2014

Diffusion of Social Network Technology and Overuse among Health Industry Knowledge Workers

Abdel Rahman Toure
Walden University

Walden University

College of Management and Technology

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Abdel Toure

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Review Committee
Dr. Lawrence Ness, Committee Chairperson,
Applied Management and Decision Sciences Faculty

Dr. Howard Schechter, Committee Member,
Applied Management and Decision Sciences Faculty

Dr. Mohammed Sharifzadeh, University Reviewer
Applied Management and Decision Sciences Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
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Abstract

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Abdel R. Toure

MS, Kean University

BSc, University of Cape Coast

Dissertation Submitted in Partial Fulfillment

of the Requirement for the Degree of

Doctor of Philosophy

Applied Management and Decision Science

Walden University

November 2014

Abstract

Many organizations now realize the important role of social network technology (SNT) in building social capital and hence broadening their customer base. However, observations have indicated that, while working, many knowledge workers use SNT to engage in non-job related activities, potentially leading to a decrease in productivity. The purpose of this study was to examine the relationship between the usage of SNT and productivity in the health sector. The theoretical foundation of this study emanated from Rogers's theory of diffusion of innovations and Campbell, Rodney, Scott, and Christopher's theory of performance. Collection of data involved a self-administered survey designed with tools from SurveyMonkey. Out of 123 respondents, some were team members (67%), some were independent (24%), others were team leaders (8%), and a few were administrators (2%). A multiple linear regression analysis subsequent to correlation analysis between each of the 4 variables of SNT (frequency of SNT use, duration of cellphone-based SNT use, duration of PC-based SNT use, and performance rating) and knowledge worker productivity revealed a significant relationship between productivity and performance. The findings suggest that, of the 4 SNT variables, performance rating statistically predicts productivity of the health care professional. Managers may find these results informative in their effort to boost productivity among their health care professional workers. Further investigations are recommended to explore the association between productivity and SNT among knowledge workers.

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November 2014

Dedication

I dedicate this dissertation to my late father, Lawyer Dramani Yakubu (former Judicial Secretary of the Republic of Ghana and Honorary Attorney-General of the State of North Carolina) who sent me to school to learn how to read and write. Though you could not wait long enough to finish this journey with me, I am sure this accomplishment will bring you joy wherever you may be.

Acknowledgement

I would like to extend my gratitude to all those without whose advice, critiques, and support I would not have accomplished this opportunity of critical inquiry and higher scholarship. Having the opportunity to stand on the shoulders of great scholars has granted me the ability to see further than I imagined. Many thanks to Dr. Ness, my committee chair, for his thoughtful guidance in directing this study, and for his unflinching criticism and support. He challenged me to reach my full potential through the dissertation process.

I would also like to thank Dr. Schechter and Dr. Sherifzadeh not only for bringing their expertise to the dissertation committee table, but also for challenging me to take my dissertation to a new height. I must acknowledge Dr. Trimble for believing in me and always motivating me to move forward and not look back. There were times when my spirit was down, but she always inspired me to move on.

My heartfelt gratitude also goes to my family and friends who in diverse ways supported and encouraged me to complete this journey. Thanks to my mother, my sister, and my wife for their prayers. I also thank my friend Toni Kosby for helping to edit my proposal when I started the process, and showing so much concern by always asking me about my dissertation.

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Chapter 1: Introduction to the study

Introduction

The use of social network technology (SNT) by some employees during working hours has become a common practice in many circles, especially among knowledge workers. Most social network applications in some enterprises enable knowledge workers to connect with others with specific expertise or shared interest (Burns & Friedman, 2012). Many industries such as agriculture, entertainment, health care, education, and banking are using SNT. So far, articles published on SNT have been on the benefits individuals and organizations derive from using SNT.

Buchinho and Images (2011) wrote about how some veterinarians have joined sites such as Facebook, Twitter, and LinkedIn mainly to capture clients. In the writers' opinion, these professionals will be missing the chance for establishing and strengthening relationships with clients if they are not greeting them on Facebook and Twitter. To professionals, these sites also serve as a free platform for advertising. Hawn (2009) submitted that SNT is reengineering the method of interaction between doctors and patients. Hawn stated that the platform SNT provides enables better communication between patients and doctors by enriching and speeding up communications.

SNT provides a platform that enables flat communication flow among stakeholders in businesses. As a result, it injects efficiency in communication between managers and employees, as well as team members (Hawn, 2009). In certain organizations, employees can just blog, or tweet ideas regarding new products and improved services, which senior managers could access instantly. In addition, senior managers can instantly share information regarding changes in policies with their peers

and other employees. SNT provides a platform for individuals within different social circles to interact at any time regardless of their geographical location. Nerney (2011) claimed that SNT provides numerous advantages. However, there is a downside that even the most outspoken people on the SNT platform have ignored or denied.

Researchers have recently observed that while at work or in the lecture theater, it is becoming increasingly common to see people (knowledge workers or students) on their personal computers (PCs) or cell phones chatting on Facebook or sending and receiving tweets from friends and other acquaintances. This behavior depicts multitasking, but current studies showed that an increasing number of knowledge workers are spending more time using SNT every day, leading to a decrease in productivity. This observation certainly calls for an empirical study to evaluate the relationship between the use of SNT and productivity of the knowledge worker.

Prior to this study, there was literature explaining how extensive interactions with others on SNT while studying affect students' performance (Austin & Totaro, 2011; Rouis, Limayem, & Salehi-Sangari, 2011). What was missing in the literature is the explanation of how the extensive use of SNT for non-job related activities affects the knowledge workers' performances and hence their daily productivity. This study fills a gap in the literature by explaining the relationship between the uses of SNT for non-job related activities while working and daily productivity of knowledge workers.

Background of the Problem

As social beings, people often like to communicate, share ideas, talk about achievements or failures, and get advice among other things. Gone are the days when two or more people had to come together physically in order to have more effective communication or share ideas. Indeed, thanks to SNT such as Facebook, Myspace, Twitter, texting, instant messaging and the likes, people can still get together without physically being together. Workers, non-workers, and students can still get together and engage in some form of interactions regardless of their geographical locations. They can share all kinds of information such as texts, voice data, and images without physically being together. Hasgall and Shoham (2007) stated that SNT has enabled the sharing of blogs, videos, contacts, and messages amongst Internet users. This technology has been very useful not only to individuals, but also to many business organizations and their stakeholders (Hoyt, 2010). As Hasgall and Shoham stated, SNT allows the instant sharing of knowledge in an organization.

Interactions through Facebook and other SNT platforms enable individuals and organizations to accumulate social capital. This interaction allows them to draw on resources from members of their network (Ellison, Steinfield, & Lampe, 2007; Haihua, Junqi, Yihao, & Zitong, 2013; Johnston, Tanner, Lalla, & Kawalski, 2013; Konetes & McKeague, 2011; Liu, Shi, Liu, & Sheng, 2013; Phua & Jin, 2011). This observation is also true in the working environment. However, some knowledge workers use these sites extensively. They frequently visit these sites and end up wasting a lot of time by interacting with friends, family members, and other acquaintances during working hours. As a result, their daily productivity is affected (Das & Sahoo, 2011). Yokoyama and

Sekiguchi (2014) found that visiting sites such as Facebook and Myspace cause an extra demand on bandwidth and pose security risks to the organization. In that case, the organization would face a reduction in productivity or even pay more for bandwidth.

In the United Kingdom, for example, a report from the British Broadcasting Corporation (BBC; 2009) quoted the chief executive of Portsmouth City Council as saying the council intended to put restrictions on access to web sites that were not business related. Regular access to such websites results in low productivity and a waste of the taxpayers' money, the report added. A few months earlier, Hampshire County threatened to block the social network sites (SNS) after finding out that employees were regularly visiting SNS sites on a daily basis (BBC; 2009).

Gyesi and Asiem (2012) indicated that, the use of Facebook contributed to a loss in worker productivity in Ghana. The writers submitted that many of the knowledge workers spend much of their time on Facebook during working hours. They observed that some bankers use most of their time on SNT when they should be helping customers; because of that, it was common to see customers standing helplessly in long queues for a long time, waiting for assistance (Gyesi & Asiem, 2012).

Knowledge workers' use of SNT for purposes other than their assigned task or job is not only common in the public service or in the banking industries but in many industries. In the United States, for example, Richtel (2011) reported in the *New York Times* that knowledge workers in the health care industry stayed on their cell phones, iPads, and computers most of the time instead of attending to patients. In the writer's report, hospitals and doctors' offices had invested heavily in these devices to help create electronic data and to reduce medical errors. However, it was common to find knowledge

workers using the devices for purposes other than patient care. For example, it was common to see a neurosurgeon making a personal call, or a nurse checking airfares instead of attending to the patient. These activities, which were not business related, were common even during critical care. The writer quoted one anesthesiologist, the director of medical care, Rochester Medical Center, New York, as saying that doctors carried these devices around the hospital under the pretext of getting electronic medical records, but one would find them on SNT engaging in other social activities.

Smith, Darling, and Searles (2011) found that out of 493 perfusionists interviewed, 55.6% used cell phones while conducting a cardiopulmonary bypass. Among them, 49.2% admitted to texting, and 21% admitted to accessing e-mails on their iPhones while performing a cardiopulmonary bypass. In addition, 15.1% admitted to using the internet while 3.1% admitted to getting on SNS while performing cardiopulmonary bypass. Mansi and Levy (2013) stressed the importance of knowledge workers paying attention when it comes to cognitive applications. The writers found that time for completion of complex-spatial tasks increases with continuous interruptions.

Problem Statement

The diffusion of SNT has surged within the last few decades. In the health care industry, this phenomenon is becoming more and more pronounced. This observation is partly attributable to the power of the computer doubling every 18 months (Moore, 1965). It is also partly attributable to the advantage it offers people. Thompson (2011) submitted that, technology has transitioned society into a stage where people interact with personal electronic devices through an increasing number of applications. As Rogers (1995) stated, the adoption of innovation is directly proportional to the perceived

advantage. The perceived advantage in the use of SNT, such as the internet, Facebook, cell phones, and iPads increases the number of individuals who adopt it. Kuss and Griffiths (2011) argued that as of 2011 the number of people with Facebook accounts was more than 500 million; within this number, 50% logged on to the site every day. They added that from 2007 to 2008, the time spent on Facebook by subscribers increased by 56.6%.

The specific problem addressed in this study, was a decrease in productivity resulting from knowledge workers' (health care professionals') increasing desire to interact with SNT during working hours. A study by Nuclear Research (2009) revealed that, out of 77% of office workers with Facebook accounts, 61% of them spent an average of 15 minutes on it daily, resulting in 1.47 % loss of productivity across the entire employee population.

The current literature has addressed how SNT affected performance of students in college. What was missing was an explanation of how the knowledge workers' use of SNT for non-job-related activities affected performance and productivity. In this study, I evaluated and elucidated the relationship between the use of SNT and knowledge worker productivity levels.

Purpose of the Study

The purpose of this quantitative study was to examine the relationship among the variables of SNT usage (frequency of SNT use, PC-based SNT duration of use, cellphone-based SNT duration of use, knowledge worker performance rating) and knowledge worker productivity levels in the health care industry. To achieve this purpose required sending a web-based Likert-type questionnaire designed to measure each

variable to a sample of 1,500 certified registered nurse anesthetists after obtaining their informed consents to secure 85 responses based on power analysis. Analysis of data collected involved the use of Statistical Package for Social Sciences (SPSS), followed by drawing of inference.

The results of the study will help heath care managers formulate policies that will help boost productivity among health care professionals. Such policies will lead to positive social change as health care professionals save more lives through increased improvement in performance and hence productivity.

Research Questions and Hypotheses

The main question posed in this study was as follows: To what extent does the use of PC-based SNT and cellphone-based SNT for non-job related functions during working hours relate to the performance level of the knowledge worker (health professional) and hence overall daily productivity? The following research questions aided in answering the central question:

1. To what extent does the frequency of use of SNT relate to knowledge worker productivity levels?
2. To what extent does the duration of use of PC-based SNT relate to knowledge worker productivity levels?
3. To what extent does the duration of use of cellphone-based SNT relate to knowledge worker productivity levels?
4. To what extent does performance rating relate to knowledge worker productivity levels?

H_o1: A relationship does not exist between the frequency of use of SNT and knowledge worker productivity levels.

H_a1: A relationship exists between the frequency of use of SNT and knowledge worker productivity levels.

H_o2: A relationship does not exist between the duration of use of PC-based SNT and knowledge worker productivity levels.

H_a2: A relationship exists between the use of PC-based SNT and knowledge worker productivity levels

H_o3. A relationship does not exist between the duration of use of cellphone-based SNT and knowledge worker productivity levels.

H_a3. A relationship exists between the duration of use of cellphone-based SNT and knowledge worker productivity levels.

H_o4. A relationship does not exist between the performance rating and knowledge worker productivity levels.

H_a4. A relationship exists between the performance rating and knowledge worker productivity levels.

Theoretical Framework for the Study

The diffusion of innovation theory, by Rogers (1995), helped to explain how and why knowledge workers adapt to technological innovations. As Rogers submitted, the main factor that leads to adoption of innovation is the perceived advantage. Therefore, as people identify the likely benefits in a new technology, they tend to use it, and as they share their experiences, others who find it intriguing, go for it. Rogers used an S-shaped curve to illustrate how innovations diffuse through society. He explained that diffusion

starts slowly at the initial stages, speeds up upon reaching a critical mass, and levels off finally as fewer individuals are left to adopt. Further elucidation of this theory and how it helped explain why knowledge workers engage in extensive use of SNT while at work appears in chapter 2. Critical examination of the contributions from other writers such as Bohlmann, Clantone, and Zhao (2010), Cantrill (2010), and Demir (2006) also supported and explained the diffusion of SNT in the working environment.

In addition, the theory of performance (Campbell, Rodney, Scott, & Christopher, 1993) helped explain how factors such as a distraction and indiscipline affect the knowledge workers' performance. Campbell et al. (1993) submitted that core task proficiency, demonstrating effort, and maintenance of personal discipline are the predictors of job performance. Studies from, Borman and Motowidlo (1997), Lu, Kao, Siu, and Lu (2010), and Motowidlo and van Scotter (1994) also contributed to explaining job performance of the knowledge worker.

Nature of the Study

Data gathering and analysis was by a quantitative method. The problem addressed in this study was a decrease in productivity resulting from the use of SNT by knowledge workers during working hours. To understand this problem required the measurement and explanation of the relationship between the use of SNT variables (SNT frequency of use, PC-based SNT duration of use, cellphone-based SNT duration of use, performance rating) and knowledge worker productivity levels. In measuring an objective reality so that data could be collected using statistical tools, quantitative design is an appropriate choice (Leedy & Ormrod, 2010; Szyjka, 2012). The usage of SNT refers to the act of employing technological platforms such as Facebook, Myspace, Twitter, and LinkedIn to

engage in social interactions or to gain social capital (Das & Sahoo, 2011; Hasgall & Shoham, 2007; Rice, 2010). Productivity is a measure of how well an individual or organization is performing with respect to inputs and outputs (Campbell et al., 1993).

In this study, I employed the use of a web-based survey instrument designed with tools from the SurveyMonkey website to collect data. The survey instrument originated from three preexisting instruments with some modifications. The instrument constitutes five sections (A, B, C, D, and E). The first three sections (A, B, and C) contains modified questions that measure SNT usage by knowledge workers (health care professionals), derived from social network site use instrument designed by Ward (2010). The modification was only in wording parts of the questions and the response options to focus on SNT usage instead of social network site use. Ward conducted three studies using the same set of questions with little modification for consistency and clarity. An internal consistency test yielded Cronbach's alpha score of 0.837. Section A contains six questions that measure the frequency of use of SNT by knowledge workers. Section B contains six questions designed to measure time spent on PC-based SNT by knowledge workers. Section C contains six questions measuring time spent on cellphone-based SNT.

Section D of the instrument contains questions that measure knowledge worker productivity levels, derived from the Endicott Work Productivity Scale, designed by Endicott and Nee (1997). The EWPS contains 25 questions pertaining to nonproductive behaviors and is applicable to numerous professional jobs. The Hamilton Rating Scale for Depression, the Symptom Checklist 90 (SCL-90), the Clinical Global Impression Severity of Illness and Global Improvement Scale, and the Zimmerman Self-reported Scale to Diagnose Major Depression Disorder indicated a high correlation (0.27 - 0.61)

among the measures. This study involved 16 questions selected from the EWPS without any modifications. The last section, Section E of the instrument, contains 31 questions that measure performance of knowledge workers, derived from the Employee Performance Appraisal (EPA) instrument designed by Bruce (1962). The original EPA instrument had 50 questions. A reliability test of the EPA instrument yielded reliability coefficients of 0.934 and 0.923 (Zuffa, 1989). For the purpose of this study, there was some modification of response option to an ordinal Likert-type of scale. Because of the modifications, the instrument underwent testing to determine its reliability and validity by using a pilot test conducted to collect and analyze data from a small sample of the population subsequent to Walden University Institutional Review Board (IRB) approval, before conducting the final survey.

Targeted respondents comprised registered nurse anesthetists. According to the secretariat of American Association of Nurse Anesthetists (AANA), as of 2013 their total membership was 46,870. Out of that number, 55% were female, and 45% were male. Because the population was not homogeneous, it called for the use of a stratified random sampling to ensure an equal chance of selecting each member of the population and equal representation of each stratum. Stratified random sampling ensures equal representation of each of the identified groups in the population (Leedy & Ormrod, 2010). Using G*Power 3.1.3 to calculate the sample size, with power of 0.8, effect size (f^2) of 0.15, and significance level of 0.05 suggested a sample of 85 participants for this study. Cohen (1988) suggested an effect size of 0.15, as a medium for a study designed to verify how effectively one variable predicts the other. Effect size helps determine the appropriate sample size and it is essential for a new study (De Martini, 2011; Fritz & Morris, 2013;

Preacher & Kelley, 2011; Sun, Pan, & Wang, 2010). To ensure the validity of this study, the AANA administrative and program assistant sent links to a self-administered questionnaire accompanied by letters explaining what the study was about including participants' right to privacy by e-mail. Out of 1500, randomly selected participants 163 responded to the survey. Participation was voluntary and anonymous. Collection and analysis of data involved the use of SPSS software. Analysis of data began with correlation analysis between each paired SNT usage variable and the knowledge worker productivity level variable followed by multiple regression testing for pairs that showed a significant correlation, and inferences subsequently drawn. Chapter 3 contains a detailed procedure employed in data collection and analysis.

