail organization (Mouritsen & Mano, 2007). Toward this end, adopting and implementing a technology refresh cycle strategy as a solution is dependent upon the diverse nature of computer technologists in the retail industry. While a replacement system may present benefits (e.g., improvements in efficiency, interoperability with suppliers and customers, and

increases in competitive advantage), organizational goals and objectives may influence the replacement decision and form the basis of status quo bias (Samuelson & Zeckhauser, 1988).

High availability is designed to meet the business demands for the availability of critical IT and IT-enabled business services (Radhakrishnan, Mark, & Powell, 2008). Toward this end, the computer technology refresh cycle as a strategic tool reduces significant infrastructure incidents, as well as drives infrastructure scalability, security, stability, and sustainability (Radhakrishnan, 2008). Industry leaders have hailed availability as the highest priority for core infrastructure and data center operations (Rich, 2013).

The primary concern that computer technologists must resolve regarding the technology refresh cycle issue is to ensure hardware life cycles and end of life software stacks are consistently updated. Kostoff and Schaller (2001) and Kerr, Phaal, and Probert (2012) emphasized that the most effective road-mapping needs to be fully integrated into the strategic planning and business operations of the organization. Vecchiato (2012a) stated that the roadmap is used extensively for planning and development to drive competitiveness. Thus, computer technologists must be knowledgeable in the technology refresh cycle strategy to accomplish the goals and objectives essential to the organization's success. A survey was undertaken by Kerr et al. (2012) estimating that 10% of manufacturing firms (mostly massive) had applied technology roadmaps (TRM) to some extent, with 80% of those companies using TRM more than once or on an on-going basis. According to Vecchiato (2012a), Nokia uses roadmaps extensively for planning the development of its product portfolio and defining its competitive position in emerging markets, with their roadmaps only applicable to their unique business context.

The retail industry needs an infrastructure platform with high availability systems to maintain a successful and productive platform (Radhakrishnan et al., 2008). However, focused

research on the strategies computer technologists need to establish a computer technology refresh cycle in a retail organization to drive competitive advantage in the 21st-century globalized economy is achievable.

## Topic Overview/Background

Frazier and Bailey (2004) cite the need for the regular maintenance of hardware and software. Routine upgrades for these components is critical to business. While some organizations in the retail industry have improved their overall concept of the technology refresh cycle, some aspects have not achieved the same level of expectations (Kerr et al., 2012). Towards this end, this research indicates a gap in the knowledge by describing the strategies computer-technologists need to establish a computer-refresh cycle in retail organizations (Mouritsen, 2013), especially with company leaders replacing their computers every three to five years. The lack of a technology refresh cycle strategy is creating high system availability issues and gaps that must be improved to ensure infrastructure scalability, security, stability, and sustainability are attained (Radhakrishnan, 2008). Therefore, the need for regular maintenance of hardware and software and routine upgrades for these components are critical to business operations from a service availability perspective. Hardware and software refresh projects can create challenges for organizations that utilize information technology (Altiris, 2006). According to Altiris, refresh plans that apply best practices lead to a reduction of an organization's hardware setup and deployment costs by 56%.

Much literature exists detailing the role of the equipment and software manufacturers in the refresh process (Intell Solutions, 2003; Microsoft Corporation, 2006; & Wipro Consulting, 2006). Additional literature also exists identifying the criticality of technology refresh (Frazier & Bailey, 2004)

The review of current research offers insights into the increased adaptation of technology refresh cycles as a strategic advantage to an organization, such as technology planning and planning for the replacement of legacy hardware and software as an ongoing process (Willard, 2000). However, practitioners and researchers have given only a passing thought to the technology refresh cycle in gaining a competitive advantage in the 21st Century's globalized economy because the concept of correlating technology refresh to drive infrastructure scalability, security, stability, and sustainability is relatively new (Radhakrishnan, 2008).

Arndt (2004) indicated that carrying out a technology refresh drives improvement with a refresh project for replacement of legacy hardware and software as an ongoing process in the education community. Over time, the use of technologies has changed as a result of the strength and growth of the Internet (Arutyunov, 2012). As a means to maintain infrastructure changes, Verma (2014) affirmed the traditional infrastructure had been reformed and replaced by much higher innovation through the use of the Internet. According to Arutyunov, one of the new technologies is the use of cloud computing. Cloud computing has been increasingly adopted by many industries globally, including community colleges (Shahzad, Golamdin, & Ismail, 2016), and the architecture as a technology refresh strategic tool to help drive competitive advantage through the means of achieving scalability, security, stability, and sustainability. From the examination of prior research, it is conceivable to study the technology refresh cycle strategy within the retail industry and such functional environments.

Computer technologists have typically understood the concept of technology refresh. Overall, the computer technology refresh cycle as a strategic tool reduces significant infrastructure incidents, as well as drives infrastructure scalability, security, stability, and sustainability and plays a significant role that is central to this study (Radhakrishnan, 2008).

Earlier research has exposed technology planning and planning for the replacement of legacy hardware and software as an ongoing process (Willard, 2000). Research suggests a correlation of service availability to infrastructure productivity issues, which arise due to hardware life cycles and end of life software failures (Radhakrishnan, 2008). Based on these findings, there is a need to establish a computer technology refresh cycle in retail organizations. One avenue for developing this relationship is through the lens of its impact on the market (Gobble, 2016). If Fortune 1000 companies can reduce downtime by 10%, the increase in availability can yield $65.7 million in revenue that would have otherwise been a lost.

The types of technology refresh cycle strategies for other industries have been envisioned as adopting and implementing robust information technology road mapping, IT asset lifecycle management, software as a service, and hardware as a service. These necessary strategies are essential and critical factors to technology refresh cycles for both present and a future organization's survival (Choomon & Leeprechanon, 2011). However, technology refresh strategies continue to advance and evolve. Present-day organizations in the retail industry are failing to gain a competitive advantage because they do not have a technology refresh strategy that manages their infrastructure hardware life cycles and end of life software. The lack of these strategies is forcing computer technologists to incorporate the technology refresh cycle as a strategic tool to gain competitive advantage (Radhakrishnan, 2008). As such, aligning business objectives and IT strategies need to evolve to maintain and improve current technology acceptance models and become more useful to deliver scalable, secured, stable, and sustainable technology infrastructure solutions for business (Moodle, 2016).

## Problem Statement

The problem addressed in this study was that many organizations do not have a technology refresh strategy that manages their infrastructure hardware life cycle and end of life software applications. Organization leaders replace their computers every three to five years. Many elements factor into this decision as it pertains to the strategies computer-technologists need to establish a computer-refresh cycle in retail organizations (Mouritsen, 2013). Khan and Valverde (2014) asserted that to run IT as a fiscally responsible business, IT experts must understand the use of IT assets and applications so that they can withstand regular audits of inventory and software compliance.

Once a technology refresh cycle is determined, well-structured roadmap processes can be designed with the necessary safeguards expected to ensure that the right aging of hardware and software effectively gets refreshed (Caetano & Amaral, 2011). According to Radhakrishnan (2008), hardware life cycles and end of life software are critical components that drive an IT infrastructure environment to allow organizations to gain competitive advantage within this technologically competitive world. Radhakrishnan further stated that staying in business requires high system availability, especially in today's competitive economy where high availability and high productivity are sustainable with a technology refresh cycle strategy.

## Purpose Statement

The purpose of this exploratory qualitative study was to explore strategies computer technologists need to establish a computer refresh cycle in retail organizations. Upon completion of the research, effective strategies to transition into a successful technology refresh cycle platform would be provided to those computer technologists and information technology (IT)

managers of retail organizations that have not yet been convinced to transition into a strategic technology refresh cycle-based organization.

## Research Question

In this study, a qualitative research approach was utilized to investigate the objective discussed in the above purpose statement. This research defined strategies computer technologists need to establish a computer technology refresh cycle. The overarching research question for this study was: What are the strategies computer-technologists need to establish computer-refresh cycles in retail organizations?

## Proposition

This study proposed that a well-structured technology refresh cycle program could drive competitive advantage opportunities to organizations in the retail industry by gaining infrastructure scalability, security, stability, and sustainability (Radhakrishnan, 2008). This proposition was formed from the literature found on organizations that have attained success in transitioning their hardware and software lifecycle into a well-defined technology refresh cycle strategy by highly maintaining road map commitments to drive productivity and limit infrastructure outages (Stocker, 2010). The other proposition of this research was based on providing practical and structured strategies for technologists with at least two years of management and leadership responsibilities that have not decided on adopting, transitioning, and implementing technology refresh cycle strategies as a tool to drive competitive advantage in the retail industry.

## Conceptual Framework

Succeeding in the 21st century as an organization requires strategic IT plans and substantial alignment with business partners (Andreica, 2006). One of the most fundamental and

critical IT strategies that drive business success is the technology refresh cycle through the use of technology road mapping (Lee, Kim, & Phaal, 2012). Running an infrastructure on the right platform and architecture, both through software and hardware, directly affects the health and prosperity of an organization from the viewpoint of scalability, security, stability, and sustainability perspective (Radhakrishnan et al., 2008).

This study attempted to explore the strategies computer technologists need to establish computer refresh cycles in retail organizations. Multiple technology refresh strategies were examined in this research, such as information technology (IT) road mapping, software as a service, and infrastructure as a service. The dissertation also reviewed the five-leading key technology refresh drivers of the study topic, such as information technology service management, information technology incident management, information technology security, risk, and vulnerability management, information technology service quality, and information technology governance (Andreica, 2006). Figure 4 provides a graphical illustration of the conceptual framework of this research.

## Assumptions/Biases

The first assumption in this study was that technologists looking for a refresh cycle must take into account significant factors, such as budget, people, process, and data security challenges, before adopting and transitioning to a technology refresh cycle strategy. The second assumption was that a fundamental knowledge regarding strategies for technology refresh cycles must be a driving force for competitive advantage. The third assumption was that all participants would answer interview questions as openly and honestly as possible. To safeguard that, participants were expected to answer the interview questions with trustworthiness. The research guaranteed the participants anonymity and confidentiality of their responses. Furthermore, the

participants were allowed the right to withdraw from participation at any time without any consequences.

Biases are commonly understood to be an influence that presents a distortion in the results of a study (Polit & Beck, 2014). The research blocked personal biases during the process of data collection and data analysis of this study. Moreover, the research inhibited any personal IT knowledge and experience about a retail organization transition into a technology refresh cycle-based strategy. Collected data was not construed or revised from the researcher's perspective purposely or unintentionally (Dey, 2015).

## Significance of the Study

The universal perspective for conducting this study is that globalization has changed the dynamics and landscape of technology strategies, applications, and the critical functions that support sustainability regarding technology refresh cycles and computer replacement strategies (Mouritsen, 2013). The study's uniqueness can be understood in comparing the traditional concept of a 'ride it out' technology refresh methodology, such as organizations using devices till they die, versus using strategies, such as information technology (IT) road mapping and virtualized technology platform resources, provided by cloud computing services in the form of software-as-a-service (SaaS) and infrastructure–as-a-service (IaaS) (Wu, Cegielski, Hazen, & Hall, 2013).

Computer technologists of retail organizations that have not adopted, transitioned and implemented technology refresh cycle strategies are uncertain to migrate into a well-structured technology refresh cycle-based platform since they are not confident about the benefits in adopting technology refresh cycle strategies. As stated by (Rajaraman, 2014), scalability,

security, stability, and sustainability should be taken into consideration when making strategic infrastructure change decisions.

This study attempted to present the strategies computer technologists need to establish technology refresh cycle strategies and how such strategies correlate to a competitive advantage in the 21st Century globalized economy in the retail sector (Shahzad et al., 2016). Furthermore, the study explored the main reasons that influenced the computer technologists who decided to adopt, transition, and implement technology refresh strategies in retail organizations. The research also hoped to provide an anticipated outcome highlighting how a well-structured technology refresh strategy could drive infrastructure scalability, security, stability, and sustainability. Finally, the computer technologists with infrastructure management responsibilities in retail organizations who have been uncertain in adopting technology refresh cycle strategies would have a clear and holistic view of the benefits in adopting well-structured technology refresh cycle strategies.

## Delimitations

This study intended to explore strategies computer technologists need to establish a technology refresh cycle in retail organizations. Other IT staff members were delimited from this research. Future studies can be conducted to determine the outcomes of adopting technology refresh cycle strategies from engaging and interviewing other IT staff. According to Leedy and Ormrod (2010), delimitations are those characteristics that limit the scope and define the boundaries of a study.

Furthermore, the study was focused on technologists with management level experience in the retail industry using a LinkedIn group of professionals, as well as participants that lived within the city of Tampa in the state of Florida. Based on the focus that the contextual setting of

the study was retail organizations that had adopted, transitioned, and implemented technology refresh cycle strategies, the interviews were conducted with the use of virtual technologies, such as Skype for Business, Microsoft LYNC, and video teleconference. Additionally, the use of virtual technologies offered a high level of flexibility, convenience, and the availability needed to provide reliable and valid responses to interview questions based on the lived and professional experiences of the participants. The study was limited to technology refresh cycle strategies; specifically information technology (IT) road mapping, software-as-a-service (SaaS) and infrastructure-as-a-service (IaaS).

## Limitations

This study was conducted via interviewing the research participants. The selection criteria of the participants were based on those technologists with management level experience in the retail industry that has adopted, transitioned, and implemented technology refresh cycle strategies in their respective organizations. According to Leedy and Ormrod (2010), the limitations of a study are potential weaknesses and are typically out of the study's control. Given that, the first considered limitation of this study was honesty from the participants in providing answers to the interview questions.

The second limitation of the study was based on the scope of the study population. The participants were selected from a focused LinkedIn group of professional computer technologists with at least two years of management experience in the retail industry. They were expected to have adopted, transitioned, and implemented technology refresh cycle strategies in their respective organizations. The technology refresh cycle strategies were investigated by interviewing only computer technologists with at least two years of management experience.

The third limitation was the number of participants. An exploratory qualitative research methodology was used in this dissertation. The principal source of data were the interviews conducted with the participants. Data collection continued until data saturation was achieved.

## Definition of Terms

The following terminology was used in this research study and is defined as follows:

*Infrastructure-as-a-Service (IaaS):* The IaaS is a virtualized environment consisting of servers, software, networks, and a complete desktop offered by a cloud computing provider (TechRepublic, 2016).

*Refresh Cycle:* A proactive strategy to replace hardware and software on a scheduled basis prior to the hardware and software reaching the end of its service life (Wipro Consulting. (2006).

*Software-as-a-Service (SaaS):* The SaaS are the cloud application (software) services that do not need to be purchased or installed by the customer (TechRepublic, 2016).

*Virtualization:* Virtualization is the process of creating a virtual rather than an actual version of an object, such as a system or business. Virtualized servers, networks, and storage are examples of computing virtualization (VMware, 2016).

## General Overview of the Research Design

An exploratory qualitative methodology was used for this study. Qualitative research enables a researcher to make associations between the theoretical aspects of the research and the practical elements of a study (Gerrish, 2011). The qualitative methodology was appropriate for allowing the research to understand the various concerns in developing a technology refresh strategy (Aczel, 2015).

Participants for the study were computer technologists in the retail industry that were members of a LinkedIn group and that had successfully established a computer technology refresh cycle in a retail organization. Purposeful sampling was used. Semi-structured interview questions were developed and used.

Data analysis followed the general approach described by Graue (2015). The study developed derived patterns and themes representing data collected from participant responses, the research observations, and field notes. Data analysis began by organizing the collected information, followed by data perusal, classification, and synthesis. The data analysis approach for an exploratory study includes (a) compiling the data from the interviews, (b) organizing the data by interviewee, (c) coding of the data (i.e., organizing the data by recognized categories), (d) identifying themes (i.e., the label attached to each recognized category), and (e) establishing data relationships (i.e., recognizing similarities and differences in themes in order to condense or separate themed categories, as appropriate). Once this process was completed, the established themed categories became the findings of the study.

## Summary of Chapter One

This chapter started with an introduction to strategies computer-technologists need to establish a computer refresh cycle (Mouritsen, 2013), especially with the general industry acceptable replacement of computers every three to five years. The chapter delivered an awareness of the general concepts and uses of technology refresh cycles as a strategic tool to achieve competitive advantage in the 21st Century globalized economy.

Chapter 2 of this study was used to cover a historical review of the literature regarding technology refresh as a competitive advantage and how well-structured technology refresh cycle strategy will deliver high system availability through infrastructure scalability, security, stability,

and sustainability. Toward the end of Chapter 2, the literature review will highlight the concepts of the 4 S's (scalability, security, stability, and sustainability) and how technology refresh strategies relate to the four concepts. Chapter 2 includes how the ITIL framework fits into the best practices model to drive high availability, reduce risks, and highlight challenges in not adopting this refresh cycle concepts and the impacts of the competitiveness of an organization based on implementing such a strategy.