Definitions

This section contains the term used. As every word takes its meaning from its context, this section provides the reader with the definitions of all the term used in this study. The intent is to ensure that both the reader and the writer understand the study in the same context and from the same perspective.

Cellphone-based SNT: SNT accessed over the cellphone. The physical component is a cell phone (Makoe, 2010; Mehta, Maretzki, & Semali, 2011; Seebruck, 2013).

Diffusion: the process of communicating an innovation through certain channels over time among members of a social system (Rogers, 1995).

Knowledge workers: People who use mental power at work. They add to the intellectual property through their mental power. They analyze data/information,

solve problems, generate ideas that lead to the creation of new products, and inculcate knowledge into others (Drucker, 1999; Maruta, 2012).

PC-based SNT: SNT accessed over a computer system and used for business or individual needs (Seebruck, 2013; Skaržauskiené, Tamosiûnaitè, & Žalénienė, 2013).

Productivity: It is a measure of how well an individual or organization is performing with respect to inputs and outputs. It is the ratio of output to the input (unit of labor) consumed to produce an output (Barnett, Batten, Chiu, Franklin, & Sebastiá-Barriel, 2014; Campbell et al., 1993).

Social network technology (SNT): A technological platform that provides an integrated toolset for social interactions (Das & Sahoo, 2011; Hasgall & Shoham, 2007; Hoyt, 2010; Rice, 2010).

Assumptions

The intent of this research led to the following assumptions:

- There was going to be an honest response from the respondents when answering the questionnaire.
- Respondents would have no fear of any repercussions after assuring them of their confidentiality.
- Full commitment and attention to job functions guaranteed high productivity.
- Full attention and commitment to job functions for the entire period during working hours' enhanced performance.
- Effective administrative and management policies enhanced high performance leading to high productivity.

- Respondents owned or had access to a computer/cell phone while at work.

Scope and Delimitations of the Study

The scope of this study was limited to 46,870 certified registered nurse anesthetists (health care professionals) who are also members of AANA. Generalizing the findings involved only the population that served as a source for the sample (certified registered nurse anesthetists who are members of AANA and working in the United States). The unit of analysis comprised certified registered nurse anesthetist.

The research study focused primarily on obtaining answers to the research questions. The findings did not indicate any significant relationship between the use of SNT and knowledge worker productivity levels. However, there was a significant relationship between performance and knowledge worker productivity levels showing that performance can effectively predict productivity as theorized by Campbell et al. (1993). This observation indicates that in an effort to boost productivity in the health care sector, senior managers need to focus more on performance of the health care professionals.

Limitations of the Study

- The research focused only on health care professionals in the health industry.
- The research did not take into consideration other industries such as education, construction, agriculture, or hotels.
- The research did not take into consideration the individual whose work solely consists of manual labor.
- There is a limitation that, results from this study may not be generalized to the entire health care industry.

- The research was limited to certified registered nurse anesthetists.
- The respondents self-evaluated their performance and productivity.

Significance

In the 21st century, industry and organization looks different from what it used to be. In the past, employees were mostly manual workers. They built the foundation for the development. Drucker (1999) stated that the productivity of the manual worker is what developed the economy, but the prosperity of the future now depends on the knowledge worker. The reason is that the economy is undergoing structural changes with more industries depending on knowledge workers than before (Emanoil & Alexandra, 2013; Wong & Neck, 2012). Drucker (1999) added that increasing productivity of the knowledge worker would lead to increase in profit generated. However, this objective will be defeated if the knowledge worker spends an excessive amount of time on SNT, interacting with other people and doing things that are not job related, with little input in the job. Certainly, this will gravely affect productivity. It, therefore, appeals to reason that this escalating situation of knowledge workers (health care professionals) using SNT when they ought to be on task needs some control. It is in this light that I sought to examine the relationship between the use of SNT and knowledge worker productivity levels in this study.

Understanding the relationship between the use of SNT and knowledge worker productivity levels will help health care managers implement policies that will deter health care professionals from engaging in the misuse/overuse of SNT while at work, and to improve their performance and hence productivity. Improved performance and therefore productivity of health care professionals in health care institutions/communities

stemming from policies enacted and implemented, based on the findings of this study, will depict the contribution of this study towards a positive social change.

Summary

SNT has some tremendous benefits for businesses. However, its surge at the workplace among knowledge workers has led to a decrease in productivity and hence the need to address it.

In this chapter, the problem has been clearly stated (the usage of SNT by knowledge workers reducing productivity), and the possible explanations to the questions, given. The purpose of this study was to determine the relationship between the use of SNT and daily productivity of health care professionals. Chapter 2 contains a critical analysis and explanation of the details of the theories (diffusion of innovation theory and the theory of performance) guiding this study. In addition to the analysis of the theory is an examination of current literature on productivity of knowledge workers and diffusion of SNT in the working environment.

Chapter 2: Literature Review

Introduction

This chapter contains an elucidation of the literature reviewed and the theoretical support for the research question. As already stated in Chapter 1, the specific problem addressed in this study was a decrease in productivity resulting from knowledge workers' (health care workers') increasing desire to interact with SNT during working hours. The purpose of the research was to examine the relationship between the usage of SNT and productivity of knowledge workers in the health care industry.

The current literature has addressed the relationship between the usage of SNT and performance of students in school, but it did not explain the relationship between the usage of SNT for non-job related activities and productivity of knowledge workers while at work.

The first part of this chapter comprises a discussion on the diffusion of technological innovations guided by Rogers's (1995), theory of diffusion of innovations. The second part includes an explanation of the diffusion of SNT in the working environment. In this part, both Rogers's theory and current literature serve as a lens in explaining the adoption of SNT by knowledge workers. The third part contains an explanation of the diffusion of cellphone-based SNT, and the fourth part contains a discussion on how PC-based SNT diffused in the health care environment. The fifth part contains a discussion on the consequence of over-adoption. The sixth part constitutes a review of theory of performance while the last part constitutes a discussion on productivity.

Diffusion of Technological Innovations

The 21st century has seen a paradigm shift in technological innovations. Continuous introduction of innovative products and services into the market has led to spontaneous technological advancements and diffusion (Kale & Arditi, 2010; Kang, Hong, & Huh, 2012; Lee, Lee, & Schumann, 2002; Robinson, 2014; Yanagawa, 2013) which have aroused the curiosity of many researchers. Joseph (2007) submitted that in recent times, researchers are focusing more on the adoption and diffusion of innovative technology. Moore (1965) may have attributed the diffusion of computer technology innovations to the power of the computer doubling every 18 months. However, that would not fully explain why the diffusion occurs. One school of thought opined that the more people appreciate technology, the higher the chance that they will adopt it (Cavusoglu, Hu, Li, & Ma, 2010; Gounaris & Koritos, 2012; Rogers, 1995).

Diffusion is the process by which there is communication of innovation through certain channels over time among elements of the community (Rogers, 1995). Backer and Rogers (1998) explained an innovation to be a new idea, practice, or object. How individuals react to an idea or practice is by how new it appears to them (Rogers, 1995). In that case, the perceived attributes such as the relative advantage or compatibility determine the rate of adoption (Afacan, Er, & Arifoglu, 2013; Carter & Campbell, 2011; George, Hamilton, & Baker, 2012; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Rogers, 1995; Walker, Avellaneda, & Berry, 2011; Wang, Wu, Lin, Wang, & He, 2012). Rogers (1995) submitted that four main elements influence the diffusion of innovations. They include innovation, communication channels, time, and social system.

Innovation

Innovation could be how a new idea, object, or picture appears in the eyes of an individual. AbuJarad and Yusof (2010) submitted that an innovation is the generating of a new idea in a new product or process. In service delivery organizations such as health care, innovation may be defined as actions, procedure or methods of working aimed at improving services, injecting efficiency, cutting down cost, and improving stakeholder experience (Greenhalgh et al., 2004). However, successful innovation should be evident by an empirical study of the determination of its strength and weaknesses in comparison to the idea, object or practice it replaces (Reiner, 2011). Rogers cautioned that, the newness of an innovation is not just about new knowledge and, therefore, should not create any misunderstanding. Someone might have knowledge about innovation for some time, but he or she might have been indifferent as far as adopting or rejecting it. Perceiving new idea, object, or practice may be in terms of knowledge, persuasion, or decision to adopt. This perception makes one wonder about the difference between early and late adopters, and what attributes of an innovation accounts for rapid or slow rate of adoption. It also raises the question of why the diffusion curve occurs after about a quarter of a percentile adoption during activation of interpersonal networks for a critical mass of adopters to start using innovation.

In Rogers's (1995) opinion, the answer to these questions lies in the fact that although some innovations are beneficial and, therefore, desirable, there are others that are harmful and uneconomical and hence, undesirable for individuals or the social system in which they find themselves. In addition, there are instances where innovation may be desirable in one situation, but is undesirable in another situation for adopters to adopt. If

innovation proves to be effective or cost effective and meet the needs of potential adopters, it is highly probable that they will adopt it (Greenhalgh et al., 2004). For example, many have embraced the advent of electronic mail (e-mail) because of the tremendous advantages associated with it. It has helped both individuals and organizations drastically reduce the cost of sending documents through the mailing and shipping industry. For many international businesses, what has even further helped to drive down the cost of mailing documents is the advent of Adobe Reader and Writer application software, which can create portable document format (PDF) files that can be attached to an e-mail (McCarthy, 2011). In this case, if, for example, managers in one location want to send documents to senior managers in another geographical location, all they have to do is to upload it as a PDF attachment and e-mail it. The senior manager can download the document instantly with little or no cost for doing that.

For those in the mailing and shipping industry, such as the United States Postal Service, the advent of e-mail has led to a drop in the number of customers causing a reduction in revenue and other financial loses (Nixon, 2012). Nixon (2012) stated that, between 2000 and 2012, the number of people who communicated and did other transactions such as payment of bills online increased from 5% to 60%. This situation led to the postal services reducing the number of centers of operation and slashing the total employee number by almost a quarter. Nixon opined that a decline in the first-class mail has made it difficult to keep up with the cost of maintaining the postal service systems using the low revenue.

One can draw a similar analogy from the use of cellphone-based SNT. In many businesses, the use of SNT on the cell phone enhances performance by allowing the

sharing of information among managers and team members including creating an opportunity for an instant solution of problems, a phenomenon known as integrated collaboration environment (Fuchs-Kittowski & Siegeris, 2010). Studies show that cellphone-based SNT is an important tool in helping solve and manage health-related problems (Augustine, 2011; Nundy, Dick, Solomon, & Peek, 2013; Rice, 2010). Mehta, Maretzki, and Semali (2011) observed that cellphone-based SNT enabled entrepreneurs in the agricultural industry to have access to current market information to make informed decisions. However, when it comes to others in the transportation industry such as professional drivers, studies showed that the use of cellphone-based SNT while working affected their performance (Benedetto, Calvi, & D'Amico, 2012; Brown, 2012; Ferdinand & Menachemi, 2014; Ismeik & Al-Kaisy, 2010; Sullman, 2012). Benedetto et al. (2012) published that using a mobile phone while driving decreases performance and should be discouraged.

Characteristics of innovation. Rogers (1995) characterized innovation into five categories: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability. Rogers stated that the difference in the rate of adoption is attributable to the characteristics of innovation as perceived by the individual. He defined relative advantage as the degree to which an innovation proves to be better than the idea it replaces. Although objective advantage of innovation may be helpful, the most important thing is the subjective view of the advantage (Reiner, 2011; Rogers, 1995). This view explains why the mode of adoption and diffusion of innovation differ from one individual to another, and in some instances an innovation is not adopted at all (Greenhalgh et al., 2004). Rogers submitted that usually relative advantage is measurable in economic terms,

social prestige, convenience, or satisfaction. Rogers opined that in most cases, economic presumptions determine the magnitude of relative advantage, but all these variables relate to some degree. Whereas early adopters use social prestige and mostly convenience as a measure of relative advantage, late adopters are more likely to use economic factors and satisfaction as a yardstick for relative advantage (Rogers, 1995). However, relative advantage alone is not an assurance for high rate of diffusion of innovation. When an innovation seems simple and compatible with the adopter's values and experience, diffusion occurs (Lin, Chiu, & Lim, 2011).

Rogers (1995) also defined compatibility as "the degree with which innovations are consistent with the existing values" (p. 15). In that case, any idea found to be inconsistent with the values and norms of a social system will either be slowly adopted or not at all. For example, gay rights in a highly religious sect of the community will meet nothing but resistance. Tuan and Venkatesh (2010) added to Rogers's explanation by stating that organizational culture influences the extent of stimulation of innovation in an organization. Tuan and Venkatesh published that the basic values, assumptions, and beliefs are integral parts of the fabrics of behavior and activities reflected as norms. They underscored the impact of norms in employees. For example, Tuan and Venkatesh observed that most medical staff in three out of the six private hospitals they studied believed that technological innovation belonged to the people who held middle management and senior management positions and were decision makers. Tuan and Venkatesh acknowledged that such attitudes do not promote innovation. In an ordered system with a high degree of control, diffusion of innovation will meet impediments

while a system with values like flexibility, freedom, and cooperative teamwork will support innovation (Tuan & Venkatesh, 2010).

The third characteristic of innovation, complexity is the degree to which a relatively complex innovation goes through adoption slowly by potential adopters (Rogers, 1995). For example, in a study to determine the factors that influence students' intention to use an online registration, Demir (2006) found that, complexity was the strongest variable in predicting attitude towards registering for classes online. The rate of adoption of an innovation increases when it is less complex in the eyes of the social system (Borrego, Froyd, & Hall, 2010; Khorshidi & Rajab-Baigy, 2010; Richardson, 2011).

Trialability, which is the fourth characteristics, refers to being able to experiment with innovation before adopting it. Rogers (1995) defined it as "the degree to which an innovation may be experimented with, on a limited basis" (p. 16). Adopting an innovation that can first go through experimental stage is cheaper and less threatening. The advantage in this case is that it eliminates any uncertainty or reduces any risk taking (Ismail, 2012; Rogers, 1995; Shin & Hwang, 2011). Rogers submitted that the rate of adoption of an innovation that can have a pretrial on a limited basis is faster than innovation without a pretrial on a limited basis. Apart from relative advantage and simplicity, trialability also expedites diffusion of innovation (Freeman, 2012; Lee & Tan, 2013; McNichol & Grimshaw, 2014; Kebritchi, 2010; Wang, Lin, Chang, & Hung, 2011). Banerjee, Wei, and Ma (2012) found that trialability helps to confirm initial perception of benefits and risks, and encourage the adoption of an innovation such as e-business. For software companies, free and trial versions do not only give an indication of

the extent of awareness of the product to the company but also the quality of the product to the consumer and hence increasing the diffusion process (Lee & Tan, 2013).

Finally, the extent to which the outcome of innovation is conspicuous was what Rogers (1995) referred to as observability. Usually, observability is associated with visibility or awareness, which tends to enhance the rate of adoption/diffusion (Heiden & Strebel, 2012; Li & Edwards, 2013; Makse & Volden, 2011; Soderhölm & Sonnenwald, 2010). Heiden & Strebel (2012) concluded in their study that, apart from competitiveness, the variables of observability is very vital in explaining where and why an innovation diffuses. Rogers noted that, people would adopt an innovation when they are aware, or it is easy to observe the benefits/outcome. Scott, Plotnikoff, Karunamuni, Bize, and Rodgers (2008) affirmed Rogers's statement when they observed a significant association between appreciating the benefits in using Healthy Heart Kit (HHK), a risk management and patient education resource for the prevention of cardiovascular disease, and physicians' intentions to use HHK. In South Africa, about 98% of students from the University of South Africa (UNISA) own cell phones with features such as camera, video, music, games, instant messaging, and internet access. They see the benefits associated with these features, such as enabling them to collaborate on research, tutoring, reading, and writing (Makoe, 2010).

Communication Channels

A *communication channel* could be an exchange of information between at least two individuals. Often, information exchange between individuals continues until it gets to the point where the two individuals reach a mutual understanding. There are instances where the information exchanged contains a new idea (Rogers, 1995). The transfer of

information containing a new idea from the source to the recipient is what defines diffusion. Therefore, diffusion could be a special case of communication. Rogers (1995) submitted that the importance of the diffusion process is the information exchange through which an individual conveys a new idea to one or several others. The diffusion process includes innovation, units of adopters that have knowledge of innovation or have tested it, units of individuals (potential adopters) who have not yet experienced the innovation, and communication channels connecting the various units (Rogers, 1995). The communication channels determine the rate of diffusion (Leonard-Barton, 1985). Rogers classified communication channels into *interpersonal channels and mass-media channels.* Mass-media channels refer to the means of transmitting a message through a mass medium such as a radio or television to reach a broader audience, and interpersonal channels are those that occur between two individuals. Millions of people can get past the awareness stage through the mass-media channel (Kwon, Lara, Enfield, & Frick, 2012). A blog from a senior manager for all employees' consumption is an example of as mass-media channel, and two individuals' texting each other or having communication on Facebook could be an example of interpersonal channel. Lee, Lee, and Schumann (2002) published that the information literature indicates that information flow is always moving from mass media towards opinion leaders (early adopters) who are often exposed to primary and secondary source of information. Conversely, interpersonal channel mediates the flow of information from mass media to the less active people (imitators) in the community (Lee, Lee, & Schumann, 2002). Karuppan (2010) submitted that the web has now become the primary communication channel for medical travels, but millions who could benefit from it are yet to welcome it. For effective diffusion of innovation or

concept to occur, there should be strong integration between mass-media and interpersonal communication (Dabphet, Scott, & Ruhanen, 2012)

Rogers (1995) posited that, diffusion of innovation occurs because potential adopters or recipients of innovations rely on the experience of the early adopters (innovators). Feng and Yang (2011) shared the same notion when they submitted that favorable information received from peers influenced the rate of adoption. This idea suggests that, the diffusion process is simply potential adopters mimicking early adopters in their communities. Leonard-Barton (1985) underscored the importance of opinion leaders in the innovation diffusion process. He explained that, opinion leaders have been identified as early adopters as shown in many studies. However, there should be a clear distinction between opinion leaders and early adopters, as it is not all opinion leaders who are early adopters and vice versa. Opinion leaders are people who are good in their judgments, play a central role, highly connected, and could help accelerated the diffusion process (Gouws & Rheede van Oudtshoorn, 2011; Kiesling, Günther, Stummer, & Wakolbinger, 2012; Nejad, Sherrell, & Babakus, 2014; Vidal, Bull, & Kozak, 2010). While the notion of early adopters focuses on the position of adopters in the adoption process, the notion of opinion leaders focuses on the influence possessed by adopters in the social set up (van Eck, Jager, & Leeflang, 2011). Nash, Bouchard, and Malm (2013) underscored the role of trust and the media in influencing adopters.