## Organization of Dissertation

The dissertation was organized in such a way that Chapter 1 provided the awareness into the general concepts and uses of the technology refresh cycle as a strategic tool to achieve competitive advantage in the 21st globalized economy. In the organization of the chapter, an overview of the topic of study was provided and background of technology refresh as a competitive advantage was also provided. The problem statement and the research question was clearly stated. The proposition of the study and conceptual framework was also discussed in Chapter 1. The discussion also addressed the assumptions and bias of the research and articulated the significance of the study. Finally, the limitations of the research and the definition of terms utilized in the research, as well as a comprehensive general overview of the research design was provided.

The organization of Chapter 2 will provide a review of the literature regarding technology refresh cycle strategy as a competitive advantage and the acceptance of this strategic tool in the retail industry setting. This chapter will also outline the ''4S'' referring to infrastructure scalability, security, stability, and sustainability and how the ''4S'' concept drives technology refresh cycle strategies and competitive advantage. Also, the chapter investigates

how standard frameworks, such as ITIL and its best practices, can help in achieving competitive advantage in the retail industry.

Chapter 3 covered the research methodology, research tradition, and research design. Population and sample, sampling procedure, instrumentation, validity, and reliably are also discussed. Data collection, data analysis, and ethical considerations complete Chapter 3.

Chapter 4 will discuss the findings of the qualitative interviews, including the themes that emerged from the research. Chapter 5 completes the study by discussing the interpretation of the findings and proposed future recommendations for furthering the research topic.

## CHAPTER TWO

Modern-day information technology literature is limited in its awareness of retail organizations' practices related to technology refresh cycle strategies. Much has been written in information technology journals, periodicals, and white papers regarding the details and logistics of adopting and implementing technology refresh, but with no focus on the retail sector (Mouritsen, 2013). The strategic use of information technology (IT) continues to expand on an annual basis (Becker, 2002; Cuban, 2002; Moersch, 1999). As computer technologists continue to strategically integrate technology as a competitive advantage concept into their infrastructure and operations, one sector does not appear in the research, that of retail organizations. Hendricks (2004) indicated that limited technology is increasingly faced with the challenge of aging computers and the need to provide adequate technology for the state-of-the-art environment to stay competitive and reduce negative impacts and outages. While much has been written on IT for competitive advantage, refresh cycle strategy formation, such as the adaptation and implementation practices, is emerging because the strategies computer technologists need to establish a computer technology refresh cycle in a retail organization continues to mature. (Caetano & Amaral, 2011). A thorough analysis of the literature supports the concept of the IT refresh cycle as a strategic tool to gain competitive advantage. The literature investigation also highlighted the key business drivers and strategies to promote infrastructure scalability, security, stability, and sustainability and how that impacts the organizational goal to gain a competitive advantage in the 21st Century. The literature review opens by presenting the background of technology refresh, IT as a competitive advantage, and the key drivers for technology refresh. The chapter also lists the three main refresh strategies that include IT road mapping, software-as-a-service, and infrastructure-as-a-service. The chapter concludes with an overview of refresh

strategies and the impact on infrastructure scalability, security, stability, and sustainability to drive competitive advantage. Technology refresh represents one of the fastest growing IT strategies and the most state-of-the-art in the information technology world.

## Overview of Technology Refresh

As information technology changes from a backend support entity to a strategic enabler, the role of *technology refresh* becomes more critical (Mouritsen, 2013). Mouritsen suggests organizations are uncertain about how the technology refresh cycle impacts service availability and productivity as it pertains to service delivery, especially with company leaders replacing their computers every three to five years. Service delivery had been the focal point for measuring service excellence in the technology world (Piccoli & Lui, 2014) Moreover**,** service delivery in the technology support spectrum is the driver of excellence and measurement of quality service. Performance efficiency is a key indicator and is also driven by consistent system reliability assessment to ensure that there is adequate bandwidth to make enhancements (Piccoli & Lui, 2014). In today's world, most organizations are building and deploying tools that provide more self-service tools. IT-enabled channels drive sustainability as well as a competitive advantage, especially in the virtualized IT era.

Despite the well-established effectiveness of information technology in producing competitive advantage, an organization's mission, core competencies, and its position to support the business strategy via strengths, weaknesses, opportunities, and threats (SWOT) analysis are intrinsic elements of the overall information technology / information systems (IT/IS) capability (Friesner, 2011). Organizations have been slow to see the role of technology refresh planning in strategy formation because organizations are uncertain about how this impacts service

availability and productivity as it pertains to service delivery such strategies have not been established (Mouritsen, 2013).

The purpose of this qualitative exploratory study was to explore strategies computer-technologists need to establish a computer-refresh cycle in retail organizations.

One of the most critical IT strategies that drives business success is technology refresh. Running an infrastructure on the right platform and architecture, both software and hardware, directly affects the health and prosperity of the overall business, especially when it comes to the lifecycle of IT equipment (Pathak, 2011). Many organizations formerly viewed IT groups as non-revenue generators. Often, IT had been looked at as the department mostly likely to be targeted during cost-cutting initiatives. Today's tight budgets and aggressive technology initiatives have disrupted platform refresh efforts in many organizations, leaving IT professionals wondering how older hardware and software, from the desktop, to servers and networks, will hold up over time (Mouritsen, 2013). However, many organizations do not have a technology refresh strategy that manages their infrastructure hardware life cycles and end of life software stacks. Organizational uncertainties about how refresh impacts service availability and productivity as it pertains to service delivery continues to rise because the strategies computer technologists need to establish a computer technology refresh cycle in a retail organization.

Technology refresh cycles offer a new and unique strategy for adopting innovation to meet changing business needs and mitigate the risk of obsolescence of existing technology (Pathak, 2011). Some of the benefits of utilizing technology refresh as a vital tool to gain a competitive advantage is that the process will lead to a reduction of significant infrastructure outages and most of all drive infrastructure scalability, security, stability, and sustainability (Piccoli & Lui, 2014).

## Computer Technology Refresh Strategies

In the globalized economy of the early 21st century, infrastructure service availability was considered the key to competitive advantage, hence retail information technology infrastructure and programs operate in an environment of rapid technology evolution in which some system components become obsolete (Grasso, 2009). Grasso further indicated that due to the fast pace of technology advancement, computer technologists and program teams need to have agility in their decision process. Also, computer technologists need to ensure they keep up with innovation and trending with advancement procedures in place to manage and refresh obsolescent infrastructure hardware and software to drive standards in delivering the business goals and objectives, such as Information Technology (IT) Road Mapping, Software-as-a-Service, and Infrastructure-as-a-Service.

### Strategy 1. Information Technology Road Mapping

Since the late 1990s, researchers have centered their work on information technology roadmapping by citing Motorola as the champion of the approach (Goenaga & Phaal, 2009; Major, Pellegrin, & Pittler, 1998; Richey & Grinnell, 2004; Willyard & McClees, 1987). The term ‘’technology roadmap’’ (TRM) is extensively and roughly used with a substantial difference in definition and meaning (Lee & Park, 2005; Loureiro, Borschiver, & Coutinho, 2010). For example, Kappel (2001) argued that road mapping is a challenging task, involving a variety of different documents. As organizations continue to look at ways to compete in a globalized economy, meeting the technology innovation challenges is one of the crucial strategic moves. Technology road mapping continues to be an essential part of the infrastructure innovation toolkit (Lee et al., 2012).

Petrick and Echols (2004) also referred to technology road mapping as a tool that enables organizations to make decisions more consciously, thus preventing the waste of time and resources and helping to reduce the risk involved in decision making. Furthermore, as organizations, especially in the retail industry, start to look into the benefits that road mapping provides the current and future vision on how the landscape of infrastructure as a competitive advantage continues to evolve. Petrick and Echols also explained technology road mapping as a strategic tool that presents a powerful technique to support technological management and planning, primarily to explore and communicate dynamic interactions between resources, organizational goals, and changes.

Spiwak (2000) defined the technology refresh process as the maintenance function of cyclically replacing information technology at the end of its service life. That relates to technology road mapping as a strategic tool that drives competitive advantage and places organizations in a competitive position in the emerging markets (Vecchiato, 2012). With organizations adopting this strategy, the hope is that there will be a guarantee of a well-structured refresh program and assurance that organizations have a refresh cycle that enforces consistent replacement of hardware and software within the organization to drive stability and sustainability. Spiwak (2000) defined the technology refresh process as the maintenance function of cyclically replacing information technology at the end of its service life.

As technology innovation continues to evolve, the information technology industry considers the technology refresh cycle of hardware and software to be part of the total cost of ownership (TCO) (Dell, 2002). At Dell and many other manufacturers, technology replacement is warranted every 36 to 60 months. Microsoft considers that the life-span of technological hardware will not exceed 60 months (Dell, 2002). In an IT whitepaper prepared by Alinean

(2003), IT industry consultants for Hewlett-Packard, Citrix, and many others reiterated that technological hardware needs to be refreshed every 36 to 60 months. Hendricks (2004) and Schlegel (2002) advocate cyclical, coordinated refreshing of software and hardware. Schlegel (2002) emphasized the fact that software distribution rates are 25% more efficient when coordinated with hardware refresh programs.

Most organizations that issue technical white papers agree that technical software requirements and hardware use are critical factors in determining technology refresh cycles, as well as what the production impacts are when these best practices and standards are not applied and enforced (Hendricks, 2004). Furthermore, many organizations look at the budget for funding these strategic initiatives, yet refuse to understand and calculate the cost of infrastructure outages and significant incidents and how that impacts the overall business. Meta group (2001) also recommended that technology equipment is replaced every 36 to 60 months. However, some retail organizations are still uncertain about how this affects service availability and productivity as it pertains to service delivery.

Hardware life cycles and end of life software stacks are critical components that allow organizations to gain competitive advantage within this technologically competitive era. Hendricks (2004) and Schlegel (2002) advocated that coordinating the refreshing of software and hardware drives stability and productivity. Microsoft Corporation (2006) emphasized operating system software as the key to determining lifecycle policies. New operating system software for computers and servers is developed and released, on average, every 24 months. Schlegel (2002) emphasized the fact that software distribution rates are 25% more efficient when coordinated with hardware refresh programs. Albright and Kappel (2003) introduced a common framework for roadmaps that describes the four levels of the roadmap. The aspects of know-why, know-

what, know-how and know-when facilitate the identification of critical decision points in the technology roadmap. Road mapping is one of the strategic tools for this study and used as a device for technology management and technologists in strategy and policy planning, as well as potentially becoming a reliable strategy for future technological preparation which may be utilized to lead the development of plans at corporate and operation levels (Choomon & Leeprechanon, 2011). Loureiro et al. (2010) stated that technology road mapping is a flexible method in which the primary goal is to assist strategic planning in market, product, and technology development in an integrated way over time. It enables resource and development (R&D) activities to be carried out more systematically, by laying out specific plans about what technologies to develop and when and how by forecasting future trends and identifying gaps between the firm's current technology levels and advanced levels it desires to achieve (Lee et al., 2012).

Finally, Albright and Kappel (2003) introduced a common framework for roadmaps, having four levels of the roadmap framework. The aspects of know-why, know-what, know-how and know-when facilitate the identification of critical decision points in the technological routes drawn within the technology roadmap. The 'Why' explains the domain of the roadmap, the team's objectives, and their strategy in achieving those objectives. 'What' explains the way, the challenges, the architecture, and evolution of the team's solution are being handled and the measurable targets. The 'How' explains the technologies that will be used to implement each part of the architecture. The 'To-Do's' explain the action plans and the risks associated with the project. Finally, the 'When' discusses the period of the process.

**Strategy 2. Software-as-a-Service**

As the IT industry continues to emerge and trend towards strategic IT platform in service delivery, the need to operate efficiently, productively, and cost-effectively continues to dictate IT strategies. In the retail industry, the primary focus is to sell at the front end while maximizing profit and reducing operating cost. Software as a service is one of the technology refresh strategies that satisfy the purpose of the study which is exploring the strategy computer technologists need to establish a computer technology refresh cycle in a retail organization. In ensuring that software stacks are up-to-date, maintained, and managed effectively, organizations turn to software-as-a-service because the strategy introduces a cost-effective and efficient way to acquire and manage software through its lifecycle from acquisition to disposition. This trend is in large part because of the widespread adoption of the cloud and the availability of services offered in the cloud environment. Software developers can save time and money in development by hosting applications in the cloud and generate consistent revenue with a monthly service model. A perfect example of this dynamic is Microsoft releasing Office 365.

Software-as-a-service (SaaS) describes a type of cloud computing service that enables the user to build any desired applications (Rajaraman, 2014). SaaS runs entirely on servers of the cloud service provider and is maintained by the service provider for future updates and versions (Gupta, 2012). Additionally, Verma (2014) stated that traditional information systems had been reformed and replaced by innovative methods through the use of the Internet. Furthermore, organizations that are utilizing SaaS as a strategic technology refresh cycle do not have to be involved in any licensing, lifecycle, or end of life issues.

From a competitive advantage perspective, organizations that have adopted and transitioned into the usage of SaaS are seeing and experiencing better services, stability, and

efficiency in maintaining, managing, and retiring licenses for software, especially the ones that are no longer being used. Rajaraman (2014) stated the SaaS is a multitenant model that would allow many users to utilize the cloud service at the same time. He also mentioned that not having to carry the burden to manage software distribution drives cost down, maximizes profit, reduces total cost of ownership, and ensures stability to drive competitive advantage.

**Strategy 3. Infrastructure-as-a-Service**

Core and critical infrastructure components like networks, servers, and storage are the heart of any technical support organization. Maintaining these core infrastructure components efficiently and productively depends on service availability, stability, and scalability. One of the technology refresh strategies is Infrastructure-as-a-service (IaaS), because of the capability it provides to organizations ranging from provision processing, storage, networks, and other fundamental computing resources where organizations can deploy and run arbitrary software, which can include operating systems and applications.

Infrastructure-as-a-service refers to the utilization of virtualized hardware components of the cloud services (Gonzalez & Smith, 2014). As stated by Gonzales and Smith, the usage of IaaS as a strategic tool is critical to infrastructure availability and correlates with the concept of competitive advantage per this study. Some retail organizations are beginning to see the evolution of infrastructure-as-a-service as an information technology refresh strategic tool and a cloud solution to manage core infrastructure components through their lifecycles.

The IaaS offers computation processing, networks, and storage resources (Mjihil, Dong, & Haqiq, 2016). Instead of the respective organizations being responsible and owning core infrastructure components from acquisition to support and maintenance, the service provider

instead carries the responsibilities for supplying power to the virtualized hardware for the IaaS platform continuously without any interruption.

Additionally, Rajaraman (2014) stated that IaaS is considered a multi-user type of service because the virtual hardware can be used and shared by many organizations at the same time. In delivering the IaaS, the cloud service provider is the party entirely in control and responsible for managing the physical and virtual computation resources. IaaS users are only responsible for the charges of their on-demand, used services (Arutyunov, 2012). Arutyunov also stated that infrastructure-as-a-service is evolving as a service-oriented technology refresh cycle strategy that ensures service availability, provides the right sizing, scalability, stability, and sustainability needed to drive competitive advantage.

## Computer Technology Refresh Strategies

In a globalized economy, infrastructure service availability is the key to competitive advantage. Hence, retail information technology infrastructure and programs operate in an environment of rapid technology evolution in which some system components become obsolete (Grasso, 2009). Grasso further indicated that due to the fast pace of technology advancement, computer technologists and program teams need to practice agility. Computer technologists also need to keep up with innovations and trends and have procedures in place to manage and refresh obsolescence in infrastructure, hardware, and software to drive standards in delivering the business goals and objectives. Several strategies have been present in the process of refreshing or updating systems and software, including:

- Strategy 1. Information Technology Road Mapping
- Strategy 2. Software-as-a-Service
- Strategy 3. Infrastructure-as-a-Service.

Petrick and Echols (2004) referred to technology road mapping as a tool that enables organizations to make decisions more consciously, thus preventing the waste of time, resources, and helping to reduce operational risk. Furthermore, organizations in the many other industries are starting to grasp the benefits of technology refresh cycle strategies as a tool to provide the current and future vision on how the landscape of infrastructure as a competitive advantage continues to evolve. Software-as-a-Service describes a type of cloud computing service that enables the user to build desired applications Rajaraman (2014). The SaaS runs entirely on servers of the cloud service provider and is maintained by the service provider for future updates and versions (Gupta, 2012). Additionally, Verma (2014) stated that traditional information systems have been reformed and replaced by innovative methods through the use of the Internet. Finally, Infrastructure-as-a-Service (IaaS) refers to the utilization of virtualized hardware components of the cloud services (Gonzalez & Smith, 2014).