Communications often occur among individuals who have common interests and backgrounds, such as level of education, social status and beliefs (Rogers, 1995). The forms of communication include observation, speech, hearing, physical action, and body language (Larsen, 2011). Rogers described individuals who share things in common as

homophilous and those with differences as heterophilous. People who share common interests are often part of the same group and have the same propensity, which make them, liable to close contacts and to a more genuine communication (Hordila-Vatamanescu & Pana, 2010). Rogers (1995) opined that because of the shared interest amongst the homophilous group, communication is very effective and rewarding. When communication is effective and rewarding between two or more individuals, they are encouraged to go on with it or repeat it as often as possible. They communicate their shared interests, with new ideas always diffusing from one individual (source) in the direction of the other individual (recipient). This form of diffusion is possible because of the difference in the degree of their technical knowledge.

Time as an Element of Innovation

Rogers (1995) published that in the innovation decision process, time is a measure of the period elapsed as people move from first knowledge of the innovation through its adoption or rejection. It could also be early or lateness of adoption of an innovation Demir (2006) defined time as the process and speed of adopting an innovation. Rogers gave five main stages of the innovation decision process as: (a) knowledge, (b) persuasion, (c) decisions, (d) implementation, and (e) confirmation. Rogers (1995) submitted that knowledge occurs when an individual identifies the existence of an innovation and gains some appreciation of what it does. Persuasion occurs when an individual adopts a favorable or unfavorable attitude toward the innovation. Decision, on the other hand, happens when individuals indulge in an activity that may lead to adopting or rejecting an innovation, and implementation takes place when individuals put the innovation into some form of use. When individuals seek already made innovation

decision, it is an act of confirmation. The individuals might reverse the previous decision if they found it to be conflicting. The length of time required for the entire process in a sequential order refers to as the innovation decision period.

Rogers (1995) classified adopters into five categories: (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. The difference between innovators and the rest of the adopters is that, innovators are actively seeking new ideas to adopt. They are highly exposed to the mass media to keep them abreast, and are widely networked. The adoption stage is quite complex as adopters will first have to experiment the innovation, evaluate it, find meaning in it, and develop an affinity for it (Greenhalgh et al., 2004). Compared to the rest of the adopters, innovators can cope with higher levels of uncertainty concerning surrounding innovations. Rogers submitted that, the degree of innovativeness and classification of individuals into various groups of adopter categories depends on the relative time of adoption of an innovation.

Rogers (1995) submitted that at the knowledge stage, individuals or units are interested in identifying the innovation and its details. However, when it gets to the persuasion, decision, and confirmation stages, they tend to fall on their peers' subjective evaluations.

Social System

Rogers (1995) defined social system as a set of interrelated units engaged in solving problems together to accomplish a common goal. He identified the members of the units of the social system to be individuals, groups, organizations, or subsystems. Bohlmann, Clantone, and Zhao (2010) in an effort to contribute to the definition of the social system wrote that a social system constitutes independent decision-making units with local

networks that define other units connected to them based on the nature of the network. In this research, the members of the units are knowledge workers in the health care industry (health professionals) who are distinguishable from one another and are working together towards the attainment of a common goal. Members of the units rely on external and internal contacts differently when it comes to making decisions about adopting an innovation (Bohlmann, Clantone, & Zhao, 2010). Rogers submitted that, an innovation that diffuses through a social system would encounter certain factors. These factors include the nature/component of the social structure, effects of norms, roles of opinion leaders, and change agents. Others include the types of innovation decisions within the social structure and the consequences of the innovations (Rogers, 1995).

Rogers (1995) opined that structure describes the orientation of units in the system, which helps in predicting the behavior of an individual in the system. For example, in a system such as technology development or regulatory institution, individuals who occupy certain key positions have a significant advantage in shaping policy development (Hintz, 2011). Often, formal structures exist in many organizations with the senior officials at the top and the lowest employee at the bottom. Instructions always start from the top and trickle down the hierarchy. It is the duty of those at the top to make policies guided by organizational goal(s) and ensure that all those down the organizational ladder understand and work within the confines of the policies. In this case, innovation diffuses from the top to the bottom and individuals adopt it equally. This form of diffusion is typical of the formal system (Rogers, 1995). Decision by individuals to adopt an innovation within this type of system is contingent on other decisions (Greenhalgh et al., 2004).

The informal system also exists in which individuals with common interest form cliques. This clique formation helps in predicting the behavior of members of the social system including when they adopt an innovation. However, two individuals in this system will not adopt an innovation equally, especially when they belong to different cliques within the society (Rogers, 1995). The reason is that the rate of adoption has influence to some degree, from their immediate environment. In contrast, individuals within a clique will adopt an innovation to the same level with the reason being that individuals who are in the same clique influence each other. As Rogers (1995) stated, a person's innovativeness is influenced both by the characteristics of the person and by the nature of the social system in which the person happens to be a member.

The Diffusion of SNT in the Working Environment

Technology is a tool that enables us to reduce uncertainty or equivocations in a cause-effect relationship, increase innovativeness, and stimulate economic growth (Frenkel, 2012; Rogers, 1995). That is why many businesses/organizations would resort to technology to solve the problem of the unknown. Rogers explained that two components of technology exist: the hardware and the software components. Often, organizations would purchase the hardware component first after innovation in order to use the software (Rogers, 1995). However, he added that some innovations only involve the software component, in that case, the business or individual would only purchase the software component in order to upgrade the system/unit, which often occurs because of the relative advantage. Rogers stated that technological innovations come with some degree of benefits for its potential users. It is because of the relative advantage such as enhancing best practices or reducing vulnerability of the system or users that

organizations would resort to using them. An example is Adobe Acrobat, the software that enables users to create, edit, format, and print PDFs regardless of the operating systems being used (McCarthy, 2011). McCarthy (2011) added that this software helps to cut down cost tremendously when running a business by making documents available electronically and for sharing by all stakeholders regardless of their geographical location or operating system employed.

Hasgall and Shoham (2007) opined that the relative advantage, such as the ability to update companywide, transparency of information, and empowerment of each employee with the information required led to businesses resorting to the use of real-time technology, which also enables an instantaneous update of local activities.

One of the most popular technological platforms often used by many small, medium, and large size enterprises is Facebook (Fernandez, 2012; Lacho & Marinello, 2010). The reason is attributable to the advantages Facebook offers, such as enabling different users of Facebook from the same organization to collaborate on an assignment/project. It provides a platform that enables flat communication among team members as well as between managers and employees. It is also free to sign up on Facebook. In the field of education, Faculty and students are using traditional SNT such as Facebook, LinkedIn, and Twitter to enhance the learning process (Barczyk & Duncan, 2012; Dyrud, 2012). A study by Rice (2010) showed that SNT enabled young people to maintain ties with peers at home and, as a result, helped them to reduce sexual risks.

Many nonprofit organizations are creating Facebook pages in order to reach people out there because of the perceived advantage of being on Facebook (Hauswirth, 2010). Sites such as Facebook, Twitter, and YouTube provide platforms to non-profit

organizations for advocacy (Auger, 2013). It is the perceived advantage that makes individuals adapt to SNT and hence the diffusion of SNT. A publication by Ellison, Steinfield, and Lampe (2007) indicate that the reason for the diffusion of SNS such as Cyworld, Myspace, and Facebook is the perceived advantage or attributes, such as individuals being able to present themselves, articulate with their social networks, and create connections with others. It includes being able to establish links with others in the same profession, initiating a romantic relationship, connecting with others with a shared interest (such as music or politics), and associating with other college students. Facebook has all the attributes mentioned above, which accounts for why over the years, since its inception in 2004, it has experienced a very high rate of diffusion amongst members of the social system. Hauswirth (2010) submitted that in the first year of Facebook's publication, the number of users rose to 1 million. Between July 2009 and July 2010, the number of users rose from 250 million to 500 million. This observation conforms to the explanation Rogers (1995) provided regarding how the diffusion of innovation occurs in a social system.

Backer and Rogers (1998) published that the rate of diffusion/adoption of a new idea (innovation) starts slowly with new adopters (innovators) in the beginning and increases, as the idea appears advantageous. Factors that contribute to the slow adoption at the beginning of the diffusion process include uncertainty, unfamiliar approaches, and resistant to change (Xu, 2013). The diffusion continues as the new adopters share their positive experiences regarding the innovation with the potential adopters (Backer & Rogers, 1998).

Rogers (1995) used an S-shaped curve (see Figure 1) to illustrate the rate of adoption of innovation. The S-shaped curve illustrates how slow the adoption begins, how it speeds up upon reaching critical mass, and levels off as the people who remain to adopt dwindle over time. That is what is happening in the health industry now regarding the diffusion of SNT. It would not be a mistake to suggest that the diffusion of SNT has reached its critical mass and has perhaps even gone beyond that point. There is the same observation in other industries.

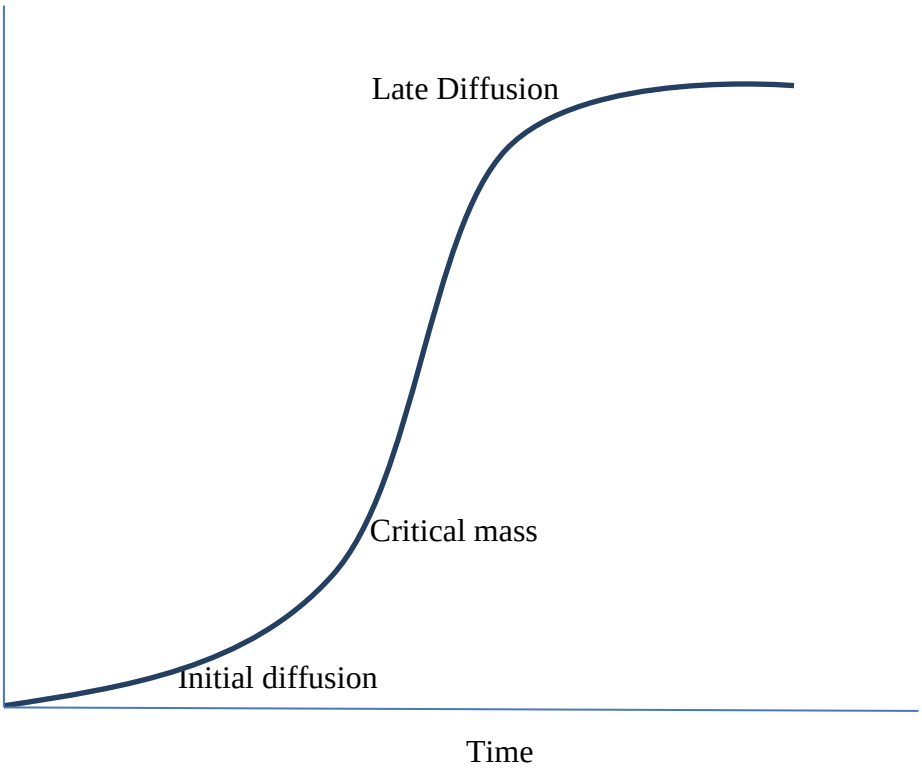

Figure 1. S-curve showing the rate of adoption of innovation

Cell Phone-based SNT

The diffusion of cell phones has reached a critical mass in many parts of the world. Cell phone diffusion is becoming very rampant (Ding, Haynes, & Li, 2010; Engel

& Green, 2011; Schäffner, 2011; Shrum et al., 2011; Yujuico & Gelb, 2011). It is very common to see people carrying them everywhere they go- school, home, social gatherings, at work, just name it. In China, many people like to access the internet on their cell phones (Liu, Wu, & Chu, 2012).

Altinkemer and Yilmaz (2008) submitted that the wireless communication industry has experienced tremendous growth worldwide. The cell phones have become very popular, and people are using them everywhere (Ding, Haynes, & Li, 2010; Porter, 2012). Between 1984 and 2006, the total number of cell phones users in the United States increased from 92,000 to about 233 million (Cavusoglu et al., 2010). The increase in the number of cell phones also led to a huge gain in revenue for wireless carriers (Altinkemer & Yilmaz, 2008). In the opinion of Sathikh (2013), the high rate of cell phone diffusion has also led to the spontaneous emergence of transitive culture capable of penetrating the social fabric and creating new behaviors. A survey conducted in November 2011, indicate that innovations in the cell phone is creating a remarkable revolution in the world (Lee, 2012).

Rogers (1995) observed that the American consumer first encountered cellular phone innovation in 1983, which led to vendors selling about 10 million of the cellular phones the following year. The number of cell phone subscribers worldwide continues to increase (Pimmer, Linxen, & Gröhbiel, 2012). Rogers (1995) submitted that, the name cellular phone stemmed from the fact that each Metropolitan area constituted demarcations called cells and as one drove from one cell to another, the telephone system automatically switched a call from one cell to another without interruption in services.

Early adopters of cellular phones were mostly males in executive positions. Their organization gave them the cell phones as an incentive to keep them happy and motivated. At that time, the price of the cell phone was high but dropped with time and improvement in quality. This observation attests to Moore's (1965) theory, which states that, the power of the computer doubles every 18 months with a drop in price. The size also decreases to a point such that it could fit into a pocket. A decade later, cellular phones had quickly diffuse and become a general consumer product so much so that one out of every three cellphones was for uses other than business. Rogers attributed the rapid rate of diffusion and adoption of the cellular phone in society to its relative advantage, compatibility, complexity, observability, and trialability.

In explaining relative advantage, Rogers (1995) submitted that one major benefit of the cell phone is its estimated ability to save about two hours a week in avoiding missed appointments and delayed schedules, as well as, improved time management. Rogers (1995) opined that saving time is very helpful, especially for people who live in big cities such as New York and Los Angeles where there is a high probability of staying in traffic for a long time. The fact that the cell phone is portable is also advantageous. In the case of an emergency when driving it becomes very useful. Cell phones have resources that enable the creation of large social capital leading to the generation of economic capital by entrepreneurs (Mehta, Maretzki, & Semali, 2011; Palackal et al., 2011; Shrum, et al., 2011). Mehta, Maretzki, and Semali (2011) added that cell phone-based social networking platforms could create a digital trust within trusted members of the system. An observation by Whitney (2010) indicate that many people own cell phones in the developing world because of the advantages associated with it such as

mobile banking and access to health care. Even though, Altinkemer and Yilmaz (2008) agreed with this statement, they also added that many people in the developing nations with low income are able to own cell phones through donations by charity organizations. The cell phones are fast, efficient and instantaneous (Lee, 2012)

Rogers (1995) submitted that, in the beginning, people used the cell phones because of the prestige attached to it, and that accounted for why it diffused in public places. The decrease in price and size also helped to increase the rate of adoption and diffusion. Altinkemer and Yilmaz (2008) observed that, an increase in functions of the cell phone over the years, stemming from technological advances in the chip caused an increase in demand that led to decrease in price.

In explaining how compatibility contributed to the rapid adoption and diffusion of cell phones, Rogers (1995) said, cell phones could connect into the landline phones and allow users to communicate with other people with regular phones. He posited that the formation of critical mass of cellular phone users was not necessary at the early stages of the innovation's diffusion.

Regarding complexity, Rogers (1995) posited that the cellular phone worked just like a regular phone, and so there was no need to learn new skills. The method or procedure for making and receiving calls were the same. A report by Makoe (2010) indicates that people felt more comfortable to use a cell phone because they found it to be simple and user friendly.

In explaining observability, Rogers (1995) submitted that the use of cell phones in automobiles, restaurants, and other public places helped emphasize status conferred to potential buyers. The innovation was conspicuous. However, adoption theory assumed

that factors as age, education, and income controlled the adoption (Wei, 2001). The theory implied that young people were more adventurous and eager to adopt. In addition, people with a high level of education became aware of the existence of new technology while higher income enabled them to purchase a cell phone. Wei's (2001) study showed that socioeconomic variables were not very important in determining the adoption of cell phones. People who use cell phones no longer fall into the category of only well-educated and wealthy consumers, but just ordinary people (Wei, 2001).

Regarding reliability, Rogers (1995) submitted that it was possible to borrow a cell phone for trial purposes and that many rental cars came with cell phones, which enabled people to try the innovation. In South Africa, the cell phone is trusted as a tool for enhancing collaborative learning as well as social interaction among distant education students (Makoe, 2010).

Altinkemer and Yilmaz (2008) published that on the wireless market, Global System for Mobile Connections (GSM) accounts for 72% of the digital market and 70% of the world's entire wireless market. The dominance of GSM on the digital market is attributable to factors such as standardization, economies of scale, and the ability to use their services anywhere on the globe. The third-generation GSM (3GSM) offers many high-end services such as video on demand, high-speed multimedia and internet services just as a personal computer can.

How PC-based SNT Diffused in the Health Care Environment

Before the advent of personal computers (PCs), businesses used the paper filing system in storing records/data. These files were in file cabinets stored in physical buildings. That means one had to have access to the physical building before accessing

the files. Data from different departments of an organization or different entities were in silos. This situation posed many challenges, especially as the customer base of many businesses increased. Searching for customer information became more tedious and time consuming. Sometimes customer information on paper files could be lost. Redundancy was also a big issue because of rewriting of customer information anytime a customer came back for a repeated transaction. This situation was not different in the health care industry. With time, innovators in businesses began to adopt the PC, and as their positive experience became obvious, and they shared these experiences with others, they started to adopt the PC. The rate of adoption increased rapidly because of the perceived advantage.