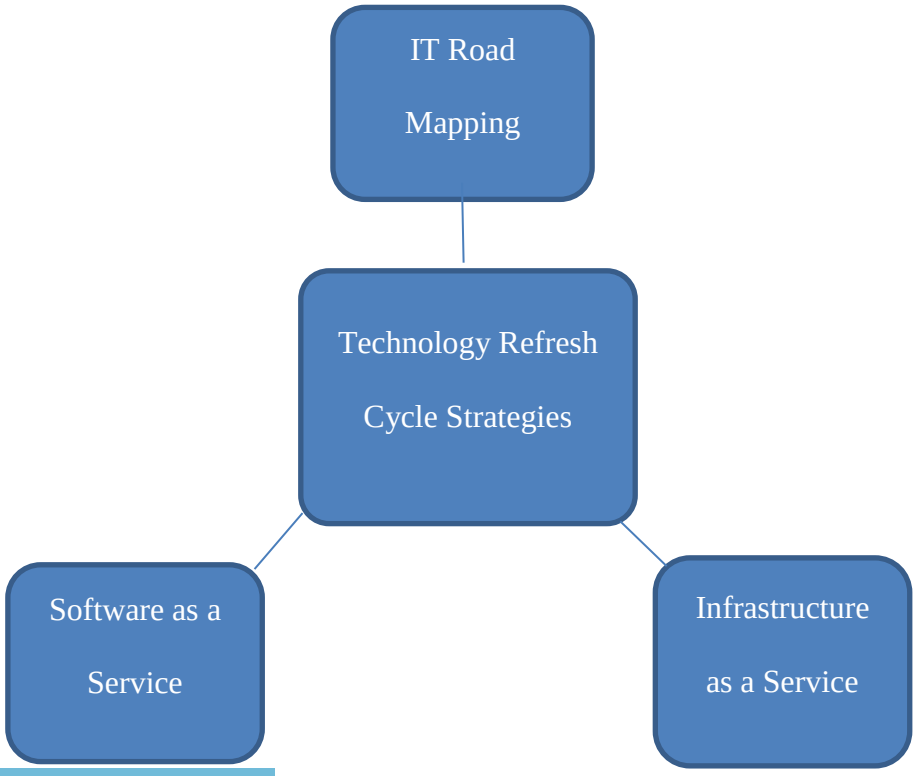

*Figure 1. Computer Technology Refresh Strategies*

## Information Technology Refresh Key Drivers

### Key Driver 1. Information Technology Service Management

Incident Management is the process that involves the rapid restoration of IT services to the business (Bon, Kemmerling, & Pondman, 2002). Organizations competing in the 21st-century globalized economy generally understand the level of competitiveness and the utilization of industry standard frameworks as a toolset for service management to drive infrastructure stability (Pollard & Cater-Steel, 2009). Managing IT assets across a large enterprise requires the use of uniform practices and standards that IT managers should follow as rules and methods that have been most widely accepted and implemented to maintain a competitive advantage with other organizations (Dorogovs & Romanovs, 2008).

Information technology service management (ITSM) drives stability and productivity. ITSM refers to the entirety of activities directed by policies, organized and structured processes, supporting procedures that are performed by an organization to plan, design, deliver, operate, and control information technology services offered to customers. Levitt (1972) argued that the introduction and applying of ITSM concepts drive IT and business growth in the service sectors of western economies to gain a competitive edge.

While similarities for supplying goods and providing service rise, several writers, including Mills (1982), have mentioned the criticality of production stability. Productivity and service quality drives business revenue and the platform to provide these functions are critical to the success of any organization. The spotlight has fallen on several aspects of service, including quality (Parasuraman, Zeithaml, & Berry, 1988) and technology (Mills, 1982). Rockart (1982)

and technology (Mills, 1982). Rockart (1982) identified service and the perception of that service by management as a critical success factor in managing information systems. This help drive the success factors within organizations as a whole.

**Key Driver 2. Information Technology Incident Management**

An organization's main goal during production hours is to maintain stability and resiliency to service and operations as well as significantly improve the effectiveness of IT services. (Bauset Carbonell & Rodenes Adams, 2012). The first goal of the incident management process is to restore a healthy service operation as quickly as possible and to minimize the impact on business operations by ensuring that the best reasonable levels of service quality and availability are maintained. Organizations that do not believe in the concept of a technology refresh cycle routinely impact the core infrastructure due to hardware life cycles and end of life software stacks (Cater-Steel & Tan, 2005). Incident management is one of the most critical aspects of any service delivery operation because the success of any organization from a productivity perspective is measured by key performance indicators (KPI) driven by the mean time to repair (MTTR) (Acikalina, 2010). Acikalina defined MTTR as a performance tool that outlines when an incident is opened to when it is acknowledged, assigned to a service representative, and resolved.

One of the primary drivers of technology refresh strategies is to reduce incident tickets drastically due to more scalable and current infrastructure, from operating systems to hardware and the core network platforms that the foundation runs on. Acikalina also stated that refreshing technology provides the sustainable platform to handle and withhold new and routine patches and systemic updates from manufacturers and vendors.

**Key Driver 3. Security Risk and Vulnerability Management**

Information security is as vital as it has ever been, and the challenges to determine the factors contributing to information insecurity prove to be of a complex nature (Pollard & Cater-Steel, 2009). With the recent rise in cybersecurity and threats, protecting infrastructure from risk, outages, and intrusions requires the use of industry-standard tools, frameworks, and best practices to manage, respond, remediate, and mitigate security issues (Fisher, 2006). Fisher also stated that running infrastructure on the old platforms will increase the possibilities of threats and intrusions because these legacy systems face challenges in withstanding newly designed vulnerability management tools and applications.

The need to adopt and implement technology refresh strategies to ensure continuous maintenance, vendor support, and readiness to meet current and future innovative challenges is a key. In providing strategies to meet these challenges, Rainer, Snyder, and Carr (1991) proposed qualitative risk analysis methodologies that comprise the following; Identification of organizational value activities, identification of IT components of each value activity, identification of linkages among value activities and IT components, determination of the value of IT assets, identification of possible threats, identification of the vulnerability of assets to threats, and resolution of the overall IT risk exposure. Straub and Welke (1998) also introduced a security risk planning model that comprises recognition of security problems, risk analysis, threat identification, and risk prioritization.

The promising solution discussed in Montesino and Fenz (2011) and Fenz, Ekelhart, and Weippl (2008) suggested using automation tools to capture the IT infrastructure status over the network and to provide controls and rules to identify the state of security. Legacy systems will fall short in this endeavor and will place the infrastructure at risk. Fenz et al. (2008) also stated

that good practices and standardization are critical to risk management. As such, the infrastructure requires adaptability potentials using new security patches on network operating systems, servers, and desktops.

The need to refresh both operating systems and hardware is critical to sustaining the 21st-century cyber challenges that organizations are faced with on a day-to-day basis. Innovation and creativity that causes cyber damage are rapidly growing and the call to ensure the stability of an organization's infrastructure and operations depends on how up-to-date its entire platform is, to reduce or eliminate the threat and have the needed tools in place to proactively detect and remediate risk. Cavusoglu, Mishra, and Raghunathan (2004) stated that the costs of countermeasures include development costs (e.g., installation costs), operational costs (e.g., maintenance costs), and response costs (e.g., personnel necessary to operate the countermeasure). Cavusoglu et al. also stated that it is evident that the price tag on successful attacks are difficult to define, as they are not limited to financial loss and can also be responsible for the loss of image, trust, and similar nonphysical values of organizations.

**Key Driver 4. Information Technology Service Quality**

Client satisfaction is critical to growing an organization’s customer base as well as maintaining loyalty and obligation to customers. Developing trust in a company is a significant part of building the company-consumer relationship (Khan & Valverde, 2014). In today’s competitive and consumer behavior driven economy, any organization’s customer base is its revenue source. Many organizations in the retail industry are providing the same goods and services, while chasing the same customers, leading to competitiveness in the marketplace (Spath, Bauer, & Praeg, 2011). Spath et al. also stated that the need to ensure customers are satisfied is a key to competitive advantage. IT infrastructure has a significant role in achieving

that goal by warranting that their technology has high availability, is stable, and maintains above 95% uptime. Gaining competitive advantage depends on the stability, productivity, and continuous functionality of critical infrastructure to achieve success and quality of service (Lin, 2003). Lin also stated that it is essential for businesses to continuously improve service quality to enhance customer satisfaction. While the importance of service quality has become more widely recognized, conceptualization and measurement continue to emerge (Khan & Valverde, 2014).

The study similarly differentiates the quality of service into two categories. First, quality through services and the information customers want and secondly, service quality through a personal relationship with IT service providers (Jia & Reich, 2011). Jia and Reich also stated that surveys of business clients and their level of satisfaction with IT service quality provide useful indicators but cannot be easily used to prescribe solutions because managers need to know how internal functioning affects customer evaluation and appreciation.

Infrastructure and operational performance indicators have to be more creative in today's digital economy where more robust tools, such as interactive and real-time dashboards, are in place to allow businesses a holistic view of how the organization is doing. IT service quality is improved to increase the business performance of the service provider, in particular, the efficiency of financial, technical, process, and human performance (Spath et al., 2011).

Utilization of the ITIL framework drives useful KPI measurement and quality measurement for IT services, which categorizes IT service quality measures and indicators into the four common areas of service quality, information system quality, process performance, and customer satisfaction measures (Lepmets, Ras, & Renault, 2011). Lepmets et al., also stated that one of the benefits of technology refresh strategies help address the four common issues to achieve a competitive advantage, for example, the better a technology infrastructure operates, the

more it positively impacts services provided, reduces outages, maximizes revenue, and increases the profit margins to meet the overall business goal and objectives.

**Key Driver 5. Information Technology Governance**

Information technology governance is a subset discipline of corporate governance focused on information and technology and its performance and risk management (Brown & Grant, 2005). IT governance continues to evolve as a very significant tool for IT operational success, yet is complicated with its application. The reason for focusing on information technology governance is due to technology becoming ubiquitous, i.e., modern IT crosses organizational activities and has become actively aligned with business activities. In combination with leadership, structures and processes should ensure that IT governance achieves the fusion of business and IT itself (Van-Grembergen, 2002).

IT governance focuses on organizational alignment, integration, and relationships. All are required to ensure that IT systems sustain and extend the organization's strategies and objectives (IT Governance Institute, 2003). According to Keynes-Pearce (2002), views on IT governance can be grouped on a spectrum ranging from structure-oriented, with the emphasis on control and coordination, to process-oriented, with a focus on sustainable capability and continuity. In between is the people-orientation to encapsulate the human element, such as leadership.

Governance is another significant contributor to service delivery, which drives competitive advantage. The 21st century IT infrastructure and operations continue to do very well concerning enforcing policies and getting the business buy-in to ensure there are discipline and structure in place to prohibit business owners the ability to install new items to the enterprise without the right protocol (Van-Grembergen, 2002). Access controls and effective policies deployed into a network by operating systems or other technology help drive and enforce

governance principles for environmental stability. Adopting technology refresh strategies and maintaining the application of refresh functions, requires governance to bind organizational leaders to the level of commitment needed to ensure full adaptability (IT Governance Institute, 2003).

**Refresh Cycle Key Drivers**

Incident Management is the process that involves the rapid restoration of IT services to the business (Bon et al., 2002). Organizations competing in the 21st-century globalized economy mostly understand the level of competitiveness and the utilization of industry standard frameworks as a toolset for service management to drive infrastructure stability (Pollard & Cater-Steel, 2009). One of the primary drivers of technology refresh strategies is to reduce incident tickets drastically due to more scalable and current infrastructure from operating system to hardware and the core network platform that the foundation runs on (Acikalina, 2010).

Information security is as vital as it has ever been and the challenges to determine the factors contributing to information insecurity prove to be of a complex nature (Pollard & Cater-Steel, 2009). With the recent rise in cybersecurity threats, protecting infrastructure from risk, outages, and intrusions require the use of industry-standard tools, frameworks, and best practices to manage, respond, remediate, and mitigate security issues (Fisher, 2006). Fisher also stated that running infrastructure on old platforms increases the possibilities of threat and intrusion because legacy platforms face challenges in withstanding newly designed vulnerability management tools and their applications.

Client satisfaction is one of the most critical pieces of growing your customer base as well as maintaining your loyalty and obligation to customers (Kang & Hustvedt, 2014). In today's competitive and consumer behavior driven economy, any organization's customer base is

its revenue source. Finally, information technology governance is a subset discipline of corporate governance, focused on IT and its performance and risk management (Brown & Grant, 2005). IT governance continues to be complicated, while also a very significant tool for IT operational success.

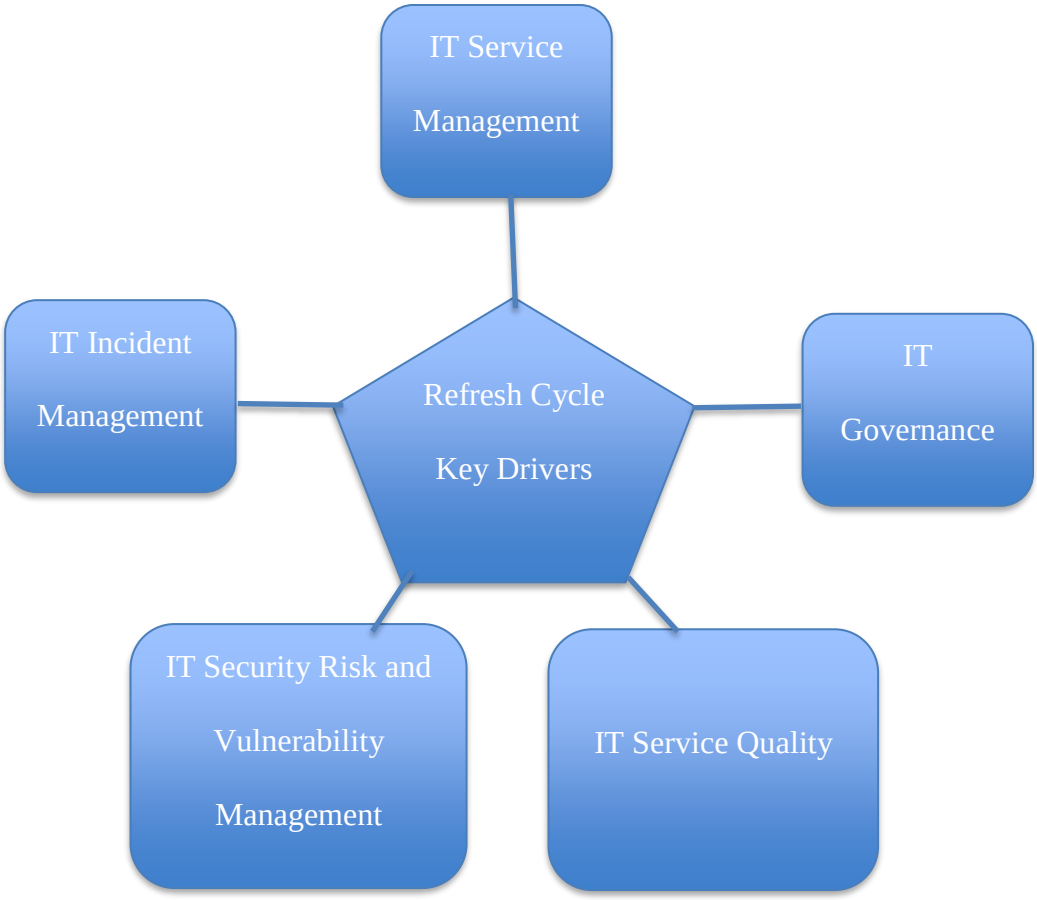


*Figure 2*. Refresh Cycle Key Drivers

## IT as a Competitive Advantage

In today's competitive business environment, systems acquisition and transitions can make or break an organization (Basahel, 2009). Information technology has a powerful effect on the competitive advantage as these technologies serve as essential elements of an overall capability (Friesner, 2011). With the full technology revolution in the 21st-century globalized economy, no company can escape the importance of competitive advantage. Gaining a competitive advantage requires strategic IT solutions programs that align with the business goals and objectives (Lin, 2003).