Cantrill (2010) observed that, in the health industry, the adoption was slow because users had little understanding of the PC and found its use intimidating. While some innovations are very explicit, other innovations are not clear for potential adopters to adopt (Khorshidi & Rajab-Baigy, 2010). Potential adopters tend to adopt the technology when they have a better understanding of it (Freeman, 2012; Gounaris & Koritos, 2012; Rogers, 1995). Cantrill (2010) submitted that the early stages of the adoption, there was no complete appreciation of the level of medical documents needed, as well as the safety-support issues. Cost was another impediment (Cantrill, 2010). Cantrill underscored the advantages associated with computerization of the health care system. The advantages include improved communication between patients and multiple health care providers, elimination of unnecessary lab tests, reduction in medical errors, improved quality of care, improved patient safety, elimination of redundancy, and improved legibility of doctors' notes, including prescriptions for medication. These are some of the major factors leading to the adoption of PCs in the health care industry.

Coupled with the aforementioned, the ability to provide a substratum for a social network platform and the benefits derived by these health institutions is also gradually pushing the adoption towards a critical mass. The benefits include reducing the distance between the health care provider and the patient, as well as establishing a relationship such as one patient to many health care providers or one health care provider to many patients. Hawn (2009) submitted that the adoption has been slow in some instances because doctors worry about the financial consequences of the innovations. They want to make sure the adoption of innovation will not cost them financially. However, the perceived advantage cannot be overemphasized, which has led to many health care providers rethinking and adopting PC-based SNT. Cantrill (2010) said the use of computers for many aspects of what we do daily has led to a rise in computer literacy and a reduction in fear to use computers in the medical environment. Hawn talked in an article about “Hello Health” as an example of a successful case of PC-based SNT with numerous advantages. Hawn (2009) submitted that “Hello Health” originated in Brooklyn, New York, in the 2008 with the sole purpose of providing citizens access to primary health care at all times and reduced cost without having to travel to meet the doctor physically. It also provides some degree of convenience for the patient. The patient only visited the doctor when it became very necessary. The patient could view Laboratory results on the computer, including doctors’ report via the internet. Doctors using the system could share patient information and attend to as many patients as possible. This innovation has so far worked very well for doctors and patients. People networking through the PC often get into in large communication networks (Seebruck, 2013; Stefanone, Kwon, & Lackaff, 2012). In Japan, for example, PC-based social

network is very vast and more dispersed in comparison to cellphone-based social network (Seebruck, 2013).

Cantrill (2010) found that the evolution of the computer mouse as a point-and-click device has led to tremendous improvement in man-machine interfaces. Other innovations of the PC's graphical user interface has made it easy to multitask and hence increased the number of adopters. With time, the size of the PC has decreased to fit the pocket and the palm, an innovation that has led to its rapid adoption. With the advent of cloud computing, much of the focus has shifted toward thin-client architecture, which is easy and less expensive to maintain (Cantrill, 2010)

Overadoption of Innovation

Adopting an innovation could be good, but sometimes people over adopt, which, can cause the objective of innovation to fizzle out. When an innovation reaches a critical mass, it tends to diffuse by itself without promotion from change agents. However, some people happen to over adopt because of status associated with it (Flight, Allaway, Wan-Min, & D'Souza, 2011). Overadoption may also be attributable to proactive coping skills, which prompts usage behavior after adopting an innovation (Gilly, Celsi, & Schau, 2012). Rogers (1995) defined overadoption as an adoption of an innovation by individuals when, in the expert's opinion, they should reject it. The causes of overadoption include the new adopter's insufficient knowledge about the new idea, inability to predict the innovation's consequences, and the status conferring aspects of a new idea (Rogers, 1995). Gilly, Celsi, and Schau (2012) submitted that, overadoption comes from peoples weak proactive skills. Some people crave for innovation, and because they cannot resist marketing pressure, they continue to adopt when they are even

not fully aware of the result. Unfortunately, it is difficult to determine whether an individual should adopt an innovation. The determination of the rationality for adopting an innovation is by an expert who has studied the innovation (Rogers, 1995). Rogers added that some individuals may perceive their reasons for adopting as rational, but that is subjective rationality rather than objective rationality.

Overadoption is a major issue in many fields (Rogers, 1995), including the health care field. Rogers (1995) observed that expensive health care institutions purchase expensive medical equipment without any justification for the use. At the same time, when it comes to equipment for communication, such as PCs, cell phones, and iPads, users tend to cling to them and use them excessively. For example, Richtel (2011) submitted that health institutions in an attempt to eliminate or reduce medical errors have invested heavily in devices such as computers and smart phones. This investment is to enhance communication and instant access to patient information. Unfortunately, observations indicate that many doctors and nurses stay focused on computers and the smartphone screens instead of the patient. This situation happens even during moments of critical care. Irwin, Hoffman, and Geiger (1998) concluded in their study that, overadoption could decrease performance in two main ways. In the first case, after adopting a particular technology, any competitive edge that the health institution might have gained by attracting patients through increased differentiation would be lost. Secondly, overadoption may lead to underuse of many of the technological innovations acquired by a health care institution and make it difficult to offset the huge cost of acquisition.

Rogers (1995) added that the attraction of an innovation's attribute is one factor that can cause overadoption. When an attribute or sub-attribute of an innovation appears very attractive to an individual, to the extent that it overrules all other conditions, overadoption can happen. This explanation accounts for the reasons some knowledge workers often focus on their PCs or cell phone screens when they should be working. They feel the magnetic pull of the attributes or the sub-attributes such as the nature of the platform for communication. The attraction is not because of the graphical user interface; rather it is because it allows them to stay in touch with their families, friends, and other acquaintances continuously. People maintain and develop relationships and strong ties both near and far on SNT platforms (Baek, Bae, & Jang, 2012; Neves, 2013; Powell, Gray, & Reese, 2013).

Pattern of Usage of SNT by Knowledge Workers in the Workplace

It has become very common to observe knowledge workers using SNT as frequently as time would allow. They sometimes stay on the sites they visited for a long time chatting with family members, friends, and other acquaintances or engaging in other things that are not job related. In the United States, studies show that about 35% of people with Facebook accounts log into their portal, many times during the day (La Barbera, La Paglia, & Valsavoia, 2009). Das and Sahoo (2011) conducted research among 1,500 respondents and found that 56% of users in the United States log onto their Facebook account at least once a day. An observation by La Barbera et al. (2009) indicated that the commonly used SNT includes Facebook, Myspace, and Friendster (p. 34).

Das and Sahoo (2011) submitted that users spend about 700 billion minutes monthly on Facebook, whereas the average user has about 130 friends on the site. The writers said people have formed a compulsive habit of visiting their own files on SNS several times in a day just to check on what friends have posted as updates and comment on them. For employees, such compulsive habits divert their attention from office work (Das & Sahoo, 2011).

It is mind boggling as to why knowledge workers would use SNT frequently and over long periods for non-job related activities such as chatting with friends, family members, and other acquaintances in their social group. In the opinion of Bartholomew and Mason (2011), such compulsive behaviors come about because of the pleasurable engagement derived from what the individuals may be consuming. So long as the reward of an activity appears to be fun or fits within the description or definition of pleasure, the individual will repeat it many times until prompted by an external factor in the environment to pause or stop. On the contrary, Rouis, Limayem, and Salehi-Sangari (2011) hold the view that people stay on SNT because they seem to perform better in online tasks and derive tremendous satisfaction from it.

Hanyun (2011) found that people who frequently visit SNSoften do that because they are self-absorbed and leisurely bored. He observed that adolescents in China are heavily involved in SNT and spend an average of 12.1 hours online weekly. These adolescents mostly have entertainment as their main motive for getting online. They also have many friends they frequently contact online. This behavior had a significant negative effect on their academic performance. Hanyun submitted that 20% of the respondents used cell phones more frequently than computers for online visits. Hanyun

opined that this behavior is not with adolescents only, but also adults and needs correction. That is how people form habits. Once we acquire such negative behaviors in our youthful stages without any corrections, they become part of us as. What is more, the adolescent eventually becomes an adult and takes up certain responsibilities in the organization as a job. If this behavior is affecting performance in school, then it is more likely to affect performance on the job.

Hardie and Tee (2007) studied adult internet users to determine their internet usage. Respondents were to answer questions focused on emotions, social networks, and internet activities. The findings of their study indicated that those who classified themselves as over users admitted to engaging in online activities for long periods, had more support from their internet-social groups, had higher levels of neuroticism and lower levels of extraversion. They also had greater social anxieties and were emotionally lonelier than the average user of the internet. Further investigation revealed that an excessive use of SNT is attributable to factors such as neurotic personality and high levels of perceived support from social network communities.

Torres (2011) opined that individuals often use SNT as a window to escape from current unwanted relationships and to meet their emotional and social needs. Torres submitted that the internet/SNT facilitates offline interactions. However, observations by Chen, Ross, and Yang (2011) did not support Torres's submission. Chen, Ross, and Yang realized that neither the desire to participate in a virtual community nor the desire to maintain a relationship predicted the frequency of use of SNT while at work, but rather a desire to find diversion and entertainment on the Intern. They underscored the importance of setting work-related goals at work to avoid any distractions by SNT.

Theory of Performance

The relationship between performance measurement and the organizational environment is paramount to organizations in this 21st century. This relationship calls for deeper and continued research into performance measurement systems used to quantify the efficiency and effectiveness of actions in order to identify problems in the organization and form strategic decisions that will lead to the attainment of the organizational goals (Gimzauskiene & Kloviene, 2011). Campbell et al. (1993) submitted that the classic view of job performance underscores the objective indicator of individual accomplishment an organization maintains. The justification for this characterization is that, personal research used a single criterion of measurement for the greater part of the century and that in scientific and professional literature the term job performance is singular with no explicit or implicit conditionals (Campbell et al., p. 38). The writers, however, held a different view; to them, search for objective indicator for measuring individual job performance has been a failure (Campbell et al., 1993).

Campbell et al. (1993) said that for one to understand job performance, it is important to first, appreciate the organizational goals. That is organizational goals drive performance and not the reverse. For example, in a social club, members judged others based on their contributions toward the attainment of the club's goal. The writers equated performance to behavior. They submitted that performance is a quantifiable and observable behavior that is scalable in terms of individual proficiency, and it focuses on the attainment of organizational goals. It is what employees must do. It is not precipitate of action, but rather it is an action itself (Campbell et al., 1993).

Performance is made of actions that are in line with primary goals and under an individual's control regardless of whether they are cognitive, motor, or psychomotor (Campbell et al., 1993). The theorists added that, in this respect, job performance is not one thing, but a conglomerate of performance components that are distinguishable in terms of what determines them (indicators) and pattern of variation with other variables.

Campbell et al. (1993) used eight factors to illustrate the major performance components. These eight factors include job-specific task proficiency, which is the extent to which individuals can execute certain core tasks central to the job, and no-job-specific task proficiency, which reflects the situation where individuals are required to execute tasks that do not have much to do with their specific jobs. For example, all registered nurses should be able to take and record body temperatures of patients, measure and record the patients' weights, and administer patients' intake of medication among other specific duties.

The next is written or oral communication task proficiency, which is a written and oral presentation to an audience. The fourth is demonstrating effort, which is a direct reflection of the consistency of a person's daily effort, the frequency with which individuals will exceed their efforts when required, and a willingness to keep working under hard conditions. The fifth is maintenance of personal discipline, which is emphasizes on avoidance of negative behavior such as staying on a cell phone or computer and chatting with other people when one should be working, sexual harassment, and substance abuse. In fact, personal discipline goes beyond just abiding by professional ethics and organizational norms. It is common to find people who act

professionally and stay within the confines of the organizational norms, yet use most of the time at work on activities that are not job related.

The sixth is facilitating peer and team performance, which is the degree to which the individuals support their peers, help them with the problems they encounter, and act as a de facto trainer. This factor also emphasizes on the individual being a good team player. The seventh factor is supervision/leadership. It includes all the behaviors directed at influencing performance of subordinates through face-to-face interpersonal interaction and influence. The eighth factor is management/administration. These factors include performance behaviors directed at carrying out goals for the unit or enterprise, and organizing people and resources to work on them. It also includes monitoring progress, helping to solve problems or overcoming crises that impede the attainment of goals, controlling expenditures, obtaining additional resources, and representing the unit in dealing with other units.

Campbell et al. (1993) submitted that, among the eight factors, the major performance components of every job include core task proficiency, demonstrated effort, and maintenance of personal discipline. While core task proficiency falls under task performance, demonstrated effort and maintenance of personal discipline fall under contextual performance (Borman & Motowidlo, 1997; Motowidlo & van Scotter, 1994). This observation suggests a multidimensional nature of performance. Motowidlo and van van Scotter underscored the importance of clearly distinguishing between task performance and contextual performance.

Task Performance and Contextual Performance

Lu et al. (2010) published that task performance constitutes task-fulfilling behaviors, which is appreciable in terms of quantity produced, quality of the product and job knowledge for task completion. Contextual performance, on the contrary, constitutes behaviors conducive to task fulfillment and can be determined using criteria such as a good relationship with colleagues, interpersonal facilitations, and commitment to the job. Quality of work, quantity of work, job performance, job knowledge, and interpersonal relationship, are multiple indicators of performance (Lu et al., 2010). Other indicators of performance include dependability and potential of the worker. Dependability has a direct effect on job knowledge (Borman, White, Pulakos, & Oppler, 1991). Borman et al. (1991) submitted that dependability may be defined as being organized and trustworthy, acting within the confines of the organizational norms, and having respect for authority. Potential, on the contrary, is the ability of the individual to achieve high performance and ascend the organizational ladder. Exhibiting high potential strengthens one's chances for promotion (Stumpf, 2010).

Motowidlo and van Scotter (1994) said task performance refers to the effectiveness with which individuals apply their technical skills/knowledge in executing a task (task proficiency) in the organization. In contrast, contextual performance refers to the personality traits individuals possess that makes them demonstrate a high degree of patriotism (organizational citizenship) for the organization. Motowidlo and van Scotter put task performance under two classes of behavior. The first is activities involved in the conversion of raw materials into organizational products and services such as selling of merchandise or patient care. The second is activities that seek to maintain the technical

core of the organization, such as supply of raw materials, products distribution, planning, coordination, supervision, and staffing to ensure that the organization survives and remains competitive.

This explanation suggests a direct relationship between task performance and the organization's technical core. Alternatively, contextual performance focuses on the organizational, social, and psychological environment supporting the technical core. Jawahar and Ferris (2011) simplified the distinction between task performance and contextual performance by explaining that task performance emphasizes the specific technical roles that the individuals play at work while contextual performance stresses on social behaviors that help to inject efficiency in the system. Contextual performance involves volunteering to do things that actually do not form part of one's specific job description, and teaming up with others to accomplish an objective for the organization (Borman & Motowidlo, 1997). Borman and Motowidlo (1997) submitted that variables that describe one's personality could also adequately predict contextual performance.

Contextual performance (organizational citizenship) is becoming popular when discussing job performance as many organizations lean towards improving service quality (Monahan & Hopkins, 2002). Monahan and Hopkins (2002) gave examples of contextual performance as helping coworkers and other superiors with their duties, working extra hours when needed, and making original and good suggestions towards improving service or product quality. Monahan and Hopkins found that nurses who were very satisfied with their jobs were those who were always willing to volunteer to help with other activities. However, current literature also indicates that extra demands on nurses can affect their performance (Gandi, Wai, Karick, & Dagona, 2011; Nabirye,

Brown, Pryor, & Maples, 2011). An observation made by Greenslade and Jimmieson (2007) indicated that, previous measure of nursing quality failed to incorporate all the necessary attributes. Greenslade and Jimmieson aimed at developing and validating a new job performance scale to assess the quality of the nurse and to distinguish between contextual and task performance. They identified eight categories of behaviors under both task and contextual performance. The categories of behaviors under task performance included technical care, information provision, coordination of care and emotional support. Under contextual performance, the categories included interpersonal support, job task support, compliance with organizational rules, and volunteering for additional duties. Greenslade and Jimmieson submitted that the inclusion of these behaviors in measuring performance of nurses allow us to examine behaviors that have a direct effect on patient outcomes/satisfaction. However, they could not generalize their findings because they used a small sample size and had a low response rate. Another reason is that, they could not demonstrate the reliability of the instrument they used.

Borman and Motowidlo (1997) opined that the difference between contextual performance and task performance are visible in three different ways. First, task activities vary from one job to another while contextual activities show considerable uniformity. Second, task activities, unlike contextual activities have to do with specific roles on the job. Third, while antecedents of task performance have a high probability of involving cognitive variables, antecedents of contextual performance have a high probability of involving personality variables. Borman and Motowidlo underscored the importance of contextual performance in their article. They submitted that current trends in

business/organizations show that contextual performance is becoming very important (Borman & Motowidlo).

A study by Bergman, Donovan, Drasgow, Overton, and Henning (2008) indicate that task performance requires general cognitive ability because workers have to learn to do their jobs. When workers acquire job knowledge, they can always respond to various situations. The writers said that in times of unusual situations, individuals with high cognitive abilities have a tendency to find excellent solutions. They associated contextual performance with behaviors that seek to maintain the social and psychological environment of the technical core. Bergman et al. (2008) found personality to be an antecedent of procedural knowledge, which predicted contextual performance in one study. In another study, Bergman et al. (2008) found cognitive ability to be an antecedent of procedural knowledge, which intend predicted contextual performance. They opined that the relationship between cognitive ability and contextual performance would become stronger as the complexity of contextual performance increases.

Motowidlo and van Scotter (1994), in their study, found that the overall performance of an individual at work constitutes both task performance and contextual performance. However, the contribution of task performance and contextual performance are independent of each other (Motowidlo & van Scotter, 1994). They found a stronger correlation between experience and task performance than with contextual performance. They also found a strong correlation between personality and contextual performance than with task performance. Motowidlo and van Scotter's study confirmed the distinction between task performance and contextual performance. It is, therefore, imperative to consider the two classes of performance when evaluating the performance on the job.

The findings from the empirical study conducted by Motowidlo and van Scotter (1994) adds to the model Campbell et al. (1993) proposed. In fact, in their submission, Campbell et al. divulged the limitation in their model by stating that, “direct evidence of this taxonomy is admittedly spares” (p. 49). In saying this, they were suggesting an empirical study to back their model. The empirical study by Motowidlo and van Scotter fills the gap. Campbell et al. (1993) added that there should be a clear distinction among performance, effectiveness, and productivity. To them, effectiveness is a way of evaluating performance. Badiru (2014) attempted to draw a distinction by stating that while effectiveness stresses on achieving specific objectives toward a long-term goal, productivity emphasizes on the throughput per unit time. Both effectiveness and productivity define performance (Badiru, 2014).

Productivity

Productivity is a measure of how well a group, organization, or industry is functioning in terms of inputs and outputs (Campbell et al., 1993; Constantinescu, 2011). Barnett et al. (2014) defined productivity as the ratio of the output of an organization with respect to the input used to produce the output. In many developed nations, productivity in service delivery is becoming the focus as it continues to contribute to the larger part of the economy (Rust & Huang, 2012). For the purpose of this study, emphasis is on individual knowledge worker productivity. As Campbell et al. (1993) submitted, the individual’s contribution to the organization should be of much concern. Improvement in productivity stemming from an innovation should lead to high cash flow and growth/prosperity (Bhatt, 2014; Booth, Bin, Hejazi, & Shum, 2011; Chia, Skitomore, Runeson, & Bridge, 2012). In the opinion of Alby (1994), productivity is a scientific

concept, which is quantifiable. Therefore, it qualifies as a variable defined and measured in absolute or relative terms. Alby (1994) defined absolute productivity as the quantity of physical work produced by a unit of labor. He also defined relative productivity as the "ratio of the quantity of physical work produced by a unit of labor on a specific project and activity to the quantity of the same work produced by a unit of labor on a standard project in a standard condition" (p. 4.1). Campbell et al. (1993) gave the subcomponents of total productivity as productivity of technology, productivity of labor, or productivity of capital. It is possible to talk about any of these subcomponents depending on the input used in the denominator. However, productivity of labor is the focus of this study.

Productivity of Labor

Productivity of labor emphasizes on the output of the worker. It is the output (products and services produced) per unit of labor input (Barnett et al., 2014; Baumann & Pintado, 2013; Bhatt, 2014; Rust & Huang, 2012). Drucker (1999) puts workers into two categories: Manual and Knowledge workers. Drucker (1999) said, "manual work constitutes repetitive manual operations, with much emphasis on speed, accuracy, and uniformity" (p. 88). Therefore, a manual worker is often associated with the task, its constituent motions, physical effort and time involved. He added that manual worker productivity has created developed economies. However, now, there is an increasing opportunity for work requiring highly advanced and thoroughly theoretical knowledge in most developed countries (Drucker, 1999). Drucker (1999) submitted that future prosperity and survival of developed economies largely depends on knowledge workers.

Moon (2009) defined knowledge workers as a group of workers who produce information that other knowledge workers use to perform their job. Their ability to

discover the need for change makes them indispensable in the organization. They use their judgment in executing their duties and those who have good insight exploit knowledge leading to improvement in productivity of the organization (GSA Enterprise Transformation, 2011; Maruta, 2012).

Davis (2002) posited that knowledge work involves employing the cognitive domain to generate useful information and knowledge. In an organization, knowledge work can be classified as *explicit,* which is the knowledge that can be easily captured and managed, or as *tacit*, which is the knowledge that is extremely personal, hidden within an individual, and is difficult to manage or tap into (Hau, Kim, Lee, & Kim, 2013; Jabar et al., 2010; Mládková, 2011; Tan, 2012). Knowledge workers intentions to share their tacit knowledge is contingent on their personal motivations (Hau et al., 2013). In the opinion of Dzekashu and McCollum (2014), the most important part of intellectual capital of every organization constitutes tacit knowledge as it has the potential to improve knowledge value and guarantee operational excellence. It is, therefore, pertinent for an organization to capture its tacit knowledge in order to remain competitive in this 21st century competitive landscape. However, Hines and Carbone (2013) caution against the quick sharing/spreading of information as it may render the intellectual property of the organization vulnerable.

Davis (2002) said that knowledge workers may engage in other activities including clerical activities when performing their duties, but they spend most part of their time indulging in activities involving knowledge work. They have formal education and their organizations value them for their knowledge and skills. However, because these qualities knowledge workers possess tend to deteriorate or dwindle with time, they

need continuous education (Davis, 2002). Even though, Davis statement may be true, Bannister and Remenyi (2009) argued that, the ability of the knowledge worker to process information does not change significantly with respect to time especially when compared to the processing capacity of the computer.

Davis (2002) opined that since knowledge work involves evaluation, analysis, programs, plans, assurances, reasoning, decisions, and plan actions, unlimited access to data would enhance the work of the knowledge worker. He called for the use of mobile computing, or embedding technology products within computing devices to give access to data at any place and time. However, he cautioned that investing in new technology might lead to some unlimited consequences.

The knowledge workers are often responsible for structuring and managing their work (Davis, 2002; Fritz, Lam, & Spreitzer, 2011). Davis (2002) submitted that unlike the production worker, timely completion of task and quality of work by the knowledge worker is contingent on good self-management and self-spacing. This calls for periods of immense concentration which when interrupted, may cause a drop in productivity. However, some knowledge workers involuntarily interrupt themselves by multitasking (Bannister & Remenyi, 2009). Bannister and Remenyi (2009) posited that the conscious mind focuses on a single task at a given time while the subconscious mind is capable of dealing with numerous tasks concurrently. Performing more than one task using the conscious mind will then require the continuous switching of attention between tasks, which is time consuming, and tend to affect productivity. Bannister and Remenyi added that even though some jobs such as managing, by nature, require frequent interruptions, many jobs knowledge workers perform, such as programming, lecturing, and surgery go

on effectively without any interruptions. Performing more than one task simultaneously using the conscious mind requires more effort and time. Research indicates that people become increasingly fatigued and the effectiveness of their cognitive ability drastically reduces when engaged in conscious multitasking (Bannister & Remenyi, 2009; Bondarenko, Janssen, & Driessen, 2010).

Evidence also exists that suggests the level of multitasking varies among individuals and can slow individuals and reduce their task effectiveness causing a loss in productivity (Dance & Service, 2013; Erne, 2012). There are individuals who do not feel comfortable with multitasking. However, Bannister and Remenyi (2009) observed that many knowledge workers work with their e-mail systems, online messaging, and chat rooms active. It is common to see people on their cell phones and laptops during meetings (Bannister & Remenyi, 2009). Bannister and Remenyi (2009) found in their study that the time knowledge workers spent on a given task before switching to another task was strikingly short. This observation suggests low quality of work during knowledge workers multitasking. Erne (2011) published that the most common challenge knowledge workers encounter includes the appropriate handling of workload and performing numerous tasks at the same time.

Six major factors determine knowledge worker productivity Drucker (1999). The first is defining the specific task so that knowledge workers will not concentrate on other things that are not task related. The second is individuals being responsible for their own productivity. The third factor is being innovative. The fourth is learning and teaching continuously. The fifth is realizing the importance of quality in productivity, and the sixth is being seen and treated as an asset rather than cost.

Drucker (1999) underscored the importance of quality in the productivity of the knowledge worker. In his opinion, quality is the essence of the output in most knowledge work and so needs preference when it comes to productivity. For example, in judging the performance of a surgeon, the question of how many patients went through surgery or an operation is not as important as how many survived the surgery and also had their problems solved after the surgery. In Drucker's words, surgeons routinely judge each other using their success rates in difficult and dangerous procedures. A case in point will be the survival rate of the patients who underwent open-heart surgery or how well their orthopedic-surgery patients fully recovered. To attain this level of quality requires full attention and time for the patient even if the surgeon is an expert or the number one surgeon in the whole world, as attention becomes a critical element for the knowledge worker during cognitive applications (Mansi & Levy, 2013).

Drucker (1999) provided a subcategory of knowledge work as technology. Technologists are people who do both knowledge work and manual work and are often not only highly knowledgeable, but also create, distribute and put knowledge into practice (Drucker, 1999; Peng, 2012). Drucker gave an example of a technologist as a brain surgeon who spends many hours doing diagnosis before performing surgery, which is a repetitive manual activity with emphasis on accuracy, consistency, and speed. He submitted that technologist might form the rapid growing and the largest group of knowledge workers. Majority of technologists includes health care lab technicians; rehabilitation technicians; X-ray technicians, ultrasound technicians, magnetic-resonance imaging (MRI) technicians (Drucker, 1999). This group constitutes people with high knowledge. In Drucker's opinion, developed countries can have a competitive edge only

by educating this group of knowledge workers. However, Phillips (2010) does not agree that technologist and technician can be the same and used interchangeably. Phillips explained that from medical parlance, technologists are highly skilled and educated individuals who create images of humans for doctors to examine and give treatment, whereas technicians are people with limited on-the-job experience and repair x-ray machines.

Ramirez and Steudel (2008) proposed a framework (model) for quantifying the intensity of knowledge work on the job. The framework helps to calculate the knowledge worker score and then places each worker in the knowledge work continuum. The greater the knowledge worker score, the greater the quality of the knowledge worker. That is the greater the knowledge worker's score, the higher the ratings of an individual as a knowledge worker. Assessing the knowledge worker aids in identifying problems related to productivity (Mahmood & Ali, 2011). The shift from manual production to automated and knowledge–driven production has led to more knowledge workers in the workforce (Dekas, Bauer, Welle, Kurkosi, & Sullivan, 2013; Martin, 2013; Ramirez & Steudel, 2008). Many industries now depend more on the performance of knowledge workers to have a competitive edge and to maximize profit. This situation calls for a clear understanding of the expectations of knowledge workers in order to satisfy their needs (Mahmood & Ali, 2011; Ramirez & Steudel, 2008).

Ramirez and Steudel (2008) underscored the importance of creating a model that will describe the level of knowledge work performed in order to enable scientific research in knowledge work and create opportunities for exploring how knowledge worker score correlates to other variables. The writers submitted that distribution can be

used to analyze the similarities and the differences that exist between and within jobs; the variance within a job; and the economic state of a country.

Ramirez and Steudel (2008) submitted that the current challenge facing the study of knowledge workers is measuring the knowledge work of employees whose tasks vary daily, lack production standard times, and have tasks performed differently by different workers. As challenging as Ramirez and Steudel may have made it sound, Moon (2009) submitted that measuring the productivity of knowledge workers is possible by determining how quickly any worker can frame a request for information and receive accurate feedback. It is also possible by measuring how quickly the worker appreciates a request and provides an answer. This definition focuses on the cognitive ability of the worker and hence the name knowledge worker.

Summary

The rate of diffusion of SNT in our working environment and its effect on productivity of the knowledge workers cannot be overemphasized. This chapter includes an explanation of why and how diffusion of technological innovations occurs through a social system. Rogers (1995) and Greenhalgh et al. (2004) submitted that diffusion of technological innovations occurs because of the perceived advantage. It also occurs because of early adopters sharing their experiences with other people in the society.

Many advantages come with the diffusion of technological innovations in our working environment. The diffusion of computers and computer-based SNT including cell phones and cell phone-based SNT in the working environment has been helpful when it comes to best practices. It has enabled many businesses to be efficient in their operations in terms of dissemination, storage, and retrieval of information. It has also

helped some businesses to have a competitive edge over their competitors. However, extensive/frequent use of these technological innovations by knowledge workers for non-job related activities tend to question their performance/productivity. Studies show that people who frequently use SNT mostly have the intent of satisfying their emotional and social needs (Hanyun, 2011; Torres, 2011) or to getting some form of entertainment (Chen, Ross, & Yang, 2011) even at the time when they should be working.

Campbell et al. (1993) demystified the factors that affect performance and hence productivity. They gave the major factors that affect performance as core task proficiency, demonstrated effort, and maintenance of personal discipline. In effect, these factors also affect productivity. However, although, productivity may be objective concept measured against accepted standard, performance is relative and its measurement is by using objectives or goals set. For example, budget performance is a relative measure against a project budget that may be big or small (Alby, 1994). Alby (1994) said that monitoring productivity has many advantages such as helping to make strategic decisions to create a competitive edge. However, controlling performance is for tactical reasons. He added that productivity and performance are indirectly related and must not be misconstrued or confused.

The current literature indicates that an increasing demand exists for knowledge workers, hence, a shift toward a knowledge-based economy. This observation suggests to senior management to do whatever it takes to attract knowledge workers. They also have to ensure that knowledge workers put in all their effort and time while at work in order to be very productive. Chapter 3 includes details of the research design, sample size, population and method used for collecting and analyzing data for the study.

Chapter 3: Research Method

Introduction

The purpose of this study was to examine the relationship between the usage of SNT and productivity among health care professionals (registered nurses anesthetists) in the health industry. This chapter provides a description of the research design, targeted population, sample and sampling procedures, instrumentation, and data analysis plan.

Research Design

This study involved four SNT usage variables (frequency of use of SNT, duration of use of cellphone-based SNT, duration of use of PC-based SNT, and performance rating) and productivity of knowledge workers. As already stated in the previous chapter, productivity of the knowledge worker seeks to measure the output in relation to the input by the knowledge worker whereas SNT is the platform that allows social interaction among groups of people.

In this study, I employed a survey design in collecting data from a group of willing participants. I explored the extent to which the use of SNT for non-job related functions during working hours relates to productivity of knowledge workers, followed by summarizing the findings and drawing of inferences about certified registered nurse anesthetists (health care professionals) in the United States. The choice of this design was not only for its simplicity, but also because this study was intended to get information from a population (sample) that would help explain the observed phenomenon in a larger population. Leedy and Ormrod (2010) submitted that a survey research design becomes an appropriate choice when the researcher wants to acquire information from a person or a group of people in order to learn about a larger population.

The survey design is popular with many disciplines including business, government, public health, sociology, and education (Leedy & Ormrod, 2010). It has proven to yield accurate results in the past by many scholars who have had the opportunity to use it in their studies (Joseph, 2007). The structuring and design also helps in collecting specific data in a specific order from respondents who are a representative sample of the population.

However, it is important to mention at this point that there are some weaknesses associated with this survey design. Among these weaknesses is the fact that, in this design, the researcher relies on the perception of the respondents, and writes a report based on what the respondents give as feedback. The researcher relies on self-reported data (Leedy and Ormrod, 2010). The question is whether what the respondents report to be true is the absolute truth or whether they are honest. Leedy and Ormrod (2010) submitted that the results obtained sometimes may not be a true representation of reality or could be misleading as some people fail to give their candid opinions on certain issues because of certain influence or fears, or just because they would prefer to lie. Some respondents may also have genuinely forgotten the facts of a past incident or they just intentionally decide to distort the facts. On the contrary, self-report rating compared to supervisory rating does not show any substantial discrepancy (Berry, Carpenter, & Barratt, 2012). In some instances, self-report rating is the befitting choice (Ng & Feldman, 2012). Demerouti, Xanthopoulou, Tsaousis, and Bakker (2014) found the score for self-report and peer-report to be the same when investigating contextual and task performance of a group of employees.

Another weakness is a tendency to use a single method design in lieu of multiple methods (Joseph, 2007). With this design, researchers also have to worry about the possibility of a low response rate. In that case, they need to consider a large sample size in order to ensure validity of the study. Besides the aforementioned weaknesses, there were also certain attributes that made survey research more appropriate for this study and the advancement of knowledge in the information systems management discipline. One attribute is the fact that conclusions drawn from a collection of data from a sample in a particular study may serve as a basis for a generalized statement about the state of affairs for a large population/organization over a long period (Aaron, 2012; Leedy & Ormrod, 2010).

Another attribute is that a survey study provides an empirical description of an observed phenomenon (Leedy & Ormrod, 2010). Survey research can instantly reach many people through the web, phone, or direct mail. Data are easy to collect and analyze (Aaron, 2012). While researchers may not control variables in survey research, they obtain the information regarding variables' relationship to one another. (Roberts, 2013). In this study, an empirical description of variables helped in the analysis and explanation of the relationship between them, which in effect helped to elucidate the observed phenomenon. In this case, managers can appreciate the gravity of the situation and take immediate steps to formulate policies to curb the situation.

Methodology used for any study is largely determined by the question(s) asked and what data to collect (Leedy & Ormrod, 2010; Patterson & Morin, 2012; Wahyuni, 2012); however, consideration was also given to other designs. The choice of experimental design was not appropriate because although the questions suggested a

relationship-based quantitative research, they did not focus on treatments and their outcome(s). The choice of a case study was also not appropriate because while case studies can produce results that are explicit and demonstrate unique features in a particular situation, researchers cannot generalize the results as they meet challenges for validity and reliability (Leedy & Ormrod, 2010; Qi, 2009).

Population

The targeted respondents were certified registered nurse anesthetists (health care professionals) currently practicing in the United States. Every survey must include a clear definition of the targeted population (Baker et al., 2010). The respondents in this research were certified registered nurse anesthetists (AANA members) working in United States. According to the AANA secretariat as of 2013, their total membership was 46,870. Out of that number, 55% were female and 45% were male. As the population was not homogeneous, it called for the use of a stratified random sampling with the aid of a computer to ensure an equal chance of selecting each member of the population, and equal representation of each group.

The administrative and program assistant to AANA e-mailed an invitation letter containing information regarding the nature of the study, including an informed consent form to participants. Participation was voluntary and anonymous. Studies showed that the response rate of web-based surveys averaged between 6% and 15%, which was 11% lower than other methods (Joyce et al., 2010; Lozar Manfreda et al., 2008). Using G*Power 3.1.3 to conduct power analysis for linear regression (*F* Test) with one predictor, power of 0.8, effect size (f^2) of 0.15, and significance level of 0.05, suggested a sample size of 85 participants. In order to attain the suggested minimum sample size so as

to reject the null hypothesis, taking into consideration the low response rate (about 6%) as the literature suggested, 1,500 randomly selected people (computer generated) who met the inclusion criteria were e-mailed links to the survey.

Procedure for Recruitment

The AANA administrative and program assistant sent an invitation letter containing information regarding the nature of the study, informed consent, a link to the web-based survey instrument, and the deadline for submission of responses through e-mail to 1,500 participants while I remained completely unaware of the details of the participants. Leedy and Ormrod (2010) underscored the importance of keeping participants information confidential in order to avoid any ethical issues. The list of 1,500 participants (certified registered nurse anesthetists) was randomly generated by a standard computer structured query language. Following 7 days after the first e-mail, a second e-mail to was sent to all participants reminding them to respond to the survey. Data collection occurred within a period of 2 weeks.