In a consumer behavior driven economy, easy accessibility to goods and services is the key to sustaining and achieving the critical component for any infrastructure to meet demands while by ensuring high availability systems. Maintaining high availability requires a well-structured technology refresh cycle as a strategic tool to ensure that infrastructure hardware and software are refreshed according to a designed roadmap to meet innovation demands (Caetano & Amaral, 2011).

Infrastructure scalability and reliability continue to drive competitive advantage with the utilization of lifecycle management tools, such as refresh cycles (Yeganeh, Tootoonchian, & Ganjali, 2013). Technology strategy as a strategic instrument for pursuing generic competitive strategies aiming at fundamentally different types of competitive advantages has been successful due to effective technology refresh strategies.

Many companies have developed a sustainable IT strategy that rises to an enterprise level or goes beyond green IT initiatives to focus on technical responsibility, competitive advantage, and sustainability (Lubin & Esty, 2010). Lubin and Esty studied pioneering companies to explore the drivers of quality and IT megatrends of the 1980s as companies migrated from efficiency-based strategies to disruptive innovation. Lubin and Esty also identified four distinct benefits of technology refresh such as reduction of costs, product re-engineering, stability, and productivity and how these benefits transformed the core business, creating new business models to drive competitive advantage.

Furthermore, information technology (IT) and business sustainability strategies or sustainability in IT services (SITS) drives competitive advantage. Viable IT innovation platform and sustainable principles have influenced the overall competitiveness. Olson (2008) stated that few companies had developed a sustainable IT strategy that rises to an enterprise-level or focuses

on technology responsibility goals. Olson also mentioned that a viable plan should be one that is complementary to the business, technology, and environment in which they operate. Within the framework of the present information and knowledge-based society, business competitiveness necessarily requires adequate IT strategies, one of which is technology refresh (Andreica, 2006). Andreica also mentioned that it is critical to implement proficient principles of designing IT strategies and implementing sufficient software and hardware systems that are always current to maintain a high level of productivity in service delivery.

As the challenge of cost reduction continues to hurt many organizations, management is integrating information systems across the globe with the expansion of businesses, offshoring, and globalization to set the pace and the ability to compete. Bradley and Byrd (2009) stated that enterprise architecture maturity is a valuable IT resource for helping organizations sustain a competitive advantage. IT professionals of various organizations are now taping into state-of-the-art technology using servers that have the capabilities of quad-core processors, high-speed memory, high capacity storage, and virtualization platforms. According to Clark (2011a), a suitable level of redundancy must be calculated and applied or else the infrastructure equipment in parallel contributes to the causation of outages, which impacts service delivery in summary. The research found that infrastructure that manages preventive maintenance requirements and technology refresh cycles proactively, locating and identifying issues before they occur, drive infrastructure stability.

The general goal of this study was to expand on the theory of technology refresh strategies within retail organizations and the role of these strategies in driving organizational goals and objectives to gain a competitive advantage. Further, the purpose of the qualitative

exploratory study was to explore the strategy computer technologists need to establish toward a computer technology refresh cycle in a retail organization.

This research also interconnects how technology refresh impacts the major component areas of how an infrastructure operates effectively and efficiently from a 360-degree viewpoint, investigating both the negatives due to the lack of these strategies as well as the positives due to operating within such a strategy.

This section outlined the computer technology refresh cycle and how it correlates to competitive advantage by utilizing industry standard strategies such as information technology (IT) road mapping, software as a service (SaaS), and infrastructure as a service (IaaS). Furthermore, how these strategies impact the five key business drivers such as information technology service management, information technology incident management, information technology security risk and vulnerability management, information technology service quality, and information technology governance was reviewed. A company can then utilize IT service quality mechanisms to measure business performance, the efficiency of financial, technical, process, and human performance via designed key performance indicators to measure success against competitors (Spath et al., 2011).

## Benefits of Technology Refresh Cycle

Retail organizations can immensely benefit from moving into a well-structured technology refresh cycle environment by utilizing information technology (IT) road mapping, software as a service, and infrastructure as a service to achieve the following benefits of infrastructure scalability, security, stability, and sustainability (Britto, 2012; Rajaraman, 2014).

### Infrastructure High Availability

Infrastructure high availability is a critical component that is designed to meet business demands for the availability of critical IT and IT-enabled business services (Andreica, 2006).

Highlighting the availability component derived from these strategies enables organizations, particularly in the retail industry that are still not convinced about technology refresh strategies, to invest in the emerging strategy that leads to a competitive advantage. This part of the literature review outlines the four key benefits of adopting technology refresh cycle strategies, namely infrastructure scalability, infrastructure security, infrastructure stability, and infrastructure sustainability

**Infrastructure scalability**

Infrastructure scalability is one of the significant benefits of technology refresh strategies in achieving competitive advantage. Baltatescu (2014) stated that scalability characteristics are one of the gains in utilizing these strategies because infrastructure scalability enables computer technologists to upgrade and access a vast variety of applications without downloading and installing any software as well as not dealing with licensing issues.

**Infrastructure security**

Infrastructure security is another significant benefit of these strategies in achieving competitive advantage. Computer technologists and IT managers should take security risks and vulnerabilities into consideration when choosing any infrastructure strategy (Ko, Kirchberg, & Lee, 2014). Organizations face threats and vulnerabilities every day due to high-end utilities and tools (Britto, 2012). Britto also stated that intrusive penetration due to aged and outdated infrastructure opens the vulnerability channels even more.

Furthermore, Brito mentioned that the security concern could individually act as one of the most critical determining factors for organizations to transition into a well structured and defined IT strategic environment to ensure infrastructure is secured, patched, managed, and monitored utilizing the latest and greatest hardware and software tools to comply with federal

and state regulations. Technologists continue to identify the trend of data privacy and security to be the most critical area of concern (Baltatescu, 2014). The adaptation of a well-structured technology refresh cycle ensures protection on core infrastructure to enable business operations to function and be productive at all times while driving competitive advantage for businesses as well as maximizing profits, all with less threat.

**Infrastructure stability**

Infrastructure stability is another significant benefit of these strategies in achieving competitive advantage. A well-structured technology refresh cycle strategy will also help organizations, particularly in the retail industry, to gain infrastructure stability in measuring and correlating end-to-end IT infrastructure resources and services by collecting, centralizing, and standardizing IT infrastructure assets such as switches, physical and virtual servers, backup services, distribution resource planning (DRP) systems, vendor management, and hardware and software objects (Lee, 2015). In driving and gaining a competitive advantage, information technology (IT) management needs to align with business priorities and support future business growth. Implementing a well-structured technology refresh cycle provides the right platform and environment to achieve the business objectives which result in a competitive advantage.

**Infrastructure sustainability**

Infrastructure sustainability is another significant benefit of these strategies in achieving competitive advantage. Sustainable infrastructure refers to the designing, building, and operating of these structural components in ways that provides the highest system availability. According to Ko et al. (2014), ensuring sustainability in core infrastructure requires effective planning and the provision of reliable services that correlate to infrastructure readiness and efficiency. In achieving infrastructure sustainability, computer technologists should have suitable road

mapping tools to ensure that devices are well maintained (Radhakrishnan et al., 2008). In doing so, organizations would accomplish the system availability needed to gain a competitive advantage.

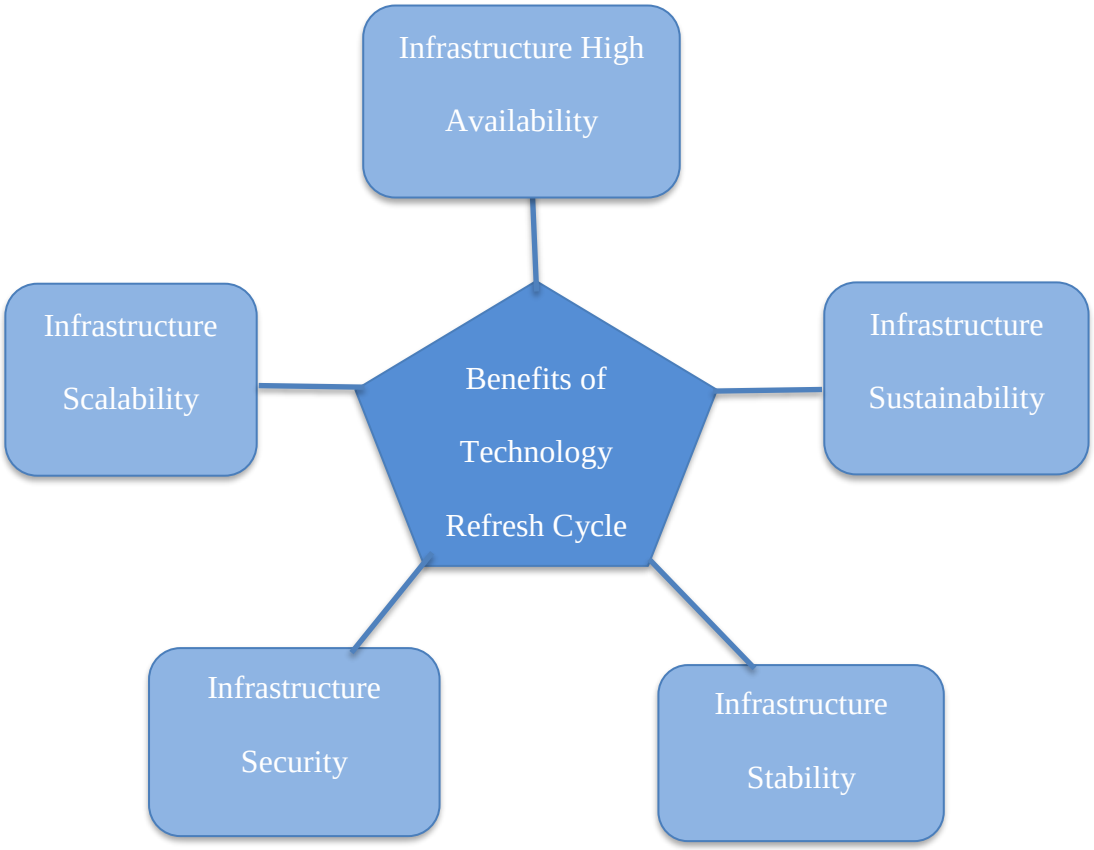


*Figure 3*. Benefits of Technology Refresh Cycle

**Conceptual Framework**

Succeeding in the 21st century as an organization requires strategic IT planning and substantial alignment with business partners (Andreica, 2006). One of the most fundamental and critical IT strategies that drive business success is the technology refresh cycle through technology road mapping (Lee et al., 2012). Running an infrastructure on the right software and hardware architecture directly affects scalability, security, stability, and sustainability perspective (Radhakrishnan et al., 2008). High availability service management (HASM) is an information

technology (IT) service management tool that is designed to meet the business demands for the availability of critical IT and IT-enabled business service (Andreica, 2006).

This literature review of prior research has presented an overview of the research topic areas that intended to explore the strategies computer technologists need to establish computer technology refresh cycles in retail organizations. Furthermore, the framework outlines the three main strategies of the research topic, as well as five key drivers and how the strategy and key drivers correlate to competitive advantage.

Multiple technology refresh strategies were examined in this study ranging from information technology road mapping to software as a service and infrastructure as a service. Also, the literature review discussed the five key technology refresh drivers that link to the research topic ranging from information technology service management to information technology incident management, information technology security, risk and vulnerability management, information technology service quality, and information technology governance. Figure 4 provides a graphical illustration of the conceptual framework of this research.

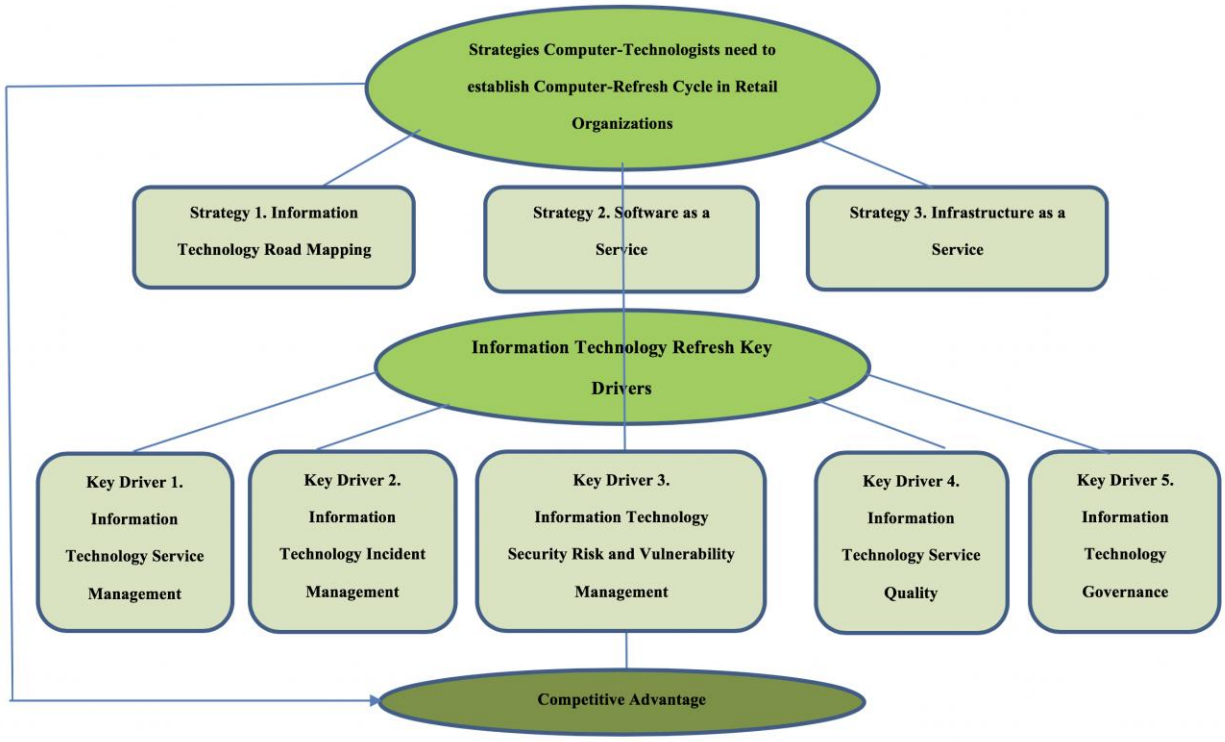


*Figure 4*. Conceptual framework.

## Summary of Literature Review

This chapter presented the literature review for this study. The history and background of technology refresh were presented as the primary context of this research. Additionally, an overview of the technology refresh cycle as a strategic tool to drive competitive advantage in the 21st century in many industries was outlined.

Along with reviewing the technology refresh overview, the three main computer refresh strategies, such as information technology road mapping, software as a service, and infrastructure as a service, were explained. Also, the five central information technology refresh key drivers, namely information technology service management, information technology incident management, security risk and vulnerability management, information technology service quality, and information technology governance, were discussed. In consideration of the

topic of this dissertation, the literature review chapter presented the background of computer technology refresh, the strategies, and key drivers and how they correlate to competitive advantage. Finally, this chapter explored the five key drivers and their benefits in achieving competitive advantage through system availability. The conceptual research framework, graphic design, and the summary section concluded this chapter.

The next chapter explains in detail the methodology of this research, including the research tradition, research questions, study design, the population and sample and the sampling procedure, the instrumentation, validity and reliability, the data collection and analysis, and finally the ethical considerations of the study.

## CHAPTER THREE

The problem to be addressed in this study was that many retail organizations do not have a technology refresh strategy that manages their infrastructure hardware life cycles and end of life software stacks. The purpose of the qualitative exploratory study was to explore the strategies computer technologists need to establish for successful computer technology refresh cycles within retail organizations. At the completion of this study, effective technology refresh cycle strategies will be provided.

The organization of this chapter will cover the research traditions, study question, design, population of the participants, sample, and finally the sampling procedure. Furthermore, instrumentation, validity, reliability, data collection, data analysis, and ethical considerations will be included.

### Research Tradition

A methodology was used in this research to support the research question as well as the research analysis of the theoretical and conceptual framework of the study (Kramer-Kile, 2012). Qureshi (2015), stated that the research methodology is diverse from the research methods itself. Qureshi also expanded on the definition of the research methodology as a logical method used to solve the research problem and arrive at a conclusion from the problem statement. Qureshi also confirmed the research methods would be the techniques and tools that help the researcher to execute the research processes.

The qualitative methodology was used for the proposed study because the qualitative method would support the researcher in connecting with both theoretical and practical facets of the conducted research (Gerrish, 2011). Parker (2014) stated that by utilizing the qualitative research methodology, the researcher would have the ability to participate heavily and

inclusively through interaction with participants as it pertains to the topic of the study. On the other hand, Parker also indicated that qualitative research methodologies equally assist the researcher to philosophically inclined subjects ranging from culture, observation, ideology, and the certainties designed about the study in question.

A qualitative methodology was appropriate for this study because in utilizing qualitative methods the researcher was enabled to understand the research problem in more depth as the investigative process progress (Aczel, 2015). Primarily, the study leveraged computer technologists and information technology (IT) managers from retail organizations who adopted robust technology refresh strategies that resulted in gaining competitive advantage through infrastructure scalability, security, stability, and sustainability. The quantitative methodology was not used for this study because this would have required verification by conducting statistical methods; however, a lack of prior research into retail practices is missing (Aczel, 2015).

A research design was used to plan the entire process of conducting the research (Ngulube, 2015). Based on the selection of the qualitative methodology, an exploratory design approach was used (Mason, Augustyn, & Seakhoa-King, 2010). Per Mason et al. (2010), an exploratory qualitative research design would efficiently showcase new research topics that could contribute to the current body of knowledge. Mason et al. stated that a researcher could also use the exploratory qualitative research strategy to study a subject from a different point of view. In describing the qualitative exploratory design, Welch, Plakoyiannaki, Piekkari, and Paavilainen-Mäntymäki (2013) acknowledged the fact that an exploratory qualitative research design could reflect opinions as well as give the researcher the flexibility to repeat the process of research and explore the research design.

An exploratory qualitative design was appropriate for this study (Kramer-Kile, 2012), after the consideration of three other qualitative design options: ethnography, case study, and phenomenology. The case study design was not utilized for this study because a case study research design focuses on a single entity or person, as stated by (Welch et al., 2013). The ethnographic design was not utilized in this study because of the focus on the cultural aspects of life or to evaluate life from a single viewpoint (Hays & Wood, 2011). The phenomenological design was not utilized in this study. According to Hays and Wood, the purpose of the phenomenology would be to examine an individual phenomenon and to express subjective knowledge through judgmental assumptions.

## Research Question

This research defines strategies computer technologists need to establish a computer technology refresh cycle. The overarching research question for this study was; *What are the strategies computer-technologists need to establish a computer-refresh cycle in retail organizations?*

## Research Design

Chapter one of this study delivered a dialogue of the research problem and the research question. Chapter two offered a complete literature review of the adoption of technology refresh cycle strategies by non-retail organizations and different technology refresh strategies were presented. Chapter three scrutinizes the methodology of this study. An exploratory qualitative method was utilized as a means to drive efficiency and provide the research with the means to get answers to the research question. The research design for this study is covered, including the population and sample, sampling procedures, instrumentation, validity, reliability, data collection, data analysis, and ethical considerations.

## Population and Sample

The population in a research study represents a pool of qualified individuals to act as the research participants (Eldredge, Weagel, & Kroth, 2014). The population for this study was computer technologists in the retail industry group of LinkedIn who have successfully performed strategies computer technologists need to establish a computer technology refresh cycle in retail organizations. The estimated size of the population was not known, although a sufficient number of technologists in the retail industry functioning as information technology (IT) managers that have utilized technology refresh as a strategic tool to gain competitive advantage was observed. The technologists and IT managers were positioned to describe the strategies they took to transition and implement technology refresh cycle strategies in their organizations. This population was appropriate because the technologists have the knowledge, skill, and the ability to express apparent viewpoints of the effectiveness of technology and strategic technique implementations (Stemmer, 2007).

According to Barlett, Kotrlik, and Higgins (2001), the sample is a smaller group of a population that represents the similar characteristics of that population. Sample size, in a qualitative methodology is typically composed of a small group of participants (Jackson, 2014). The sample was obtained by determining those who understood the primary purpose of the research, had the familiarity, skill, and knowledge of the topic area, and where available and convenient to access (Marshall, Cardon, Poddar, & Fontenot, 2013). The anticipated sample size for the study was 10. The sample size was appropriate because Whitaker and Albertson (2011) and Clark (2012) conducted similar studies where a sample size of 10 and 9 was used.

## Sampling Procedure

A sampling procedure is a technique that enables the study to select the potential participants that need to be interviewed (Dooley, 2007). For this qualitative study, purposive sampling was utilized as the sampling procedure. Purposive sampling allows for the selection of those participants that can provide a comprehensive exploration of the research problem (Higginbottom, 2004). Purposive sampling was appropriate for the proposed research because the study could incorporate the prior experience and familiarity of the participants around the subject of the study through their understanding and existing knowledge (Barrett & Scott, 2014).

The population for the proposed study was a group of computer technologists in a retail industry group on LinkedIn. These participants self-identified themselves as meeting the criteria for inclusion in the study. Once identified, potential particpants were contacted regarding being a part of the research. Potential participants were contacted using email or phone numbers obtained from the LinkedIn of the potential participants. Participants were characterized by establishing selection criteria (Cleary, Horsfall, & Hayter, 2014). The selection criteria for participants was that they had be a computer technologist with at least two years of retail technology management experience and have knowledge in technology refresh cycle strategies and professional experience in the IT field in general (Cleary et al., 2014). There were no demographic requirements for this study.

When a participant agreed to participate in the study, the informed consent form was sent to the participant before the interview (Jackson, 2014). Following that, the interview time and date was established. The researcher utilized notes from the interviews, recordings of interviews, nonverbal communication, and clarifications (Onwuegbuzie, Leech, & Collins, 2010).

**Instrumentation**

For qualitative research, the researcher is an implicit part of the study and must collect valid and reliable data (Briller, Schim, Thurston, & Meert, 2012; Joppe, 2000). With qualitative research methodology, the research utilizes open-ended questions. During data collection, a designed question and answer session was utilized to capture interview data. Due to the locations of some of the technologists and where their organizations were located, the study used technology such as Microsoft LYNC, Cisco Video Conferencing and Skype for Business to conduct conference interviews. The interview process used interview questions to capture the interviewee's perceptions (Appendix A). An audio recorder was used to record the interview transcripts and notes. For this study, transcribing software was used to convert the audio recordings of the interviews to text files. Each interview lasted 30 to 60 minutes.

Open-ended, semi-structured interview questions were utilized to explore the understanding of the participant's awareness and opinions regarding refresh strategies in the retail space (Xu & Storr, 2012). The open-ended interview questions encouraged the participants to provide detailed descriptions of their lived experiences, perspectives, and stories. Depending on the responses provided, follow-up or probing questions were asked to capture additional details (Jacob & Furgerson, 2012). One-on-one interviews took place at a date, time, and location that were convenient to each participant. Handwritten notes of each participant's interview were captured. Contingent upon the responses provided, follow-up or probing questions was asked to capture additional details (Jacob & Furgerson, 2012).

Labeling of the captured data was used to ensure participants' personal information and identifiable data would not be revealed or affected. There was no personal identifiable

information collected during the interview process. Participants were labeled by a letter ‘’P’’ followed by a number.

The process of ensuring that participants were not harmed included keeping the participant’s name, title, and the name of the organization where the participant was employed unidentified. The usage of code names as previously mentioned was used to label the participants.

## Validity

Validity is the degree of congruence between the explanations of the phenomena and the realities of the world (McMillan & Schumacher, 2006). Thomas and Magilvy (2011) also utilized the word qualitative *rigor* to explain the validity of a qualitative study. By qualitative rigor, Thomas and Magilvy implied trustworthiness and confidence of the research findings. Furthermore, Thomas and Magilvy listed dependability, credibility, transferability, and confirmability as the four main components of research validity.

Dependability is an evaluation of the quality of the integrated processes of data collection, data analysis, and theory generation (Lincoln & Guba, 2000). Dependability is important for a qualitative study because it establishes the research study’s findings as consistent and repeatable (Thomas & Magilvy, 2011). For this study, dependability was addressed by documenting the research design and implementation, the methodologies and methods, and the details of data collections, such as filed notes, memos, increasing transparency, and effective data analysis (Stemmer, 2007).

Credibility is the confidence that is placed on the truth of the research findings (Holloway & Wheeler, 2002; Macnee & McCabe, 2008). Credibility is important for a qualitative study because it establishes thoroughness of the study by adopting the following credibility strategies: prolonged and varied field experience, time sampling, reflexivity (field journal), triangulation,

member checking, peer examination, interview technique, establishing the authority of researcher, and structural coherence (Graneheim & Lundman, 2004). For this study, credibility was addressed by doing full descriptions, transcending research paradigms, and the involvement of detailed, rich descriptions not only of participants' experiences of phenomena but also of the contexts in which those experiences occurred.

Transferability is the degree to which the results of qualitative research can be transferred to other contexts with other respondents (Bitsch, 2005; Tobin & Begley, 2004). Transferability is important for a qualitative study because it provides a detailed description of the inquiry and ensures participants are selected purposively (Bitsch, 2005). For this study, transferability was addressed by providing readers with evidence that the research study's findings would apply to other contexts, situations, times, and populations.

Confirmability is the establishment of dependability, credibility, and transferability within research (Thomas & Magilvy, 2011). Confirmability is important for a qualitative study because it establishes the level of confidence that the research study's findings are based and shaped by the participants' narratives and words rather than the researcher's biases (Lincoln & Guba, 2000). For this study, confirmability was addressed by utilizing the audit trail technique of detailing the processes of data collection, data analysis, and interpretation of the data.

## Reliability

Reliability relates to the ability of a measuring instrument to collect accurate data (Bashir, Afzal, & Azeem, 2008). Reliability refers to the extent of the consistency of results over time and an accurate representation of the total population under study. In addition, reliability is enhanced if the results of a study can be reproduced under a similar methodology (Joppe, 2000).

Reliability is the consistency with which researchers measure the results of an instrument to collect accurate data (Bashir et al., 2008). Triangulation improves the reliability of collected

data captured from multiple perspectives (Jonsen & Jehn, 2009). The reliability of the collected data obtained by asking open-ended questions increases the trustworthiness and consistency of the collected data since open-ended questions inspire the participants to share their visualizations and experiences.

Conducting member checking enhances the reliability and validity of the data collection process (Pritchard & Whiting, 2012). After all the interviews were completed, a copy of the transcribed interview transcripts was converted into a Microsoft Word file for all 10 participants. There were 10 files with 10 questions answered for each participant. The files were sent to each participant with a request to determine if the transcription represented what was said The participants were also advised to mark up any discrepancies and return the files, if necessary. Using triangulation contributes to the validation of data through cross verification from two or more sources (Bogdan & Biklen, 2006). Through triangulation, the study identified categories and themes using multiple resources. This process helped in interpreting the same known data utilizing numerous methods to improve the findings (Jonsen & Jehn, 2009).

Triangulation is a data analysis technique used in qualitative studies to direct the researcher to advance the method of data collection, as well as data evaluation (Jonsen & Jehn, 2009). With this study, triangulation occurred after data analysis was completed. All data were transcribed and data coding and theme identification were completed. The triangulation analysis results were compared to the literature review to determine compliance and alignment to ensure consistency and reliability of the entire process as listed in chapter 3 of the study.

Upon approval of the study proposal, a pilot study was conducted to gauge the sampling procedures, the applicability of the research questions, and the design of the questionnaire (Pritchard & Whiting, 2012). A pilot study was conducted by sending the interview questions to

three technologists in the field of retail infrastructure and operations with robust technology refresh cycle strategies. The three individuals were asked to give their opinions regarding the central research question and the interview questions and solicited feedback as to whether the interview questions were practical, had clarity, and if the this would yield the anticipated answers by asking the designed interview questions.

## Data Collection

The research question guides the data collection process necessary to capture needed information for a proposed study (Yoon, Schaefer, Brinegar, Malu, & Reyes, 2015). The research question for this study was; What are the strategies computer-technologists need to establish a computer-refresh cycle in retail organizations?

The data collection technique selected to answer the research question was semi-structured interviews. Semi-structured interviews provide dependable data about the participants' substantial life know-how since the construction and atmosphere of semi-structured interviews allow participants to examine their perspectives (Kolar, Ahmad, Chan, & Erickson, 2015). Semi-structured interviews encourage participants to elaborate on their answers based on their individual and professional know-how and stories (Fifolt, 2013).

Phone and email were utilized as the means to communicate with potential participants to confirm their willingness to participate and coordinated their availability. The researcher provided email and phone numbers to the participants. Communication through email and phone were utilized as a point of contact throughout the process until the interviews were completed.

Ten participants (computer technologists) from retail organizations that have effectively and successfully transitioned their respective organizations into utilizing technology refresh cycle strategies were interviewed. Participants were asked open-ended questions and potential follow-on questions during the semi-structured interviews as specified in the interview protocol

(Appendix B). The proposed plan was to conduct the interviews at a combination of offices of the IT managers located within the local vicinity of selected technologist and utilization of teleconference audio/video technology for participants located outside of the researcher's city and state. The precise date and time of each interview were established after participants confirmed information for the scheduled meeting.

Each of the interviews encompassed the following general process: (a) establish rapport with the participant; (b) introduce the study, its purpose, and its constraints; (c) obtain a signed consent agreement form, (d) use the interview protocol (see Appendix B) to ensure all questions were asked and were in the correct format, (e) use probing techniques of the silent probe, overt encouragement, elaboration, clarification, and reflection; and (f) thank the participant for their time and efforts.

Each of the interviews was recorded using the built-in features for Microsoft (MS) LYNC and Skype for Business. A personal journal was used during the interview to capture the researcher's reports on the participants, detailed annotations of the participants' statements, and the field notes of the interview.

After the interviews were completed, the recorded information was transcribed into Microsoft Word using Dedoose. Upon completion of each interview, the data was transcribed and the quality checked, as well as proofreading the text.

In summary, data collection occurred using notes, recordings of interviews, and observations of study participants (Cleary et al., 2014). Each interview lasted between 30 to 60 minutes and was recorded. The recorded data was transcribed in Microsoft (MS) Word and password protected. The data were then cross-referenced with any notes and relevant information that was collected (Onwuegbuzie et al., 2010).

## Data Analysis

An exploratory qualitative methodology was selected over other qualitative designs because the focus of the research was to categorize and interpret themes (Mason et al., 2010). Qualitative data analysis methods are conceptual and relational (Mayer, 2015). Conceptual data analysis involved the establishment of research themes. Relational data analysis started with the identification of present concepts and continued by looking for semantic relationships (Graue, 2015). Semantic relationships were established using thematic units. Thematic units are high-level abstractions interpreted from basic themes and patterns established in the qualitative data (Mayer, 2015). The data analysis process involves the emergence of themes from the interview transcripts and other collected data, such as the personal journal.

Data analysis began by organizing the collected information, followed by data perusal, classification, and synthesis (Graue, 2015). The data analysis approach for exploratory analysis included (a) compiling the data from the interviews, (b) organizing the data by interviewee, (c) coding of the data (i.e., organizing the data by recognized categories), (d) identifying themes (i.e., the label attached to each recognized category), and (e) establishing data relationships (i.e., recognizing similarities and differences in themes in order to condense or separate themed categories, as appropriate). Following the completion of the 10 interviews with all participants of the study, the recorded files were transcribed using Dedoose. Dedoose streamlines the necessary qualitative analysis, an inductive process (Williams, 2011).

As stated by Mayer (2015), analyzing data in a qualitative research method comprises a collaborating model that involves the following factors: collecting the data; displaying the data; verifying the data; and reduction of the data. During the data display phase, received responses of the participants were transcribed into word-based documents. The transcribed responses were sent to the participants as part of the member checking process. Each participant was asked for

verification of their responses to validate accuracy and consistency. Furthermore, the participants were advised to ensure the transcribed responses reflected their answers to the interview questions. The data analysis process began after confirmation of data accuracy was received from the participants.

The collected data were categorized into different codes. The coding rules utilized in this study to map textual units into data codes considered the codes as groupings. Different textual units of data were all located in each grouping. The process then built and categorized the several codes grounded on the objectives of each interview question. During the coding phase of data analysis, the data reduction process occurred, as stated by Mayer. Mayer also stressed the importance and criticality of the data reduction process primarily due to the likelihood of valuable data lost. Extreme care and attention were applied in the study as it relates to the method of data reduction or removal of repetitive data to prevent the loss of any prominent data.

The technique that was used to translate data terms into themes was that the coded data was separated and observed for relationship and patterns. Groupings were created to magnify the data relationships. The process took all the memos and assigned themes to them.

The themes and combinations of themes were recorded as memos in the research journals. The memos with the same names were combined and synthesized into a very concise set of themes. According to Mayer (2015) themes are used to test the coding consistency in themes and patterns established in qualitative data. Mayer also stated that the process of data analysis comprises the development themes from interview texts and other collected data, example journals, memos, etc. Once these processes were completed, the Dedoose software suite was used in conducting the analysis. Responses of all 10 participants to each question generated eight themes based on the 10 questions.