Instrumentation

The instrument for this study emanated from three already existing instruments with some modifications. There are three main parts of the instrument, divided further into five main sections (A, B, C, D, and E). The first part of the instrument constitutes Section A, B, and C, with modified questions designed to measure SNT usage by health care professionals. The modification is only in wording parts of the questions and the response options. Section A consists of six questions that measure frequency of use of SNT; Section B consists of six questions that measure the duration of use of PC-based SNT, and Section C consists of six questions that measure the duration of use of

cellphone-based SNT (see Appendix A). Ward (2010) developed the survey model for these questions. She used the instrument to measure social network site use by students. To ensure the validity of the instrument, Ward conducted three surveys using the same set of questions with little modification for consistency and clarity on three different occasions (September/October, November/December, and March/April). She used the same population for the surveys. Out of the 436 participants from the first part of her survey, 369 also completed the second survey. The third part had 330 respondents from both the first and the second surveys. An internal consistency test yielded a Cronbach's alpha score of 0.837. I obtained permission to use Ward's instrument (see Appendix C).

The second part of the instrument constitutes Section D and has questions that measure knowledge worker productivity. I used the EWPS, which Endicott and Nee (1997) developed. This scale contains 25 questions regarding specific nonproductive behaviors and is applicable to numerous professional jobs. The rating of each question is on a five-point scale, ranging from *never* (0) to *almost always* (4). Total score ranges between 0 and 100, with 0 representing the best possible score and 100 representing the worst possible score. Test-retest and the internal consistency reliability data report (within 10 days - 2 weeks) for EWPS using samples from two populations (depressed outpatients and non-depressed community samples) gave a score of 0.92 as the interclass correlation coefficient of reliability for the total score. The alpha internal consistency coefficient of reliability was between 0.92 and 0.93, indicating high consistency (Endicott & Nee, 1997). Assessing the validity concurrently, using the Hamilton Rating Scale for Depression, the Symptom Checklist 90 (SCL-90), the Clinical Global Impression Severity of Illness and Global Improvement Scale, and the Zimmerman Self-reported

Scale to Diagnose Major Depression Disorder indicated a high correlation (0.27 - 0.61) among the measures. A high correlation shows that EWPS total scores have validity as a measure of severity of illness. This part of the instrument involved sixteen questions out of the 25 original questions for the purpose of this study (see Appendix A). I obtained permission to use this instrument from Jean Endicott (see Appendix B).

The third part of the instrument, Section E, measures performance of knowledge workers. Questions for this part are from the EPA instrument (Bruce, 1962). There were seven sections of the EPA instrument with ratings between 0 and 42. A 7-point Likert-type scale measured the sections as *poor, limited, fair, good, very good, superior,* and *excellent*. Determination of the overall job performance was by totaling the means on the subscale and finding the average mean. A reliability test of the instrument yielded reliability coefficients of 0.934 and 0.923 (Zuffa, 1989). For the purpose of this study, I modified the questions by choosing 31 questions relevant to this study out of a total of 50 questions. I also modified the Likert-type scale to measure the seven sections as: *strongly disagree, disagree, neither agree/disagree, agree,* and *strongly agree.*

Due to these modifications, subsequent to IRB approval, there was a pilot testing to collect and analyze data from a small sample of the population before the final survey. The purpose of the pilot test was (a) to exercise the intended data collection procedures, and (b) to conduct preliminary testing to assess initial construct and instrument validity, as well as for a preliminary evaluation of data analysis testing. The full and final sample did not include data and analyses from the pilot test.

The owner of the instrument, Martin Bruce, is deceased. He had his own publishing company called Martin Bruce, Ph.D., Publishers. I attempted several times in

vain to get permission to use the instrument. Martin Bruce Publishers have two addresses on the internet. I sent letters through the United States Postal Services to the two addresses (one in New York and the other in Florida). All the letters came back to me (returned mails) because the United States Postal Services could not find the addresses. I also contacted the Better Business Bureau and the United States Chamber of Commerce to find out if they could help me with any phone numbers so that I could contact the publishers, but they did not have the publishers on their list. Unfortunately, there was no information on the internet regarding who had the copyright for the instrument. I tried to contact Jean M. Palormo, who evaluated the instrument, but I found out she also passed away. All efforts to contact Barbara S. Zuffa, who used the instrument in 1989, have also been in vain.

Operational Definitions

The following are variables identified based on the research question:

Frequency of use of SNT. Measuring this variable involved six items from the Social Network Site Use survey. They include questions 1 through question 6 from Section A of the survey instrument (see Appendix A). The questions pertain to frequency of using social networking sites, such as Facebook and Twitter. Response options are on a Likert-type scale and include *never, once, a few times, almost every day, and every day*. Computation of scores involved averaging the six items, and treating data as a continuous variable.

Duration of use of PC-based SNT: Measuring this variable involved six items from the Social Network Site Use survey. The six items include questions 7 through question 12 from Section B of the survey instrument (see Appendix A). The questions

pertain to the duration of use of PC-based social networking sites, such as Facebook and Twitter. Response options are ordinal, based on a Likert-type scale and include *none, some, quite a bit,* and *an extreme amount*. Computation of scores involved averaging the six items, and treating data as a continuous variable.

Duration of use of cellphone-based SNT: Measuring this variable involved six items from the Social Network Site Use survey. The six items include questions 13 through question 18 from section C of the survey instrument (see Appendix A). The questions pertain to the duration of use of cellphone-based social networking sites, such as Facebook and Twitter. Response options are ordinal, based on a Likert-type scale and include *none, some, quite a bit, and an extreme amount*. Computation of scores involved averaging the six items, and treating data as a continuous variable.

Knowledge worker performance rating: Measuring this variable involved seven items from the EPA survey: Quantity of Work, Quality of Work, Job Knowledge, Initiative, Interpersonal Relationships, Dependability, and Potential. The seven items were measured using questions 20 through question 26 from section E of the survey instrument (see Appendix A). Response option is ordinal, based on a Likert-type of scale and include *strongly disagree, disagree, neither agree/disagree, agree,* and *strongly agree.* Computation of scores involved averaging the 31 items, and treating data as a continuous variable.

Knowledge worker productivity levels: Measuring this variable involved the use of EWPS. The items for this variable include all questions under section D (question 19) of the survey instrument (see Appendix A). Computation of scores involved summing responses to the 16 items and treating data as a continuous variable.

Data Collection Procedure

Certified registered nurse anesthetists who gave their consent to take the survey self-administered the survey instrument. The administrative and program assistant to AANA e-mailed a letter containing the purpose for the study, informed consent, the survey link, instructions for filling out and returning the survey and the participants' rights to privacy to the targeted respondents. Survey distribution and collection involved a fully automated web accessible, self-administered survey system. The respondents had seven days to complete and return the survey. Subsequent to the seven days was another e-mail from the administrative assistant to all participants reminding them to complete the survey. Data collection occurred within a period of two weeks.

Alternative methods bypassed in the event of data collection include face-to-face, telephone interviews, and mailing. The reason for bypassing those methods was the time and cost involved. Conducting a survey online could be less time consuming, convenient and cost effective (Aaron, 2012; Leedy & Ormrod, 2010). Hardigan, Succar, and Fleisher (2012) found web-based survey to be 2.68 times less expensive than a mail survey.

Data Analysis Plan

Collection and analysis of data employed quantitative descriptive statistical tools (SPSS). Using descriptive statistics brought meaning to the data collected from the sample. Data analysis commenced with computation of frequency and percentages on nominal (categorical/dichotomous) data. There was computation of means/standard deviations for continuous (interval/ratio) data as advised by Howell (2010).

Assessment of the research questions started with four Pearson correlation analyses between the four SNT usage variables (frequency of use of SNT, duration of use

of PC-based SNT, duration of use of cellphone-based SNT, and performance rating) and knowledge worker productivity levels; one correlation analysis for each SNT usage variable. The correlation analysis was to determine if a statistically significant relationship did exist (at $\alpha = 0.05$, two-tailed) between knowledge worker productivity levels and each SNT usage variables. Pearson product-moment correlation (r) was a bivariate measure of association (strength) of the relationship between each SNT usage variable and knowledge worker productivity levels. Given that all variables are continuous, and the aim of the study seeks to assess the relationships, or variation in the distribution of the z scores, Pearson correlations are the appropriate bivariate statistic (Pagano, 2010). Further analyses involved SNT usage variables, which showed a significant correlation to the knowledge worker productivity variable. There was no further analysis with SNT usage variable that had no significant correlation to the knowledge worker productivity levels.

Research Question 1

R1: To what extent does the frequency of use of SNT relates to knowledge worker productivity levels?

H_o1: A relationship does not exist between the frequency of use of SNT and knowledge worker productivity levels.

H_a1: A relationship exists between the frequency of use of SNT and knowledge worker productivity levels.

Research Question 2

RQ2 To what extent does the duration of use of PC-based SNT relates to knowledge worker productivity levels?

H_o2: A relationship does not exist between the duration of use of PC-based SNT and knowledge worker productivity levels.

H_a2: A relationship exists between the use of PC-based SNT and knowledge worker productivity levels.

Research Question 3

RQ3: To what extent does the duration of use of cellphone-based SNT relates to knowledge worker productivity levels?

H_o3: A relationship does not exist between the duration of use of cellphone-based SNT and knowledge worker productivity levels.

H_a3: A relationship exists between the duration of use of cellphone-based SNT and knowledge worker productivity levels.

Research Question 4

RQ4: To what extent does performance rating relate to knowledge worker productivity levels?

H_o4: A relationship does not exist between the performance rating and knowledge worker productivity levels.

H_a4: A relationship exists between the performance rating and knowledge worker productivity levels.

Assessing research questions one through four involved a multiple linear regression to determine if those SNT usage variables found to be statistically significant in the correlation analysis (in the preliminary analysis) effectively predict knowledge worker productivity levels. The regression equation (main effects model) used is as follows:

$$y = \beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + \beta_3 * x_3 + \beta_4 * x_4 + e. \quad (1)$$

Where y = knowledge worker productivity levels, β_0 = constant (which includes the error term), β1 = first regression coefficient, x_1 = frequency of use of social SNT, β_2 = second regression coefficient, x_2 = duration of use of PC-based SNT, β_3 = third regression coefficient, x_3 = duration of use of cellphone-based SNT, β_4 = fourth regression coefficient, x_5 = knowledge worker performance rating, and e = the residual error (Tabachnick & Fidell, 2012). Assessing the significance of each predictor involved the use of a *t* test while explanation of the extent of prediction involved the use of beta coefficients.

For significant predictors, every one-unit increase in the predictor led to an increase in knowledge worker productivity levels by the unstandardized beta coefficient. The predictor variables treated as continues variables include frequency of use of SNT, duration of use of PC-based SNT, duration of use of cellphone-based SNT, and performance rating. The outcome, variable was the knowledge worker productivity levels

The next chapter, chapter 4 contains details of the data collection including the timeframe and analysis. It also includes a report on descriptive characteristics that characterize the sample, findings in the statistical analysis, and summary of answers to the research questions and hypotheses tested in this study.

Chapter 4: Results

Introduction

This chapter contains the analysis of the study. The purpose of this study was to examine the relationship between the use of SNT and productivity among knowledge workers (registered nurse anesthetists) in the health industry. In this study, I examined the use of SNT (such as LinkedIn, Facebook, Myspace, etc.) on the job by certified registered nurse anesthetists and its relationship with their daily productivity. The data obtained in the quantitative correlation study helped in addressing the following research questions and hypothesis.

Research Question 1

R1: To what extent does the frequency of use of SNT relates to knowledge worker productivity levels?

H_o1: A relationship does not exist between the frequency of use of SNT and knowledge worker productivity levels.

H_a1: A relationship exists between the frequency of use of SNT and knowledge worker productivity levels.

Research Question 2

RQ2 To what extent does the duration of use of PC-based SNT relates to knowledge worker productivity levels?

H_o2: A relationship does not exist between the duration of use of PC-based SNT and knowledge worker productivity levels.

H_a2: A relationship exists between the use of PC-based SNT and knowledge worker productivity levels.

Research Question 3

RQ3: To what extent does the duration of use of cellphone-based SNT relates to knowledge worker productivity levels?

H_o3: A relationship does not exist between the duration of use of cellphone-based SNT and knowledge worker productivity levels.

H_a3: A relationship exists between the duration of use of cellphone-based SNT and knowledge worker productivity levels.

Research Question 4

RQ4: To what extent does performance rating relate to knowledge worker productivity levels?

H_o4: A relationship does not exist between the performance rating and knowledge worker productivity levels.

H_a4: A relationship exists between the performance rating and knowledge worker productivity levels.

This chapter contains a detailed report on the analysis of the survey data, interpretation, and explanation in consistency with the underlying theoretical foundation. In the report are findings in respect of each of the four research questions. The chapter begins with changes made in the instrumentation during the pilot study prior to the final study, followed by a description of the data collection process, the descriptive statistics report, the results, and the summary of the findings.

Pilot Study

There was a pilot study subsequent to IRB approval before the final study. In order to get nine responses to represent about 10% of the sample size, the American AANA secretariat sent the web-based survey instrument link to150 randomly selected certified registered nurse anesthetists who were also members of AANA. Evidence that an online survey would yield 6% response rate (Lozar Manfreda et al., 2008) led to the calculation of 150 participants for the study. Preceding the questionnaire was an invitation letter and a letter of consent form. Eighteen people responded to the study. The first step in the analysis was to visually assess the data for missing cases and outliers. Participants removed for not completing the survey were four.

I calculated the means, standard deviations, and Cronbach's alpha values for the variables of interest. Guidelines established by George and Mallery (2010) were used to determine the internal consistency of the survey subscales. They are as follows: $\alpha \geq 0.9$ is excellent, $\alpha \geq 0.8$ is good, $\alpha \geq 0.7$ is acceptable, $\alpha \geq 0.6$ is questionable, $\alpha \geq 0.5$ is poor, and $\alpha < 0.5$ is unacceptable. Alpha values ranged from 0.13 to 0.86.

Alpha values for Quantity of Work, Quality of Work, Job Knowledge, Interpersonal Relationship, and Potential were less than acceptable and hence reassessed to scale if items removed. The Quantity of Work scale could not improve above 0.13, so there was no need to revise it. Only the third and fifth items remained after revising the variable, Quantity of Work. For Job Knowledge, only the second and third items remained. For Interpersonal Relationship, only the first, third, and fourth items remained. For Potential, only the third and fourth items remained after revising the variable. The revised scales were used to calculate the variables used in the statistical analysis. The

regression model ran successfully after calculating all the variables and entering them in the regression model.

Data Collection

Data collection from participants occurred within a period of 2 weeks. The data collection was conducted using a web-based survey instrument, developed from three preexisting instruments (SNS, EWPS, and EPA instrument), with permission from the copyright holders. Seven days after launching the final survey, the AANA administrative and program assistant sent a reminder to all participants by e-mail. Out of 1500, randomly selected participants 163 responded to the survey. Subsequent to visual examination of data for missing cases and removal of 32 participants for not completing the full survey was assessment of univariate outliers with the creation of z scores. Cases greater than 3.29 standard deviations from the mean were considered outliers (Tabachnick & Fidell, 2012) when data were standardized to a mean of 0.00 and standard deviation of 1. After removing eight cases, the final data analysis involved 123 participants.

Results

Descriptive Statistics

Half of the sample was male (61, 50%) and the other half was female (62, 50%). All participants worked in the United States (123, 100%). Regarding their level of education, those who had master's degree (113, 92%) formed the majority of the participants, followed by those with an undergraduate degree (7, 6%), and those with a PhD (3, 2%) forming the minority of the participants. Regarding the role they played at work, most participants indicated they were team members (82, 67%), followed by

independent (29, 24%), team leaders (10, 8%), and those in administration (2, 2%). Frequencies and percentages are in Table 1.

Table 1

Frequencies and Percentages for Participant Characteristics

Characteristic	*N*	%
Gender		
Male	61	50
Female	62	50
Work in the US		
Yes	123	100
No	0	0
Level of education		
Undergraduate degree	7	6
Master's degree	113	92
Ph. D.	3	2
Role at work		
Administration	2	2
Team leader	10	8
Team member	82	67
Independent	29	24

Note. Percentages may not total 100 due to rounding error.

I assessed reliability for the variables of interest using Cronbach's alpha values followed by computation of alpha values for the SNT usage variables (frequency of used of SNT at work, duration of use of PC-based SNT, duration of use of cellphone based SNT, and performance ratings) and knowledge worker productivity. The SNT usage variable, performance rating had seven subscales (Quantity of Work, Quality of Work, Job Knowledge, Initiative, Interpersonal Relationship, Dependability, and Potential) hence the computation of alpha values for all of them. Guidelines established by George and Mallery (2010) aided in assessing alpha values. Reassessing alpha values below 0.71 led to the removal of items that were negatively influencing the scale. The variables, frequency of use of SNT ($\alpha = 0.84$), duration of use of PC-based SNT ($\alpha = 0.88$), duration of use of cellphone-based SNT ($\alpha = 0.89$), and knowledge worker productivity

(α = 0.89) had acceptable alpha values. The subscales for performance ratings: Quantity of Work (α = 0.69), Quality of Work (α = 0.81), Interpersonal Relationship (α = 0.89), Dependability (α = 0.78), and Potential (α = 0.89) also had acceptable alpha values. However, Job Knowledge (α = 0.33) and Initiative (α = 0.60) had alpha values that were unacceptable and could not be improved beyond 0.70; hence they were removed as they were negatively influencing the scale. Table 2 presents the first and second run of the Cronbach's alpha values. Table 3 presents the items removed to improve the scales.

Table 2

Cronbach's Alpha Values for Scales of Interest

Scale	No. of items	α	Revised no. of items	A
Frequency of Use of SNT	6	0.84	6	0.84
Time spent on PC based SNT	6	0.88	6	0.88
Time spent on cell-phone based SNT	6	0.89	6	0.89
Performance ratings				
Quantity of work	5	0.45	2	0.69
Quality of work	5	0.28	2	0.81
Job knowledge	4	0.24	2	0.33
Initiative	4	0.39	2	0.60
Interpersonal relationship	4	0.51	2	0.89
Dependability	5	0.56	3	0.78
Potential	4	0.58	2	0.68
Knowledge worker productivity	16	0.89	16	0.89

Table 3

Individual Survey Items Removed to Create More Reliable Scales

Scale	Subscale item removed	Statement
Quantity of work	1	Does not consistently turn out a reasonable amount of work.
Quantity of work	2	Does just enough to get by. Almost never comes out with that little bit extra.
Quantity of work	3	Does an average amount of work consistently, but needs to be supervised.
Quality of work	1	Careless work. Work has to be checked. Undependable.
Quality of work	2	More than occasional mistakes. Does not consistently meet standards.
Quality of work	3	Few errors. Work only occasionally has to be corrected. Dependable quality.
Job knowledge	1	Does not know enough about the job to make contribution to the company.
Job knowledge	4	Thorough knowledge of overall job and virtually every detail.
Interpersonal Relationships	1	Sometimes upset others. Not skilled in human relations.
Interpersonal Relationships	2	Offers no cause for criticism. Accepted by coworkers.
Dependability	1	Unreliable. Excessive absence. Cannot be counted on.
Dependability	2	Requires little close supervision. Reliable.
Potential	1	Doubtful will become competent in present job.
Potential	3	Skilled worker now. Should be able to progress further.

I calculated the means and standard deviations on the variables of interest and created scores for frequency of use of SNT, duration of use PC based SNT, duration of use of cellphone-based SNT by summing the corresponding items. Responses ranged from 0 - 24, where higher scores indicate greater time spent on SNT. Calculations of scores for the performance ratings involved averaging the items in the scale. Scale scores ranged from 0 - 4, where higher scores indicate greater endorsement of the corresponding positive behavior. Scores for knowledge worker productivity involved summing responses to the 16 items. Responses ranged from 0 - 64. A high score indicated higher productivity. Means (M) and standard deviations (SD) for the scores are in Table 4.

Table 4

Means (M) and Standard Deviations (SD) for the Variables of Interest

Scale	*M*	*SD*
Frequency of use of SNT	3.49	3.40
Time spent on PC-based SNT	1.18	2.04
Time spent on cell-phone based SNT	2.93	3.04
Performance ratings		
Quantity of work	3.19	0.73
Quality of work	3.08	0.73
Job knowledge	2.74	1.04
Initiative	3.36	0.60
Interpersonal relationship	3.39	0.60
Dependability	3.49	0.48
Potential	3.24	0.73
Knowledge worker productivity	59.10	5.18

Results of the Tests of Hypotheses

Assessment of each hypothesis began with Pearson correlation analyses between the SNT usage variables (frequency of use of SNT, time spent on the use of PC-based SNT, time spent on the use of cellphone-based SNT, and performance rating) and knowledge worker productivity levels. Further analyses involved SNT usage variables, which showed a significant correlation to the knowledge worker productivity levels. There was no further analysis with SNT usage variables that had no significant correlation to knowledge worker productivity levels.

Hypothesis 1: Frequency of use of SNT and knowledge worker productivity levels. The purpose of hypothesis 1 was to determine the extent to which the frequency of use of SNT relates to knowledge worker productivity levels. The Pearson product-moment correlation coefficient between the two variables (frequency of use of SNT and knowledge worker productivity) was $r = 0.05$, $p = .557$, which indicates there was no statistically significant relationship between the variables.

Hypothesis 2: Duration of Use of PC-based SNT and knowledge worker productivity levels. The intent of testing hypothesis 2 was to investigate the extent to which the duration of use of PC-based SNT relates to knowledge worker productivity levels. The correlation coefficient, $r = 0.04$, $p = .665$, was statistically insignificant, which demonstrated the absence of a statistically significant relationship between the duration of use of PC-based SNT and knowledge worker productivity levels.

Hypothesis 3*:* Duration of Use of cellphone-based SNT and knowledge worker productivity levels. The purpose of hypothesis 3 was to examine the extent to which the duration of use of cellphone-based SNT relates to knowledge worker productivity levels. The correlation coefficient, $r = 0.01$, $p = .964$, was statistically insignificant, demonstrating the absence of statistical significant correlation between duration of use of SNT and knowledge worker productivity levels.

Hypothesis 4: Performance rating and knowledge worker productivity levels. The purpose of hypothesis 4 was to investigate the extent to which performance rating relates to knowledge worker productivity levels. The subscales used in measuring performance rating after adjusting the scale included Quantity of Work, Quality of Work, Interpersonal Relationship, Dependability, and Potential. As a result, the investigation between the subscales of performance ratings and knowledge worker productivity levels involved five correlation analyses. Only two correlation coefficients out of the five were statistically significant. The correlation conducted between Quality of Work and knowledge worker productivity was statistically significant, $r\ (121) = .21$, $p = .018$. In addition, the correlation conducted between Potential and knowledge worker productivity was significant, $r\ (121) = .26$, $p = .004$, indicating a statistically significant relationship

between Potential and knowledge worker productivity. The results of the correlations are in Table 5.

Table 5

Pearson Product Moment Correlations between Potential Predictor Variables and Knowledge Worker Productivity

Variable	Knowledge worker productivity levels
Frequency of use of SNT	.05
Time spent on PC-based SNT	.04
Time spent on cell-phone based SNT	.01
Performance ratings	
Quantity of work	.06
Quality of work	.21*
Interpersonal relationship	.18
Dependability	.05
Potential	.26**

Note. $*p < .05$, $**p < .01$.

Following the correlation analysis was a multiple linear regression to assess research questions one through four. The formula for the regression model is as follows:

$$SA.sqrt = \beta_0 + \beta_1 * Quality + \beta_2 * Potential + error. \quad (2)$$

Where, SA.sqrt is the square root transformation of knowledge worker productivity, β_0 is the constant, β_1 is the regression coefficient for Quality of Work, and β_2 represents the regression coefficients for Potential. The null and alternate hypotheses entered into the regression model are as follows:

$H_0$4. A relation does not exist between the performance rating and knowledge worker productivity levels

H_a4. A relationship exists between the performance rating and knowledge worker productivity levels.

The predictor variables in the analysis were Quality of Work and Potential. The outcome variable was knowledge worker productivity. The regression model was

significant, F (2, 120) = 5.31, p=0.006, R^2 = 0.08, and Potential showed a significant relationship with knowledge worker productivity, b = 0.33, p = .048. The assumptions of the multiple linear regression include normality, homoscedasticity, and the absence of multicollinearity.

Normality

Normality examined with a normal p-p plot and was not met (Figure 2).The deviation in normality led to the exercise of data transformation. Tabachnick and Fidell (2012) recommend the transformation of variables with negative skew by a reflected square root (Equation 1). The equation used to transform the knowledge worker productivity levels is as follows:

$$SA.sqrt = -1 * \sqrt{\max(SA) - SA} \qquad (3)$$

The normal p-p plot showed little deviation after reassessing normality (Figure 3).

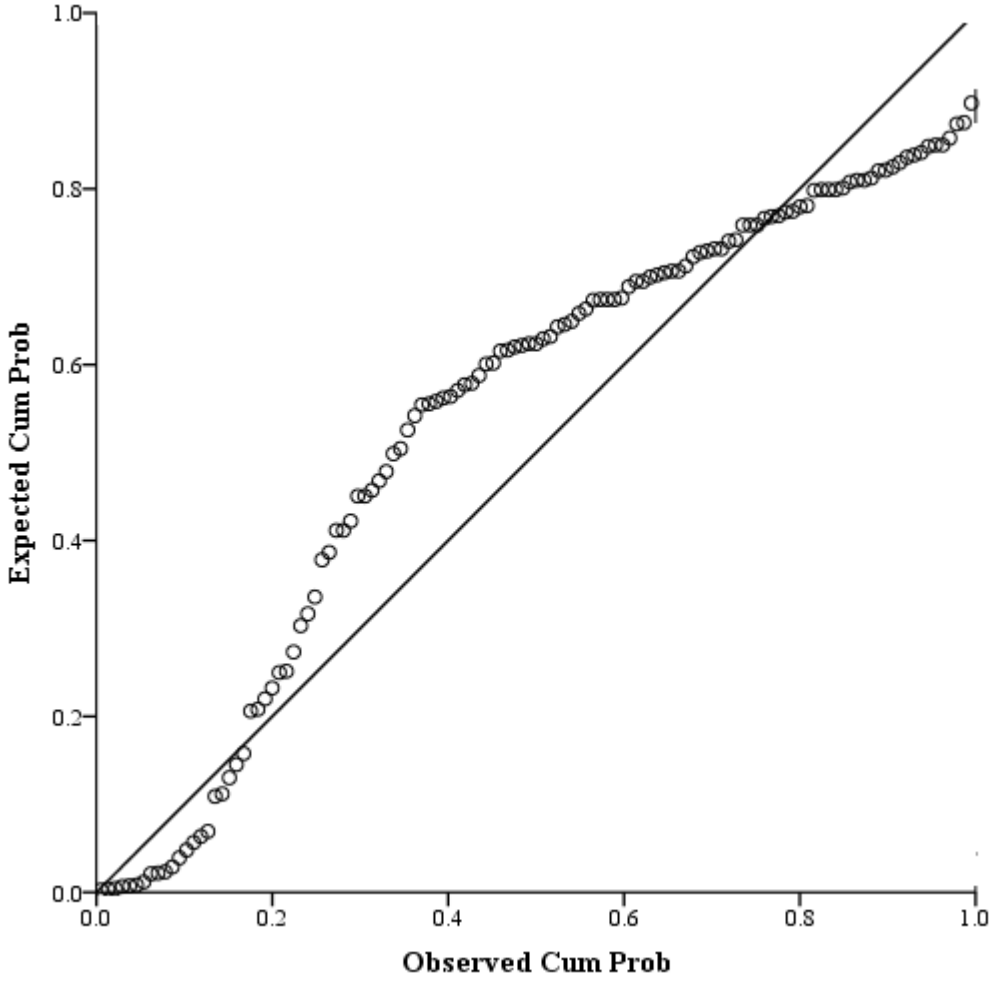

Figure 2. Normal p-p plot of residuals.

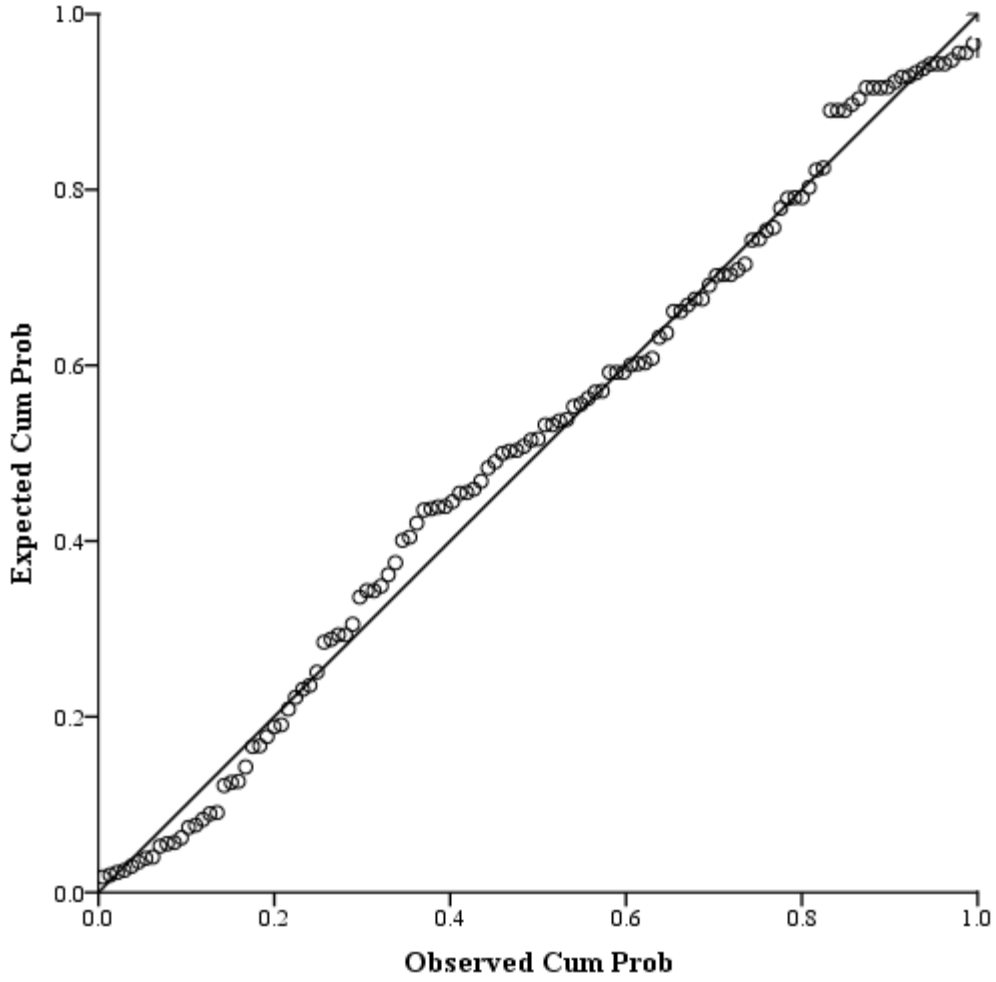

Figure 3. Normal p-p plot of transformed residuals.

I assessed homoscedasticity with a residual scatterplot. The data appeared distributed in a rectangular format about the regression line, indicating the assumption was met (Figure 4). Assessment of the absence of multicollinearity by examining variance inflation factors (VIF values) revealed that none of the values was greater than 2.0, confirming the assumption.

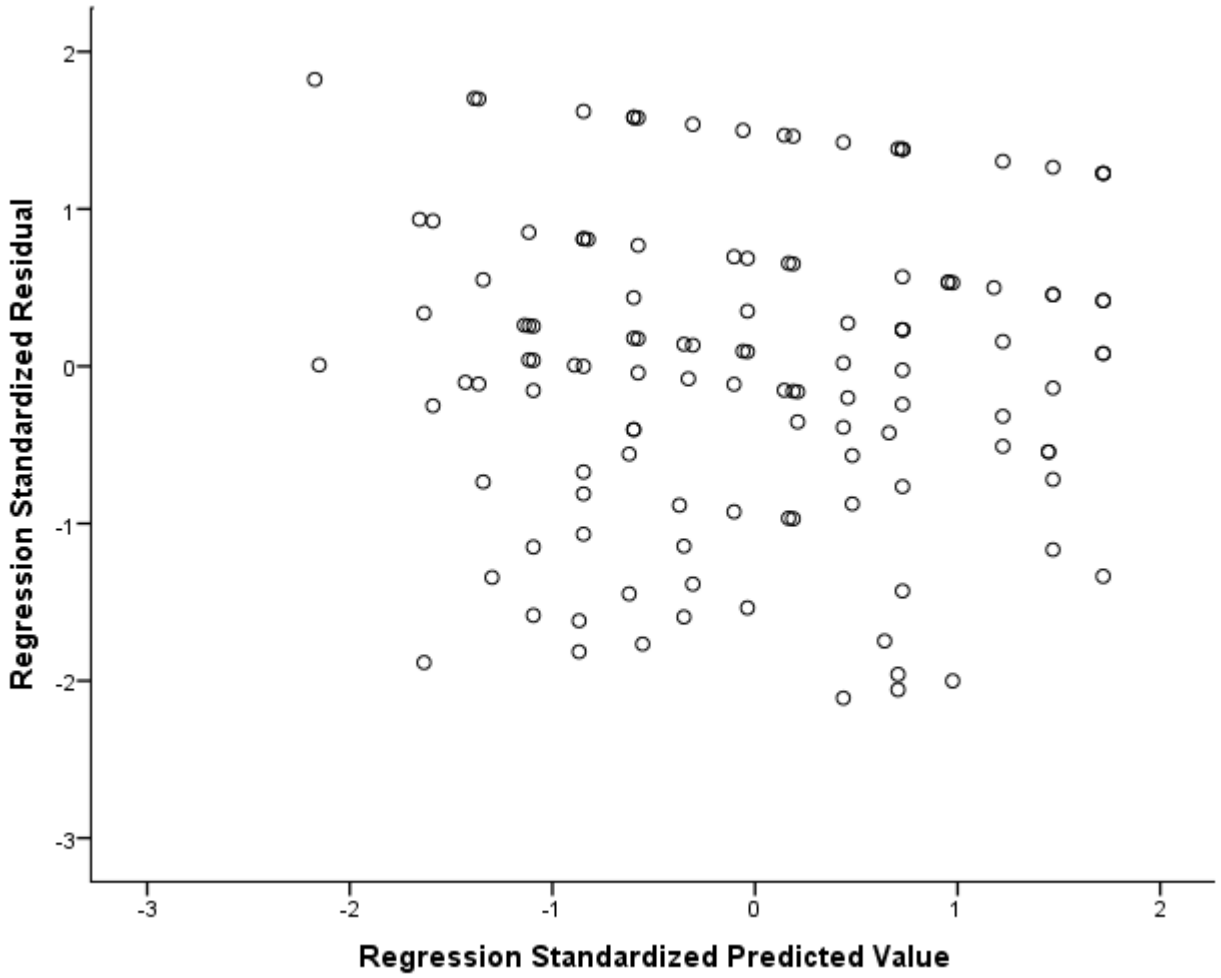

Figure 4. Residuals scatterplot to assess homoscedasticity.

The multiple linear regression that was conducted to determine if Quality of Work and Potential predicted knowledge worker productivity was significant, F (2, 120) = 5.31, p = .006, R^2 = 0.08, indicating the model did predict knowledge worker productivity. Further examination of the individual predictors suggested that Potential was significantly related to knowledge worker productivity, b = 0.33, p = 0.048. For every one-unit increase in Potential, the square root of knowledge worker productivity increased by 0.33 units. As a result, only null hypothesis 4 ($H_0$4), a relation does not exist between performance and knowledge worker productivity levels, could be rejected in

favor of the alternative. Null hypotheses 1 ($H_0$1, r = 0.05), null hypothesis 2 ($H_0$2, r = 0.04), and null hypothesis 3 ($H_0$3, r = 0.01) could not be rejected. Results of the regression are in Table 6.

Table 6

Multiple Linear Regression with Quality of Work and Potential predicting Knowledge Worker Productivity

Variable	*b*	*SE*	β	*t*	*p*
Quality of work	0.25	0.16	0.15	1.51	.133
Potential	0.33	0.16	0.15	2.00	.048

Summary

Evaluating the relationship between the use of SNT and productivity among certified registered nurse anesthetists in the United States was the focus of this study. The study involved conducting Pearson correlation analysis between four variables for the use of SNT (frequency of use of SNT, duration of use of PC-based SNT, duration of use of cellphone-based SNT, and performance rating) and knowledge worker productivity levels.