## Ethical Considerations

The ethical values applied during the research method involved informing the participants of the right to have a safe environment for the interview. As part of the ethical consideration standards, receiving an informed consent form was included, as well as an explaiation to participants of their right to terminate the interview without giving a reason for ending the interview (Hegney & Tuck-Wai, 2010). Each one of the participants signed an informed consent form before their interviews started.

To ensure the highest level of quality for ethical research, the principles of the *Belmont Report* protocol were upheld. The Belmont Report principles are primarily focused on the well-being of study subjects (Bromley, Mikesell, Jones, & Khodyakov, 2015). The vulnerable research population must be protected from potential exploitation (Rogers & Lange, 2013). The main principles of the Belmont Report protocol (i.e., autonomy, beneficence, and justice) should be maintained (Strause, 2013).

Researchers are obligated to ensure no harm comes to participants due to participation in a study (Hegney & Tuck-Wai, 2010). Risks must also be curtailed or significantly reduced. To ensure awareness of the risks and benefits of this study, each participant was required to sign an informed consent form. The consent form included (a) the purpose of the study, (b) the involvement of participates, (c) participation procedures, (d) the benefits of the research, (e) the risks of taking part, (f) costs and compensation, (g) confidentiality, (h) voluntary nature of participating, and (i) the rights of the participant to withdraw from the research study (Wright, 2012).

According to (Chenail, 2011), biases can occur due to preexisting knowledge and experience with the topic of study. This bias was mitigated by using open-ended questions

throughout the interview process, concentrating exclusively on the responses of participants, performing triangulation, and using note taking.

## Summary of Chapter Three

With this study, an exploratory qualitative research design was used. An exploratory qualitative research design was appropriate because it provides a suitable method for this study by exploring a current research issue and attempts to find a strong description of an existing problem (Kramer-Kile, 2012).

Data were collected from 10 participants. These participants were selected from computer technologists in a retail industry group of LinkedIn. The participants were expected to have successfully adopted and transitioned their respective organization into functioning using technology refresh cycle strategies. Purposive sampling was utilized. Semi-structured interview questions were also utilized.

Data analysis was completed by following the general approach described by Graue (2015). The study provided the main themes and related key topics to each of the identified themes that characterized the semi-structured data that was collected from responses from the participants, observation from the researcher, and field notes.

## CHAPTER FOUR

This qualitative research study explored the research question, What are the strategies computer-technologists need to establish a computer-refresh cycle in retail organizations? The purpose of the qualitative exploratory study was to explore strategies computer-technologists need to establish a computer-refresh cycle in retail organizations. The essential issue was that many organizations in the retail industry do not have a technology refresh strategy that manages their infrastructure hardware life cycles and end of life software stacks. Also, computer technologists are still uncertain about how technology refresh cycle strategies impact service availability and productivity as it pertains to service delivery, especially in the 21st-century globalized economy where competitiveness is a key to business success. The intent on completion of this research was that effective strategies for shifting into a well-structured technology refresh cycle would be provided to those computer technologists and information technology (IT) managers in retail organizations. The study was structured to provide insight into adopting, transitioning, and implementing technology refresh cycle strategies.

This chapter presents the demographics of the participants, data collected from the qualitative interviews of the participants, and the data analysis. Additionally, this chapter discusses the eight emerging themes, the related key topics, and the findings of the research. The chapter ends with a summary of this section.

### Participant Demographics

The participants for this qualitative research included computer technologists and IT managers in the retail industry that had already adopted well-structured technology refresh strategies for their infrastructure and operations platform. Participants were expected to have at least two years of experience in managing infrastructure in the retail industry and have an understanding of enterprise computing technology and involvement in implementing well-

structured technology refresh strategies. Each participant member was initially contacted through e-mail, phone calls, or LinkedIn. Once the participant agreed to be part of the study, emails were sent out asking for availability and dates and times to set up interviews. All the participants for this qualitative research study shared the same background, such as computer technologists, IT managers, directors, or senior leadership of the information technology infrastructure as part of the IT department of their respective retail organizations. There were 10 participants in this study. Out of the 10 participants, there were six males and four females. Due to the anonymity requirements of this study, the participants are referred to as PID (Participant's Identification) with the numbers 1 through 10. The participants were selected from a LinkedIn group of professionals. Table 1 specifies the participants' gender and their positions during the time they adopted, transitioned, and implemented technology refresh cycle strategies in their respective organizations.

Table 1. *Participants Demographics*

| PID | Gender | Position |
|---|---|---|
| M1 | Male | Vice President of Information Technology Infrastructure |
| M2 | Male | Director of Infrastructure and Operations |
| M3 | Male | Technology Operations Manager |
| F1 | Female | Chief Information Officer |
| M4 | Male | Enterprise Desktop Support Operations Director |
| M5 | Male | Information Technology Service Operations Director |
| M6 | Male | Infrastructure and Operations Manager |
| F2 | Female | Enterprise Desktop Engineering Manager |
| F3 | Female | Vice President of Information Systems and Security Operations |
| F4 | Female | Assistance Vice President of Technology Operations |

At the start of each one of the interviews, the participants were asked questions regarding the number of years of experience they had in the information technology field, how many years of management experience they had, and their personal and professional knowledge about strategies regarding computer refresh cycles. Table 2 specifies each participant's length of experience in the IT field as well as how many years they had in computer refresh cycle strategies.

Table 2. *Further Statistics from Participants*

| PID | Years of experience in IT | Years of Management experience in IT | Positions |
|---|---|---|---|
| M1 | 15 | 10 | Vice President of Information Technology Infrastructure |
| M2 | 25 | 15 | Director of Infrastructure and Operations |
| M3 | 10 | 8 | Technology Operations Manager |
| F1 | 18 | 15 | Chief Information Officer |
| M4 | 22 | 13 | Enterprise Desktop Support Operations Director |
| M5 | 26 | 16 | Information Technology Service Operations Director |
| M6 | 9 | 7 | Infrastructure and Operations Manager |
| F2 | 6 | 3 | Enterprise Desktop Engineering Manager |
| F3 | 13 | 6 | Vice President of Information Systems and Security Operations |
| F4 | 9 | 6 | Assistance Vice President of Technology Operations |

## Presentation of the Data

The insight of the exploratory qualitative nature of this study required all interviews to be conducted utilizing Skype for Business, Microsoft LYNC, or other video teleconferencing, as well as face-to-face within the city of Tampa in the state of Florida. Ten interview questions with

two follow-on questions were asked of the 10 participants interviewed. The interview questions for this study were as follows:

1. How many years of IT experience do you have?
2. How long have you been using a technology refresh cycle as a strategic tool in your organization?
3. What were the main reasons that made your organization adopt and implement technology refresh cycle strategies?
4. What type of technology refresh cycle strategies are you using (IT Road mapping, IT, SaaS, IaaS, etc.)?
5. What main issues did you encounter in the process of transitioning into well-structured technology refresh cycle strategies?
6. How did the transition affect people and processes in your organization?
7. How did technology refresh cycle strategies impact your day to day infrastructure support incidents?
8. Did technology refresh cycle strategies help improved technology awareness within your organization and how?
9. What benefits have you gained from adapting and transitioning into a technology refresh cycle strategy?
10. Do you recommend other retail organizations adopt and implement a well-structured technology refresh cycle strategy?

A pilot study was done as part of the data collection procedure. The interview questions were sent to three experienced technologists in the field of retail infrastructure and operations with a robust technology-refresh cycle strategy background. As part of the results of the pilot

study, the 10 questions were adequately aligned with the topic of the research to deliver practical and realistic answers.

## Thematic Findings

The research was able to abstract essential patterns out of the collected data and to begin building the study findings by examining the themes methodically. In the next section, the outcomes of analyzing the themes is presented. Table 3 provides an overview of the eight generated themes.

Table 3. *Themes and Related Interview Questions*

| Interview Questions | Main Theme |
|---|---|
| What were the main reasons that made your organization adopt and implement a technology refresh cycle strategy? | Reasons for Technology Refresh adoption |
| What type of technology refresh cycle strategies are you using (IT Road mapping, Saas, and IaaS)? | Technology Refresh Strategies with Cloud Services |
| What main issues did you encounter in the process of transitioning into a well-structured technology refresh cycle strategy? | Transition Issues |
| How did the transition affect people and processes in your organization? | Transition Processes and People |
| How did a technology refresh cycle strategy impact your day-to-day infrastructure support incidents? | Incident Management |
| Did technology refresh cycle strategies help improved technology awareness within your organization and how? | Technology Improvement Awareness |
| What benefits have you gained from adapting and transitioning into a technology refresh cycle strategy? | Technology Refresh Strategies Benefits |

| | |
|---|---|
| Do you recommend other retail organizations to adopt and implement a well-structured technology refresh cycle strategy? | Technology Refresh Strategy Recommendation |

## Presentation and Discussion of Findings

Each of the 10 participants that were interviewed was asked 10 questions each. Eight main themes were recognized out of the 10 interview transcripts as the result of conducting the interviews. The remainder of this section presents the themes identified in the study.

### Theme 1: Reasons for Technology Refresh adoption

Two key topics surfaced when participants responded to the follow-on questions. The key topics were (a) Planned adoption of technology refresh strategies and (b) Incident adoption of technology refresh cycle solutions. The main theme produced from this question and its key related points are presented below in Table 4.

Table 4. *Theme 1 and Its Key Related Points*

| Main Theme | Key Related Points |
|---|---|
| Reasons for Technology Refresh adoption | Planned adoption of technology refresh strategies<br>Incident adoption of technology refresh cycle solutions |

For the planned adoption of the technology refresh strategies key topic, five of the participants specified they adopted technology refresh strategies over their outdated lifecycle management due to infrastructure outages and incidents. They performed a performance analysis of a competitor, measured the effectiveness and stability of their infrastructure, planned for the transition, and selected to move into a well-structured technology refresh cycle platform. Table 5 contains of three responses from participants who chose to adopt a technology refresh strategy while they studied the efficiency of the refresh cycle solution.

Table 5. *Theme 1 Responses: Reasons for Technology Refresh Adoption (Planned Adoption)*

| Responses |
| --- |
| I cannot remember. We realized that we were spending lots of time and money working on our end-point devices that are out of warranty and struggling with fulfilling project deliverables. |
| From my understanding, I think it was cost effective to run our infrastructure with a defined refresh cycle, especially our hardware. |
| Not that I can remember. We transitioned so we can keep all our equipment covered under maintenance. |
| I know that our environment suffered a lot of outages because we didn't keep up the replacement of our old infrastructure. We have core components that are over 10 years old and still being used. |
| One thing I can say is that on a weekly basis we at least have three major outages that impact our business, and, in most cases, it was due to a failed server or network component that was in production for years over the maintenance period. |

For the incidental adoption of the technology refresh cycle solution key topic, five out of the 10 participants faced incidents and emergencies that required them to adopt and transition to a well-structured technology refresh cycle strategy as their main reasons, although the remaining five saw a reduction in incidents after transitioning. Table 6 covers the responses of the five participants who encountered emergency incidents and outages that resulted in the implementation of a needed technology refresh cycle solution.

Table 6. *Theme 1 Responses: Reasons for Technology Refresh Adoption (Incidental Adoption)*

| Responses |
|---|
| Yes. We had many issues with our desktops, laptops, and tablets that the corporate employees and sales agents used because they are aged, and we kept spending money on a 3rd party repair shop to keep them running. |
| Yes. We continuously have outages and emergency incidents. I realized that our volume of events and disruptions started to rise when monthly performance metrics are presented to the executive leadership team. The cause for 90% of our incidents was a hardware failure, and mitigation actions were always to replace the devices in question. |
| Yes. We had lots of incidents. We went to a technology refresh cycle to have stability and to use our resources better. Before we transitioned, we had hardware failures and consistently. Many times, they were out of warranty and had no support. And it took more than 48 hours to restore critical services. |
| Yes. There were at least three emergency outages in a week. Better resource time management was one of the key factors why we thought it made sense to go this route. We always found ourselves in a position where we are buying refurbished units as a backup for critical production equipment. |
| Yes. We had incident after incident, and some of them caused significant outages. There are times that our sales representatives' hardware used for processing payments and running daily sales dies in the middle of the day due to battery life. It impacts revenue and is bad for customer experience. |
| Although we saw our issues reduced, this was not the main reason why we transitioned. |
| Our reasons were not incident based, but we saw benefits from that front as well. |
| The primary reason was not incident driven despite we were able to lower the incident volume after the transition. |
| Incidents weren't the fundamental reasons, but we saw great improvement after implementation |
| The reasons were different, as every department has their pain point before implementation. The help desk team reported that their incident calls reduced and their problem numbers trended down also. |

**Theme 2: Technology Refresh Strategies with Cloud Services**

Gathered data for this interview question and its follow-on questions produced one main theme and four key related points. The main theme was developed because of the numerous types of technology refresh cycle strategies. The key related points surfaced by each different variety of technology refresh strategies and included (a) information technology (IT) road mapping, (b) software-as-a- service (SaaS), and (c) infrastructure-as-a-service (IaaS). The fourth key point was produced because of the subject related to cloud service providers. The main theme produced from this question and its key related points are presented in Table 7.

Table 7. *Theme 2 and Its Key Related Points*

| Main Theme | Key Related Points |
|---|---|
| Technology Refresh Strategies with Cloud Services | Information Technology (IT) Road Mapping |
| | Software –as – a Service (SaaS) |
| | Infrastructure – as – a Service (IaaS) |
| | Cloud Services Provider |

IT road mapping was one of the most established technology refresh strategies adopted by the participants of this study. All 10 participants interviewed specified that they used IT road mapping in their respective organizations. The use of IT road mapping is to support technological management and planning, especially to explore and communicate dynamic interactions between resources, organizational goals, and environmental changes. From a technology refresh cycle standpoint, the technology roadmap itself is the document generated that identifies critical system requirements, the end of life cycle of the technology products and process performance targets, and the technology alternatives, along with the milestones for

meeting those targets. Table 8 contains the participant's responses when asked about IT Road Mapping as a technology refresh strategy.

Table 8. *Theme 2 Responses: Technology Refresh Strategies (Information Technology (IT) Road Mapping)*

| Responses |
|---|
| We currently use IT road mapping to manage the life cycle of our technology. Our engineering team owns the responsibilities to keep it updated at all time. |
| We use IT road mapping in my company as a baseline to know when to retire our assets and when they are close to end of life, for example, our desktops and laptops. |
| My company utilized IT road mapping as a tool to initiate technology refresh to remove obsolete technology equipment from the infrastructure, especially our servers. We have strict requirements to follow when it comes to our servers. Not so much of our endpoint devices. |
| My firm depends heavily on IT road mapping to ensure that we refresh our servers, desktops, laptops, and tablets. We use a color-coded spreadsheet to track end of life. Our point of sale terminals are refreshed as well, but it aligns with the Payment Card Industry compliance and requirements. |
| We use IT road mapping. I developed the IT road mapping for my organization and maintained it with meetings with all different IT teams, but not fully followed the way it is supposed to be. However, for the core servers, like SCCM distribution points, file and print servers, and network components are mostly supported through the life cycle. |
| We use IT road mapping within my company to support our hardware. It is widely supported by all parties. We do also have other services like Device as a Service which supports a segment of our core infrastructure. We use road mapping for our end of life cycle for network switches, routers, and our servers. |
| Road Mapping is one of the tools we use for all our end-user computing environments, such as PCs, laptops, printers. We refresh our technology end-user computing devices based on the roadmap, and it has reduced incident tickets and outages. |
| We have always had IT road mapping. However, it's wasn't used. My team spends the time to keep it up, but higher-ups do not follow, especially when the time is up for refresh. We do now. |
| IT road mapping is part of our end of lifecycle management. Our vendors force our hands to maintain the roadmap as they stop manufacturing some products and components we have in our fleet, for example, our managed print services. |

Saas (Software-as-a-service) was one of the most established cloud services adopted, transitioned, and implemented by the participants in this study. Eight out of 10 participants

interviewed indicated that they use software-as-a-service (SaaS). One of the uses of SaaS can be software distribution solutions that manage the installation and deployment of applications to end users as well as updates, upgrades, and license management. Additional usage of SaaS was to eliminate the expense of hardware acquisition, provisioning, and maintenance, as well as software licensing, installation, and support. Table 9 contains the participant's responses when asked about SaaS as a technology refresh strategy.

Table 9. *Theme 2 Responses: Software-as-a-Service (SaaS)*

| Responses |
|---|
| My company does have software in the cloud as well, and we use it to manage our software distribution and managing licenses, an example is our performance management system. |
| We have software as a service. My team utilizes this as a means to refresh, update, and upgrade our software when needed without being outdated. |
| Yes, we use software as a service. We had issues with our out-moded software and also spending so much time fixing problems because of lack of updates. Since we went to software as a service, we have reduced incidents drastically. |
| We recently adopted software as a service shortly after we implemented road mapping. The software as a service was intended to handle our software and application suite for stability reasons. |
| Scalability was one of the problems we were having with our software management from licensure to enterprise vulnerabilities. We have been able to utilize software as a service effectively to our advantage to help us scale properly and prevent outages. |
| We bought into the software as a service concept a year ago and it has helped us. Our information security and desktop engineering teams have been the greatest beneficiaries of this from patch management to incident management activities. |
| We are new to software as a service. Our IT leadership team brought in a consulting firm to evaluate our environment and software as a service was recommended to cover software refresh and asset management gaps. It has been close to a year, and we have seen stability and reduction of cost but too early to say what the ROI is fully. So far as we are still preparing metrics. |
| We have software as a service in my company. I consider software as a service a good tool. We use to have problems with how our applications get refreshed. we were stocked with office 2013 for years. Now that we have software as a service, we recently upgraded to office 365 and that paves the way to stay abreast with the industry with newer versions and updates at all times. Many of our end-user application issues have reduced. |
| No, we don't use software as a service. We have other cloud services as part of our strategies. |

Three out of the 10 participants interviewed stated that they adopted infrastructure-as-a-service (IaaS) in their respective organizations. The information technology managers reported that there are a couple of technology teams that utilize some hardware services in the cloud. This

use of IaaS was mainly for the storage and application development teams. Table 10 contained the responses from the participants when they were asked about IaaS as a technology refresh strategy.

Table 10. *Theme 2 Responses: Infrastructure-as-a-Service (IaaS)*

| Responses |
|---|
| We only used infrastructure as a service to manage lifecycle and replacement of our servers. |
| We have implemented infrastructure as a service to cover our VMware infrastructure, especially for our server environment. Maintaining them and ensuring they were effectively managed with the appropriate end of life strategies and refreshing when the time is up. |
| We use that heavily. Our data center operations are fully onboard into infrastructure as a service to help limit our outages due to legacy systems and out of date hardware. We have seen a tremendous reduction in enterprise outages since we on-boarded infrastructure as a service. |

**Theme 3: Transition Issues**

Gathered data for this interview question produced one main theme and four related key points. The main theme surfaced from the issues that the participants experienced throughout the process of adopting, implementing, and transitioning to a well-structured technology refresh cycle strategy. The four key points were mentioned when each one of the participants stated a precise problem. The key points for the theme were comprised of (a) information technology service management configuration (ITSM), (b) lack of knowledge, (c) end user's adoption, and (d) infrastructure compatibility, as presented in Table 11. Out of the 10 participants that were interviewed, they all stated that they did not experience any pushbacks from the executive leadership teams.

Table 11. *Theme 3 and Its Key Related Points*

| Main Theme | Key Related Points |
|---|---|
| Transition Issues | Information technology service management (ITSM) configuration<br>Lack of knowledge<br><br>End user's adoption<br><br>Infrastructure compatibility |

Four out of the 10 participants stated there were no issues or troubles during the implementation phase of their technology refresh cycle solutions. The remaining six communicated on the four key points. Table 12 comprises the responses of participants with regards to issues during the transition.

Table 12

*Theme 3 Responses: Transition Issues*

| Responses |
| --- |
| One of the issues we ran into had to do with the ITSM tool we use. HP Service Center didn't have the model needed to effectively manage our IT hardware and software roadmap. We ended up buying a tool from an asset management company that was integrated with our platform to help with asset discovery. It took us some time to get everything working as close to plan. |
| There were obviously some issues and challenges along the way during the transition. However, they were not show stoppers. A couple of the problems were with the end users adapting to the new platform with the transition to office 365 and saving data to one drive. During the implementation, the process to uninstall our client base office products and install office 365 had some issues mainly with Microsoft Visio and Project. |
| The only issues that we ran into were to do with compatibility with our previous infrastructure because we had run on legacy boxes and apps for a long time. We spent lots more than we planned. We found ourselves refreshing and transitioning at the same time in a couple of areas such as networking and servers. Lack of knowledge was also an issue we had but were managed by aggressive training schedules and tools. |
| We had problems mainly with our users and some of the technical staff. Mostly, there was a lack of better planning and preparation work before the production release. Not much was done in the development region before going into production. The end users adjusted over time and the technical team appointed a SME who led the transition effort. Things were smooth after that. |
| There were compatibility issues with our core legacy systems. Some of our environment was still running Windows XP Embedded on our thin clients, and that was an issue. We refreshed the legacy platform and transitioned into Citrix Zen Apps and Zen Desktops. |
| There were issues reported during transition because our SCCM Server version was two revisions behind and also our functional domain level needed to be upgraded. That cost us extra project funding and additional resource hours to address both critical issues. |

**Theme 4: Transition Process and People**

Gathered data for this interview question indicated that six out of the 10 participants that were interviewed stated that processes and people weren't impacted in any way in implementing technology refresh cycle strategies in their respective organizations. Furthermore, they didn't

need workshops because the affected areas that experienced the changes were service matter experts. Only four participants stated that they went through some form of process change, such as performing a full IT Asset Lifecycle Management processes from procurement to disposition. The participants also suggested the transition affected people from a resource availability and readiness perspective. The same four participants also indicated that there were either some workshops and or gap analysis of their previous processes and provided refined process documentation. Table 13 contains the participant's interview responses to the interview question.

Table 13. *Theme 4 Responses: Transition Process and People*

| Responses |
| --- |
| My staff was impacted by a resourcing point of view. They spent lots of unplanned time to work with a vendor that was onsite to review our IT lifecycle processes so they could identify inefficiencies as well as update our procedures to align with our new roadmap plans. |
| There was a five-day workshop to educate my technical staff with the creation and maintenance of formal roadmaps to help manage our software and hardware asset lifecycles efficiently. We had people problems during the transition because we were short staffed and faced production support metrics issues which impacted my staff's monthly performance bonuses because it's a metrics-driven environment. |
| We went through a painful vendor selection process to get an SME to provide process review and enhancement. |
| We ended up getting an individual contractor who could only work in two phases with one of my direct reports. Review and mentorship. My staff ended up developing the processes with the help of the vendor, and that impacted us financially and with resource availability. |

**Theme 5: Incident Management**

Gathered data for this interview question indicated that all 10 participants that were interviewed stated that adopting, transitioning, and implementing technology refresh strategies in their respective organizations impacted their day to day infrastructure support incidents positively by reducing incidents and outage volume. Furthermore, all 10 participants stated that

their historical monthly performance metrics before implementing either information technology (IT) road mapping, software as a service, infrastructure as a service, and/or the combination of these strategies indicated that their trending metrics compiled before and after implementation showed positive trending, such as reduction in incidents, outages, and infrastructure change induced outages. Table 14 comprises the responses of participants with regards to incident management.

Table 14. *Theme 5 Responses: Incident Management*

| Responses |
|---|
| Since implementing IT road mapping to manage the life cycle of our technology, our enterprise incidents have reduced to 25% due to outdated hardware related issues. We measure 13-month trending at all times, and it shows a positive trending. |
| After we started sticking to IT road mapping in my company and used that as a baseline to know when to retire our assets, we have seen our enterprise issues gone down, especially problems related to our desktops and laptops. |
| After changing our operating strategies to something more structured, we have seen that it paid off. Our problem tickets are low. We provided metrics to our senior executive teams on a monthly basis and six months before and after metrics is a good story. |
| We now refresh our servers, desktops, laptops, and tablets based on road mapping. It has helped us achieve infrastructure stability and had drawn down our incidents and infrastructure change-related incidents. We have a tool that tells us where we were and where we are now. We use ServiceNow ITSM tool. |
| We use to use a tool call Extraction. Extraction is connected to our incident management tool, and it provides us with visibility of our performance across the board. We have already seen advantages in transitioning to IT road mapping and software as a service. The outages we use to see and the frequency of them have toned down a lot to a single digit percentage compared to over 50% before implementation. |
| IT road mapping is our core strategy for our business focusing on our network switches, routers, and our servers. When we look back from where we were before investing in these initiatives, we have seen a stable platform with very less core technology outages. Our reporting tool, CA Service Desk, provides data that compares before and after implementation. We are doing way better now. |

| Responses |
| --- |
| There is a reduction in some tickets overall. My company is a metrics-driven company, especially with the technology teams. We have reduced our tickets and have freed our technicians for time to be able to focus on projects. |
| Despite the reduction of interruptions, we do have room for development as some of our technicians are still in the maturity phase in ensuring they follow the process. The bottom line is that we have seen technical issues reduced, we now see process and people related issues that could have been prevented. |
| Enterprise-wide outages have gone down. We have stability, and our quality scores have increased after implementation. We have continued to trend positively. |
| Our problem and change management team provided weekly major incident reports and change-inducing incidents. Over the past year, the data shows that we have cut down major incidents and outages by 50% after implementation. |

**Theme 6: Technology Improvement Awareness**

Gathered data for this interview question indicated that all 10 participants that were interviewed stated that not only did the entire technology operations see improvements in technology awareness, their end-user population saw that as well. Furthermore, all participants alluded to the point that end users have seen a scale down of software packages deployed to their systems as well as an increased frequency of new technology deployed to their stations without needing to request for it. Participants also stated that they see upgrading and updating applications frequently and finally they have been introduced to more cloud technology tools, such as office 365, an employee performance management system, data in the cloud from a storage perspective, and much more. Table 15 comprises the responses of participants with regards to technology improvement awareness.

Table 15. *Theme 6: Technology Improvement Awareness*

| Responses |
| --- |
| Yes, and for the most part, our technical teams now can connect to real-time knowledge base articles to learn new technologies that have helped troubleshoot incidents quickly. |
| Infrastructure as a service was implemented in our environment and has helped bring awareness to our prior struggles and shed light on the need to refresh consistently to stay current with the industry. |
| My firm has developed a three-person team with the sole purpose to research and recommend technological innovation following our transition. What we have seen coming from this team |
| Our leadership team is presented with innovation and automation ideas to meet business objectives. The results of these meetings have contributed to technology awareness to the rest of the organization using real-time publications. |
| Transitioning my company has yielded lots of positives including technology awareness. Despite cloud being out there for a while, many of our leaders were mostly worried about security. The technical team advocated strongly for cloud and many other innovative ideas to help the company stay competitive. |

**Theme 7: Technology Refresh Strategies Benefits**

Gathered data for this interview question indicated that participants specified they have benefited from adopting, transitioning, implementing well-structured technology refresh cycle strategies. Although the participants mentioned that technology refresh cycle strategies are cost-effective, they also emphasized that the cost to initially transition, such as retiring obsolescent hardware infrastructure and software to procure new ones, was expensive but indicated that the long-term benefits and operational cost savings have been cost-effective.

The participants presented numerous benefits that resulted in different advantages that gained from utilizing technology refresh cycle strategies in their respective organizations. The benefits that were listed are (a) service availability, (b) scalability, (c) security, (d) stability, (e) sustainability, and (f) cost. These six key related points are presented in Table 17.

Table 16. *Theme 7 and Its Key Related Points*

| Main Theme | Key Related Points |
|---|---|
| Technology Refresh Strategies Benefits | Service availability |
| | Scalability |
| | Security |
| | Stability |
| | Sustainability |
| | Cost |

All 10 participants stated that adopting a technology refresh cycle strategy has been advantageous and valuable to their respective companies, based on which approach was chosen, with each of the participants indicating one desired benefit over others. Table 18 contains the responses from the participants that were interviewed.

Table 17. *Theme 7 Responses: Technology Refresh Strategies Benefits*

| Responses |
|---|
| One of the crucial benefits is service availability. The great thing about infrastructure as a service was our core services were available despite hardware or software fault. |
| We benefitted a lot from backups, security and cost perspective, the transition to road mapping and infrastructure as a service has these benefits. I can replace core servers within a few hours compared to weeks. |
| Gained huge stability. Our incidents and outages fell dramatically compared to pre-transition. |
| The most significant advantage for us was scalability. |
| Probably cost reduction and sustainability. |
| Besides security, there is a certain level of stability in our environment. We have reduced hardware failure problems since we refreshed our hardware. |
| We had fewer infrastructure changes because of the removal of old equipment and had seen stability because of that. |
| Our technology needs are appropriately scaled, and our downtime is low. |
| Low cost, limited outages and stable infrastructure. |
| We have experienced sustainability, scalability, and stability. |

**Theme 8: Technology Refresh Strategies Recommendation**

Gathered data for this interview question and the related follow-on questions resulted in one main theme generated about technology refresh strategy recommendations. Participants were all favorable to adopting, implementing and transitioning their respective organizations to a well-structured, refresh oriented technology organization. Table 18 contains the responses from the participants that were interviewed.

Table 18. *Theme 8 Responses: Refresh Strategies Recommendation*

| Responses |
|---|
| The hardware and software license cost has been lower for us compared to what we spent on our previous operating model. Our revenue has increased each quarter since we implemented software as a service. I can say that it's contributed to a competitive advantage. |
| I would say yes, the business lost money and customers due to service availability. After implementation, we have gained stability and reduced business impact. I see that as a gain for the business. |
| We have a competitor across the street from a few of our stores, and we have lost business due to consistent problems because of old legacy platforms. We have been regaining our clients back and seen sales numbers up. I will say there is a competitive advantage here. |
| Our service quality scores went through the roof. Our system outages had taking a downward trend. Probably from a long-term perspective, there is a potential competitive advantage, but I don't see financials, so I can't say. |
| I would say yes. Our competitors should be looking at these strategies and adopting what works better for their environment. We have been able to perform full disaster recovery and high availability tests for the first time in our company's history. |
| Absolutely. I would recommend technology refresh strategies to any company. We recently have a 3rd party research company come to assess our platform, and the results were overwhelmingly positive. We have been able to meet high purchasing demands without crushing our systems. I will undoubtedly say, there is a competitive edge. |
| Yeah. The pressure on the technical staff because of constant failures in the past has subsided. We can focus on innovation and deploy new and industry standard technologies to meet our customer's need. From the way I see it, there is a competitive advantage in doing so. |
| Yes, I will. We receive new releases and updates. Our sales agents are now able to write sales orders right in front of the customer and in front of the merchandise being purchased. Our platform is scalable and easy to customize our business needs with fewer complications. I will say it's made us very competitive. We have attracted more business. |
| Most definitely. We have suffered lots of system outages which had crippled our ability to sell merchandise both online and at the stores. Post implementation, we have been able to reduce our production impact by 75%. That for me is a reason why I will recommend road mapping and software as a service to any company. |

## Summary of Chapter Four

With the introduction section of Chapter 1, the review of the literature section in Chapter 2, followed by the research methodology outlined in Chapter 3, Chapter 4 offered the main themes that developed during the process of data analysis. The discussions and findings of the main themes, related key points, and outcomes of this research were presented and discussed in Chapter 4. The study included 10 participants, computer technologists with at least two years of information technology management from a LinkedIn group of professionals in the retail industry, that had adopted, transitioned, and implemented technology refresh cycle strategies. The research used the saturated data from the conducted interviews to present the results of this study. Interviews were transcribed into the textual document, and eight themes were formed. Chapter 5 will include a summary of the interpretation of the findings of the research questions and will present implications and recommendations for future study.

## CHAPTER FIVE

This study focused on the significant emergence of technology refresh cycle strategies in the 21st Century globalized economy where competitive advantage is the key to business success. However, computer technologists and researchers have given only a passing thought to technology refresh cycle strategies as a tool for gaining a competitive advantage. As the rate of technology refresh cycle strategies continues to emerge coupled with the rise of varieties of strategies such as information technology (IT) road mapping, software-as-a-service (SaaS), and infrastructure-as-a-service (IaaS) the need for organizations, especially within the retail industry, to review adopting, transitioning, and implementing such refresh strategies to drive competitive advantage is a key. Radhakrishnan (2008) stated that the computer technology refresh cycle is a strategic tool that reduces significant infrastructure incidents, and drives infrastructure scalability, security, and stability.

The single overarching research question for this study was: What are the strategies computer-technologists need to establish a computer-refresh cycle in retail organizations? The purpose of this exploratory qualitative inquiry was to explore strategies computer-technologists need to establish a computer-refresh cycle in retail organizations. The essential problem was that computer technologists of retail organizations that have not yet adopted, transitioned, and implemented technology refresh cycle strategies for their respective retail organizations are still uncertain about how technology refresh cycle strategies impact service availability and productivity as it pertains to service delivery, especially in the 21st Century globalized economy where competitiveness is a key to business success.

Ten computer technologists having at least two years of information technology management experience with adequate knowledge, skills, and exposure to technology refresh

cycle strategies were interviewed. The participants that were interviewed for this study were asked to share their professional experience, participation, and contribution in the process of adopting, transitioning, and implementing technology refresh cycle strategies in their respective retail organizations. The data that were captured in the course of interviewing these participants served as the foundation for the themes that emerged from this study.

This chapter provides a summary of the findings and discussion of the conclusions, as it related to the research question and problem statement. Chapter 5 also includes the limitations of the study, implications for practice, recommendations for future research, and the conclusions of the study.

## Findings and Conclusions

The purpose of this qualitative study was to explore strategies computer technologists need to establish a computer refresh cycle in retail organizations. A significant, key result obtained in this study after conducting 10 interviews was that adopting, transitioning, and implementing technology refresh cycle strategies by retail organizations is recommended. With many caveats in mind, all 10 study participants suggested computer technologists of retail organizations that have not implemented technology refresh cycle strategies in their respective organizations should consider looking into using technology refresh cycles to manage their infrastructure hardware life cycles and end of life software stacks.

This section provides a detailed explanation of the study findings. Eight main themes and 16 related key points emerged from the data analysis procedure performed in the previous chapter. The five most important outcomes of this study are as follows; (a) incident management, (b) technology refresh strategies with cloud services, (c) benefits of technology refresh strategies, (d) cost, and (e) recommendation for technology refresh cycle strategies.

**Incident Management**

Incident management is one of the most critical aspects of any service delivery operation because the success of any organization from the productivity perspective is measured by key performance indicators (KPI) as a result of infrastructure stability, reduction in service interruption, and reducing impacts to production.

Among the main themes that emerged in this study, the theme of incident management received the most common responses. The study revealed that 100% of the participants responded the same about how the implementation of technology refresh cycle strategies impacted their day to day infrastructure support incidents positively as compared to pre-implementation. Furthermore, the implementation resulted in a downward trending of infrastructure outages and incidents after the implementation according to the participants and the findings of the study.

The participants pointed out the same methods used in measuring before and after implementation trends to determine success criteria by comparing historical and current monthly incidents and performance metrics. It is important to mention that one of the participants stated that "our problem and change management team provided weekly major incident reports and change-inducing incidents. Over the past year, the data shows that we have cut down major incidents and outages by 50% after implementation". Reducing overall incidents and outages by implementing technology refresh cycle strategies would strongly benefit organizations in the scope of this study as well as technologists in other sectors that are not yet convinced of the benefits of executing technology refresh cycle strategies.

It is also worth noting that one of the participants indicated stated that,

> We now refresh our servers, desktops, laptops, and tablets based on road mapping. It has helped us achieved infrastructure stability and had drawn down our incidents and

> infrastructure change-related incidents. We have a tool that tells us where we were and where we are now. We use ServiceNow an information technology service management (ITSM) tool.

This study also revealed that implementing technology refresh strategies drive performance improvements by reducing infrastructure incidents and outages that impact productivity.

**Technology Refresh Strategies with Cloud Services**

Among the main themes revealed in this study, technology refresh strategies with cloud services was one that observed similar responses about using information technology (IT) road mapping yet produced diverse discussion in the utilization of software as a service and infrastructure as a service, as well as diverse responses about the cloud service providers being used. The study revealed that 100% of the participants indicated that they use information technology (IT) road mapping as one of the technology refresh cycle strategies. Furthermore, seven out of the 10 also mentioned that they utilize both information technology (IT) road mapping and software as a service. Two of the participants also stated that they use information technology (IT) road mapping and infrastructure as a service. Finally, one of the participants indicated that they use all three of the technology refresh cycle strategies, such as information technology (IT) road mapping, software as a service, and infrastructure as a service. Six of the participants did not reveal the name of the cloud service provider they use; however, four did, and revealed a total of eight different providers.

Existing literature suggests that road mapping is one of the strategic tools used as a device for technology management and strategic and policy planning, as well as potentially becoming a reliable strategy for future technological preparation which may be utilized to lead the development of plans at the corporate and operation levels (Choomon & Leeprechanon,

2011). It is worth noting that one of the participants developed road mapping for his organization.

The study also revealed that software-as-a-service (Saas) was used in conjunction with information technology (IT) road mapping, whereas road mapping was used for lifecycle management of hardware while software as a service was used for software distribution solutions to manage the installation and deployment of applications, provisioning to end users as well as updates, and upgrade and license management.

It is worth noting that software as a service is a very productive tool when it comes to asset management and technology refresh cycles that helps organizations stay with the fast pace growth, innovations and advancement in the industry. Software as a service also increases productivity and drives cost down. The findings of the study also revealed that although infrastructure as a service is one of the technology refresh strategies, only three of the participants used this method at their respective organizations. The study also revealed that all three strategies could co-exist in the same organizations however utilized for three different reasons for the same common goal. Existing literature suggests that infrastructure-as-a-service (IaaS) refers to the utilization of virtualized hardware components of the cloud services (Gonzalez & Smith, 2014). Also, Gonzales and Smith stated that the use of infrastructure as a service as a strategic tool is critical to infrastructure availability and correlates with the concept of competitive advantage.

**Benefits of Technology Refresh Cycle Strategies**

One of the most important benefits that emerged in the findings was the reduction of information technology costs due to adopting, transitioning, and implementing technology refresh cycle strategies. The cost factor had also been presented separately as one of the unique

findings in this study. Despite cost being one of the resounding benefits that can convince computer technologists, IT managers, and executive leadership teams in retail organizations to move from their legacy IT systems into a refresh cycle-based strategic solution. Service availability, scalability, security, stability, and sustainability are among the technology refresh cycle strategic benefits mentioned by the participants of this study.

This study also revealed that implementing technology refresh cycle strategies can provide scalability and security. As suggested by participants, their technology needs were appropriately scaled and their downtime was lowered. One participant also believes that having an appropriately scaled platform offers significant benefits to users and organizations from all angles, such as system capabilities, infrastructure networks (routers and switches), accommodating growth, and having less production impact.

**Cost**

Based on the findings, a unique discovery emerged as it relates to cost and overall total cost of ownership (TCO). Cost was also discussed separately as one of the benefits of adopting, transitioning, and implementing technology refresh cycle strategies. Although the participants mentioned that technology refresh cycle strategies are cost-effective, there was also the cost factor due to initial transitioning, such as retiring obsolescence hardware infrastructure and software to procure new ones, upgrades, licensing, and more; however, findings showed that the long-term benefits and operating costs have been effective with a positive return on investment over time.

Furthermore, cost is an essential element in enabling computer technologists and IT managers across many industries in meeting the organization's goals and objectives while driving initiatives and innovations to compete in the 21st-century globalized economy.

Implementing technology refresh strategies may not automatically lead to money-saving initially; however, over time it certainly drives operating costs down, impacts the total cost of ownership, saves on IT resource time, reduces overall IT spending on support hours, increases IT resource availability to meet project deliverables, and invests more into innovation and business intelligence. Additionally, it is important to mention that implementing technology refresh cycle strategies such as information technology road mapping, software-as-a-service, and infrastructure-as-a-service drive money-saving results.

**Recommendation for Technology Refresh Cycle Strategies**

The study discovered that all of the participants acknowledged the main theme of recommendation for technology refresh cycle strategies. All of the participants recommended adopting, transitioning, and implementing technology refresh cycle strategies. The purpose of this study was to explore strategies computer technologists need to establish a computer refresh cycle in retail organizations. This finding is in alignment with the purpose of this study since all of the participants were favorable to adopting, transitioning, and implementing technology refresh cycle strategies.

## Implications for Practice

In the 21st Century globalized economy, competitive advantage is the key to any business success. Technology refresh cycle strategies can be adopted, implemented, and transitioned by either planned strategic approaches or by incidents and emergencies. Planned transition and implementation of technology refresh strategies can lead to a successful infrastructure change in an organization, whereas the incidental adoption of technology refresh strategies occurring because of an outage happening in the infrastructures can result in mismanaging overall IT operations, functions, stability, and losing total control over systems performance. As organizations are increasingly embracing technology refresh strategies to explore market

opportunities and gain competitive advantage, it becomes critical to operating on a platform with high availability and adequate scalability, security, stability, and sustainability.

Computer technologists and IT managers of an organization should have a vast knowledge of technology refresh strategies, such as information technology road mapping and cloud services, that provides software and hardware refresh solutions, such as software as a service and infrastructure as a service. Computer technologists should examine numerous technology refresh strategies, cloud services, key drivers, benefits, and recommendations before transitioning from legacy networks, clients, and servers to a more robust and innovative environment.

The outcome of this study suggested that the adoption, transitioning, and implementation of technology refresh strategies was adequate to drive competitive advantage by gaining high availability, infrastructure scalability, security, stability, and sustainability. Effective technology refresh cycle strategies may act as a catalyst that drives attractions to more adopters to embrace information technology road mapping, software-as-a-service, and infrastructure-as-a-service as a means to reduce production impacting incidents and outages, reduce operating cost, increase revenue, and position organizations competitively.

## Implications of Study and Recommendations for Future Research

This qualitative study explored the effective strategies for computer technologists in retail organizations in transitioning from traditional and legacy information technology systems into a technology refresh cycle based environment. The study participants delivered original data that described the key reasons for adopting technology refresh cycle strategies and reflecting on incidents, outages, costs, and benefits. Moreover, participants provided an understanding from their professional, lived experiences and connection in the process of transitioning into a

technology refresh cycle-based environment. This study revealed some area of implications and proposes the following recommendations for future research.

As technology refresh strategies continue to evolve and gradually approaches its maturity, information technology road mapping and cloud services are some of the techniques being used to keep platforms up-to-date and refreshed but also operate productively and cost-effectively.

During this study, it was revealed that a lack of planning and lack of end-user knowledge created some obstacles during the transition. It is recommended that future studies be conducted to provide general knowledge to the end users as well as technical staff that require training. Furthermore, it is recommended that further studies be conducted to provide implementation strategies such as performing an initial overall assessment of an environment and providing the development and review of implementation plans with all stakeholder before transitioning.

This study also has revealed that information technology road mapping is one of the key technology refresh cycle strategies that was used as a baseline by the computer technologists in the retail industry. Road mapping was also coupled with robust cloud-based service solutions such as software as a service and infrastructure as a service. It is recommended that future studies be conducted to provide original knowledge on designing standardized technology refresh cycle strategies solely based on cloud solutions, such as data center as a service (DCaaS), platform as a service (PaaS), and device as a service (DaaS), to drive competitive advantage.

## Conclusion

The focus of this study was to explore the strategies computer technologists need to establish a technology refresh cycle in retail organizations. The study also examined different reasons, issues, and factors in the process of moving from a traditional and legacy information technology systems platform into a robust technology refresh cycle based platform in retail

organizations. Even though technology refresh cycle strategies have been examined in other research settings, fewer studies have been conducted about adopting, transitioning, and implementing technology refresh cycle strategies in retail organizations.

The research design for this study was qualitative. The interview data were collected from 10 participants. Semistructured, qualitative interviews and follow-on questions were utilized to investigate the central question of the study. Data analysis was performed, and eight main themes were identified in the process. The themes that were generated were explored and completely discussed. Also, key related points emerged from an in-depth analysis of the themes. Through the findings of this study, effective strategies for retail organizations' adoption, implementation, and transition into a technology refresh cycle based platform were discovered. One of the significant outcomes of this study was the recommendation that adopting, transitioning and implementing technology refresh cycle strategies in retail organizations be used as a means to achieve infrastructure scalability, security, stability, and sustainability to gain a competitive advantage.

The main eight themes that emerged from the study data analysis were:

- Reasons for technology refresh adoption can be planned or incident related.
- Technology refresh strategies with cloud services such as information technology road mapping, software as a service, and infrastructure as a service can coexist.
- Transition issues may include information technology services management configuration, lack of knowledge, end user's adoption, and infrastructure compatibility.
- Transition and people can be a combination that enhances process change and workshops.
- Incident management showed downward trending on infrastructure outages post-implementation.
- Technology improvement awareness led to numerous benefits such as knowledge in cloud-based platforms and information technology lifecycle management.

- Technology refresh strategy benefits include service availability, scalability, security, stability, sustainability, and cost.
- Technology refresh strategies are recommended in the retail space.

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**APPENDIX A**

# Interview Questions

1. How many years of IT experience do you have?

2. How long have you been using technology refresh cycle strategy as a strategic tool in your retail organization?

3. What were the main reasons that made your organization to adopt and implement a technology refresh cycle strategies?

4. What type of technology refresh cycle strategies are you using (IT Road mapping, IT Lifecycle Management, SaaS, IaaS, etc)?

5. What main issues did you encountered in the process of transitioning into a well-structured technology refresh cycle strategies?

6. How did the transition affect people and processes in your organization?

7. How did a technology refresh cycle strategies impact your day to day infrastructure support incidents?

8. Did technology refresh cycle strategies help improved technology awareness within your organization and how?

9. What benefits have you gained from adapting and transitioning into a technology refresh cycle strategies?

10. Do you recommend other retail organizations to adopt and implement a well-structured technology refresh cycle strategy and why?

**APPENDIX B**

# Interview Protocol

1. Explain the purpose of the study.
2. Assure participant confidentiality and have the participant sign the informed consent agreement form.
3. Address participant physical comfort concerns (lighting, room temperature, chair, and ambient noise distraction, make water available.
4. Record the subject's number on the top of the interview field notes.
5. Encourage participants to open up about their experiences.
6. Monitor participant body language to minimize influencing subject answers.
7. Precisely record participant responses and annotate any non-verbal responses.
8. Audio record and assign a chronological number to each interview.
9. Ask interview questions in order and ask follow-on questions for clarification (see Appendix C).

Interview and follow-on questions:

1. How many years of IT experience do you have?

Follow-on question 1: How many years have you been in infrastructure management role.

Follow-on question 2: Do you have any technology refresh experience?

2. How long have you been using technology refresh cycle as a strategic tool in Your organization?

Follow-on question 1: Did I understand you correctly when you stated the missing elements? I heard you say (repeat participant response).

Follow-on question 2: Were you involved in the transition into a well-structured technology refresh cycle strategy?

3. What were the main reasons that made your organization adopt and implement a technology refresh cycle strategies?

Follow-on question 1: Where there any major infrastructure outage or emergency that made you transition into a structured technology refresh cycle?

Follow-on question 2: I heard you state (repeat participant response). Will you elaborate for clarification purposes?

4. What type of technology refresh cycle strategies are you using (IT Road mapping, IT Life Cycle Management, Saas, IaaS etc.)?

Follow-on question 1: Who are your managed service provider?

Follow-on question 2: Why did you select these providers?

5. What main issues did you encounter in the process of transitioning into a well-structured technology refresh cycle strategies?

Follow-on question 1: Were there any pushback from executive leadership teams?

Follow-on question 2: What types of pushback did you receive (budget, resources, readiness, etc.)?

6. How did the transition affect people and processes in your organization?

Follow-on question 1: Were there any workshops held to educate technologists in your organization about this transition?

Follow-on question 2: What processes did you have to change and implement?

7. How did a technology refresh cycle strategies impact your day to day infrastructure support incidents?

Follow-on question 1: Where there any trending identified in your day to day infrastructure incident volumes?

Follow-on question 2: Where there before and after transition measurements done and how was that measured?

8. Did technology refresh cycle strategies help improved technology awareness within your organization and how?

   Follow-on question 1: What types of technology awareness will you say (different technologies, Industry Trends, Innovations, etc.)?

   Follow-on question 2: Would you explain the innovations aspect a little further?

9. What benefits have you gained from adapting and transitioning into a technology refresh cycle strategies?

   Follow – on question 1: Has technology refresh cycle strategy been cost-effective to your organization? If yes, explain.

   Follow – on question 2: Has technology refresh cycle strategy prevented technological obsolescence? If yes, explain.

10. Do you recommend other retail organizations to adopt and implement a well-structured technology refresh cycle strategy?

    Follow-on question 1: If yes, why do you recommend that?

    Follow-on question 2: Do you see this as a strategic tool to drive competitive advantage? If yes, how?

At the end of the interview, each participant will be thanked for his or her participating in the research study.

Each participant will be reminded that the transcript of the interview will be provided during the member-checking process to ensure the accuracy of the transcript. Participant will also be reminded that their identities and agency affiliations will remain confidential and will not be printed, released, or published.