The sample size used was 123 (50% female and 50% male). The study took a period of two weeks. Participants' educational background ranged from an undergraduate degree to a graduate degree (Ph.D.). Participants also classified themselves as administrators, team leaders, team members, and independent. The four research questions assessed in this study are as follows: (1) to what extent does the frequency of use of SNT relates to knowledge worker productivity levels? (2) To what extent does the duration of use PC-based SNT relates to knowledge worker productivity levels? (3) To what extent does the duration of use of cellphone-based SNT relates to knowledge worker productivity levels? (4) To what extent does performance rating relate to

knowledge worker productivity levels? The four research questions led to the testing of four hypotheses, hypothes1 (H1), hypothesis 2 (H2), hypothesis 3 (H3) and Hypothesis 4 (H4) for research questions 1, 2, 3, and 4 respectively. The intent of testing the first hypothesis (H1) was to determine the extent to which the use of SNT relates to knowledge worker productivity levels. For the second hypothesis (H2) testing, the focus was to determine the extent to which the duration of use of PC-based SNT relates to knowledge worker productivity levels. The third hypothesis testing was to verify the extent to which the duration of use of cellphone-based SNT relates to knowledge worker productivity levels. The purpose of testing the fourth hypothesis (H1) was to determine the extent to which the performance rating related to knowledge worker productivity levels. Correlation analysis revealed no statistical significant correlation between the SNT usage variables of hypotheses 1, 2, and 3, and knowledge worker productivity levels. However, there was a significant correlation between the SNT usage variable of hypothesis 4 and knowledge worker productivity levels. Further regression analysis using all the variables showed that the SNT usage variable in hypothesis 4, performance, predicts knowledge worker (certified registered nurse anesthetist) productivity levels. Hence the rejection of the null hypothesis ($H_0$4) for the research question 4 in favor of the alternate (H_a4). The other three null hypotheses ($H_0$1, $H_0$2, and $H_0$3) for research questions 1, 2, and 3 respectively were accepted.

The findings of chapter 4 are further discussed in chapter 5.The final chapter, chapter 5 contains all the major findings in the study and their interpretation in the context of the literature, limitations of the study, recommendations for further study, implications and conclusion on the study.

Chapter 5: Discussion, Recommendations, and Conclusion

Introduction

In this study, I examined the relationship between the use of SNT and knowledge worker productivity levels in the health care sector, to fill the gap in the literature. The purpose of the study was to measure the relationship among the SNT usage variables (frequency of use SNT, duration of use of PC-based SNT, duration of used of cellphone-based SNT, and performance rating), and knowledge worker (certified registered nurse anesthetists) productivity levels.

I employed a quantitative method of inquiry in gathering data from certified registered nurse anesthetists with the help of a web-based survey designed with tools from SurveyMonkey. Using G*Power 3.1.3, a power of 0.8, and effect size of .15 suggested a sample size of 85 participants. However, the data collection generated 163 responses, 32 of which were incomplete. Univariate outliers were assessed using *z* scores after invalidating the incomplete response. After clearing of the dataset of eight cases (outliers), analysis of data involved the use of SPSS software. The final analysis, involved responses from 123 participants. Half of the sample (50%) was male, and the other half (50%) was female. All the participants indicated that they worked in the United States. The majority of them (92%) held master's degrees, 6% had an undergraduate degree, and 2% held PhD degrees. The majority of them (67%) indicated that they were team members. The rest were independent (24%), team leaders (8%), and administrators (2%).

Interpretation of Findings

Based on the results obtained from testing the hypotheses, three out of the four null hypotheses were accepted. Correlation analysis preceded regression analysis. For the first research question (To what extent does the frequency of use of SNT relates to knowledge worker productivity levels?), correlation analysis conducted between frequency of use of SNT and knowledge worker productivity levels revealed no statistically significant relationship after testing Hypothesis 1 (H1). However, the results also indicated that the frequency of use of SNT (r =.05, p = 0.05) was positively related to knowledge worker productivity levels, implying that even though the linear relation may not have been strong, they both increased or decreased in the same direction. One variable did not increase when the other decreased. Chen, Ross, and Yang (2011) found in their study that the desire to find diversion and entertainment on the Internet predicted the frequency of use of SNT for non-job-related activity while on the job and recommended the setting of work-related goals at work to avoid any distractions by SNT.

For Research Question 2 (To what extent does the duration of use of PC-based SNT relates to knowledge worker productivity levels?), correlation analysis between the duration of use of PC-based SNT and knowledge worker productivity levels showed no statistically significant correlation after testing Hypothesis 2 (H2). However, the duration of use of PC-based SNT (r =0.04, p = 0.665) was found to be positively related to knowledge worker productivity levels. As difficult as it may be to speculate, this observation may be explained by the fact that adoption of the PC in the health care sector was slow, and perhaps still slow as users had little understanding and found the PC intimidating. (Cantrill, 2010; Rogers, 1995).

For Research Question 3 (To what extent does the duration of use of cellphone-based SNT relates to knowledge worker productivity levels?), correlation analysis between duration of use of cellphone-based SNT knowledge worker productivity levels also showed no statistically significant correlation after testing Hypothesis 3 (H3). However, the duration of use of cellphone-based SNT ($r = 0.01$, $p = 0.964$) was found to be positively related to knowledge worker productivity levels.

For Research Question 4 (To what extent does performance rating relate to knowledge worker productivity levels?), two of the subscales that were used for performance rating, showed statistically significant correlation with knowledge worker productivity levels. The two subscales were Quality of work ($r = 0.21$, $p = 0.018$) and Potential ($r = 0.26$, $p = 0.004$). The other subscale (Quantity of work, Interpersonal Relationship, and Dependability) did not show any statistically significant correlation even though they were positively related to knowledge worker productivity levels. A further multiple linear regression analysis with the two subscales (Quality of Work and Potential) and the outcome variable (knowledge worker productivity levels) affirmed a significant relationship, F (2, 120) = 5.31, $p = 0.006$, $R^2 = 0.08$. As a result, Null Hypothesis 4 ($H_0$4) was rejected in favor of the alternative hypothesis (Ha4). The observations made in the analysis also led to the acceptance of all the other three null hypotheses ($H_0$1, $H_0$2, and $H_0$3).

The results indicated that there was no significant relationship between the SNT usage variables, frequency of use of SNT, duration of use of PC-based SNT, duration of use of cell-phone based SNT, and knowledge worker (certified registered nurse anesthetist) productivity levels. It further indicates that three SNT usage variables

(frequency of use of SNT, duration of use of PC-based SNT, and duration of use of cellphone-based SNT) did not predict knowledge worker productivity levels. The results were in contrast with what Nuclear Research (2009) published. The publication by Nuclear Research indicated that out of 77% of office workers with Facebook accounts, 61% of them spent an average of 15 minutes on it daily, resulting in 1.47% loss of productivity. The discrepancy may be due to the magnitude of the correlation coefficient values of the variables even though they all showed a positive correlation. However, the magnitude of the correlation should not create the assumption that observed correlations are representative of the majority of respondents, and generalized to the entire population (Bedeian, 2014; Tavakol & Dennick, 2011).

The results also showed a significant correlation between performance and productivity levels. Performance predicts productivity as evident by regression analysis. Campbell et al. (1993) explained performance as a quantifiable and observable behavior that is scalable in terms of individual proficiency, and it aids in the attainment of organizational goals. Among the indicators of performance is the Quality of Work and Potential of the worker (Lu et al., 2010). Individuals will realize their potential when there is room for growth and development (van Staden & du Toit, 2012). Productivity is a measure of how well an individual or organization is performing with respect to inputs and outputs (Barnett et al., 2014; Campbell et al., 1993). Drucker (1999) stressed the importance of Quality of Work in the productivity of knowledge workers. Drucker submitted that for most knowledge work, quality is paramount when it comes to productivity because it is the essence of the output. It is in this light that Greenslade and

Jimmieson (2007) aimed at developing and validating a new job performance scale to assess the quality of the nurse and to distinguish between contextual and tax performance.

Limitations of the Study

There were some limitations encountered in this study. One limitation was that the research focused only on certified registered nurse anesthetists in the United States who were members of the AANA. Knowledge workers in the health care sector include all health care professionals with formal education who use their mental power and contribute to the intellectual property, such as all doctors, registered nurses, and pharmacists, and other technologists. It does not include those whose work just consists of manual labor.

Respondents self-evaluating their performances and productivity may be another limitation. The question one might ask is whether they were honest with their responses to the questions. Paunonen and O'Neill (2010) submitted that even though some scholars may challenge the construct validity of self-report, psychologists trust it as the basis for measuring typical performance. The writers opined that authentic report on personality and behavior should come from the individual under study. Self-report measures have proven to be statistically reliable (Bedeian, 2014; Claes et al., 2012). Claes et al.'s (2012) study revealed support for the reliability of self-report and proxy ratings. However, it is worth noting that self-report, proxy report, and all other forms of ratings are susceptible to many of the same cognitive and other types of biases (Bedeian 2014).

Recommendations

Many scholars have written about the benefits derived by business and people from using SNT. The intent of this study was to evaluate the diffusion of SNT and its

overuse in the health care sector. The findings indicated no significant relationship between the use of SNT and productivity. However, the study helped in substantiating earlier findings that performance does predict productivity. It, therefore, becomes imperative for the manager in the health care industry to pay more attention to performance of the health care professional in an attempt to boost productivity. Listed below are some recommendations for further studies:

- An investigation of the relationship between the use of SNT and knowledge worker productivity levels in a different industry.
- A research to replication this study, and to substantiate the relationship between the use of SNT and productivity using a different set of population with more balanced gender distribution.
- Investigation to determine the relationship between the use of SNT and productivity levels of certified nurse anesthetists in a particular state or a small geographical region.
- A qualitative design to explain the behavior or nature of the attributes of productivity as knowledge workers use SNT on the job.

Implications

Scholars such as Buchinho and Images (2011), Ellison, Steinfield, and Lampe (2007), Hawn (2009), and many others have written about the advantages associated with the use of SNT. There is also literature on the use of SNT by students and its impact on their performance. However, none of the scholars focused on the relationship between the use of SNT and knowledge worker productivity levels. Prior to this research, there has not been any empirical study to fill the gap.

This study narrows the gap in the literature. The findings from this research have implications for scholars and practitioners. This study not only confirms that performance predicts productivity but also provides a better understanding of the attributes of performance that can predict productivity. The results of this study depict that Quality and Potential are good predictors of productivity; two key attributes classified under contextual performance (Lu et al., 2010; Stumpf, 2010).

The knowledge acquired from this study can help not only health care managers in assessing health care professionals' vis-à-vis their daily productivity levels but also enact policies that will help to enhance productivity in the health care sector. Improving productivity in the health care sector has the potential to bring positive social change in every community of the United States. It also has the potential to maximize profit for health care institutions.

Conclusion

This research focused on evaluating the relationship between the use of SNT and the knowledge worker productivity levels. The targeted population constituted certified registered nurse anesthetists who are also members of the AANA. Computation of sample size revealed 85 participants as the sample needed to reject the null hypothesis. The level of education of the participants ranged between undergraduate degree and graduate degree (Ph.D.). Many of the participants were team members (67%), some were independent (24%), others were team leaders (8%), and a few were administrators (2%).The theoretical framework for this study include the diffusion of innovation theory (Rogers, 1995) and the theory of performance (Campbell et al., 1993).

The empirical evidence showed a positive relationship between three SNT usage variables (frequency of use of SNT, duration of use of SNT, and duration of use of cellphone-based SNT) and productivity levels but the relationship was weak and not statistically significant. The empirical evidence also confirmed that performance predicts knowledge worker productivity levels as explained by Drucker (1999). The attribute of performance that predicted productivity was potential.

Clearly, the results show that Potential, which is an attribute of Performance, can effectively predict productivity of knowledge workers. With the shift from manual labor dependent economy to a knowledge dependent economy, the potential of the knowledge worker to be productive and progress is of paramount importance. This study will aid managers' in creating policies that will help boost productivity among health care professionals.

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Appendix A: Survey Instrument

This questionnaire is designed to measure the relationship between the use of social network technology (SNT) such as Facebook, Twitter, LinkedIn, MySpace, and Productivity in the health care industry.

***1. Please indicate your level of education by choosing one of the following options:**

- Undergraduate degree
- Master's degree
- PhD.

***2. Please indicate the role you play at work:**

- Administration
- Team Leader
- Team Member
- Independent (work alone)

***3. Do you work in the United States of America?**

- Yes
- No

***4. Please indicate your gender**

- Female
- Male

✱This section of the questionnaire contains a list of questions and statements related to the frequency of use of SNT at work. Please respond by choosing one of the following: (a) Never, (b) Once, (c) A few times, (d) Almost the entire day, (e) The entire day.

Section A

On a daily basis:

	Never	Once	A few times	Almost the entire day	The entire day
1. How often do you update your status on SNT?	○	○	○	○	○
2. How often do you communicate with friends on SNT?	○	○	○	○	○
3. How often do you use SNT to communicate with friends at your job?	○	○	○	○	○
4. How often do you use SNT to communicate with family?	○	○	○	○	○
5. How often do you use SNT to communicate with friends who do not work in your institution (work, church, etc.)?	○	○	○	○	○
6. How often do you use SNT to communicate with your supervisors at your job?	○	○	○	○	○

***This section of the questionnaire contains questions and statements related to the time spent on PC-based social network technology (SNT) while at work. Please respond by choosing one of the following: (a) None, (b) A little time, (c) Quite a bit of time, (d) Extreme amount of time, (f) The whole time.**

Section B

On a daily basis:

	None	A little time	Quite a bit of time	Extreme amount of time	The whole time
7. How much time do you use to update your status on PC-based SNT?	○	○	○	○	○
8. How much time do you use to communicate with friends on PC-based SNT?	○	○	○	○	○
9. How much time do you use PC-based SNT to communicate with friends from your job (or institution)?	○	○	○	○	○
10. How much time do you use PC-based SNT to communicate with family?	○	○	○	○	○
11. How much time do you use PC-based SNT to communicate with friends who do not work in your institution (work, church, etc.)?	○	○	○	○	○
12. How much time do you use PC-based SNT to communicate with your supervisors at your job (institution)?	○	○	○	○	○

∗This section of the questionnaire contains questions and statements related to the time spent on Cellphone-based social network technology (SNT) while at work. Please respond by choosing one of the following: (a) None, (b) A little time, (c) Quite a bit of time, (d) Extreme amount of time, (f) The whole time.

Section C

On a daily basis:

	None	A little time	Quite a bit of time	Extreme amount of time	The whole time
13. How much time do you use to update your status on cellphone -based SNT?	○	○	○	○	○
14. How much time do you use to communicate with friends on cellphone - based SNT?	○	○	○	○	○
15. How much time do you use cellphone - based SNT to communicate with friends from your job (or institution)?	○	○	○	○	○
16. How much time do you use cellphone - based SNT to communicate with family?	○	○	○	○	○
17. How much time do you use cellphone - based SNT to communicate with friends who do not work in your institution (work, church, etc.)?	○	○	○	○	○
18. How much time do you use cellphone - based SNT to communicate with your supervisors at your job (institution)?	○	○	○	○	○

***This section of the questionnaire measures productivity. Please respond by choosing one of the following: (a) Never, (b) Rarely, (c) Sometimes, (d) Often, (e) Almost always.**

Section D

19. During the past week, how frequently did you:

	Never	Rarely	Sometimes	Often	Almost always
Take longer lunch hours or coffee breaks?	○	○	○	○	○
Just do no work at times when you would be expected to be working?	○	○	○	○	○
Find yourself daydreaming, worrying or staring into space when you should be working?	○	○	○	○	○
Have to do a job over because you made a mistake or your supervisor told you to do a job over?	○	○	○	○	○
Find you have forgotten to respond to a request?	○	○	○	○	○
Avoid attending meetings?	○	○	○	○	○
Avoid interaction with co-workers, patients, vendors or supervisors?	○	○	○	○	○
Have a co-worker redo something you had completed?	○	○	○	○	○
Find it difficult to concentrate on the task at hand?	○	○	○	○	○
Notice that your productivity for the time spent is lower than expected?	○	○	○	○	○
Notice that your efficiency for the time spent is lower than expected?	○	○	○	○	○
Lose interest or become bored with your work?	○	○	○	○	○
Work more slowly or take longer to complete tasks than expected?	○	○	○	○	○
Have your boss/coworkers reminded you to do things?	○	○	○	○	○
Have trouble organizing work or setting priorities?	○	○	○	○	○
Fail to finish assigned tasks?	○	○	○	○	○

***This section of the questionnaire is for performance appraisal. Please read the questions very carefully and answer them to appraisal yourself in your present job by choosing one of the following: (a) Strongly disagree, (b) Disagree, (c) Neither agree/disagree, (d) Agree, (e) Strongly agree.**
Answer to the best of your ability. Please be fair, honest, and avoid the tendency of awarding a high rating when it is not justified. Remember that your anonymity is fully assured- no other person(s) including your employer is going to have access to your response.

Section E

20. Quantity of Work:

	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Does not consistently turn out a reasonable amount of work.	○	○	○	○	○
Does just enough to get by. Almost never comes out with that little bit extra.	○	○	○	○	○
Does an average amount of work consistently, but needs to be supervised.	○	○	○	○	○
Amount of work is always above average.	○	○	○	○	○
Superior quality. Almost always can be counted on to do more.	○	○	○	○	○

*21. Quality of Work:

	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Careless work. Work has to be checked. Undependable.	○	○	○	○	○
More than occasional mistakes. Does not consistently meet standards.	○	○	○	○	○
Few errors. Work only occasionally has to be corrected. Dependable quality.	○	○	○	○	○
Consistently better quality than most.	○	○	○	○	○
Exceptional workmanship. Appearance, accuracy and general quality rarely matched.	○	○	○	○	○

*22. Job Knowledge:

	Strongly disagree	Disagree	Neither Agree	Strongly agree	agree/disagree
Does not know enough about the job to make contribution to the company.					
Requires only occasional supervision. Definitely satisfactory grasp of the job.					
Knows the job well enough to be left almost completely independent.					
Thorough knowledge of overall job and virtually every detail.					

*23. Initiative:

	Strongly disagree	Disagree	Neither Agree	Strongly agree	agree/disagree
Has to be led. Does not show extra effort unless prodded.					
Better than average. Willing to do more than most.					
Conscientious, diligent, self-starter, and does not wait for assignments.					
Can almost always be counted on to do that little bit extra, and to work overtime.					

*24. Interpersonal relationship:

	Strongly disagree	Disagree	Neither Agree	Strongly agree	agree/disagree
Sometimes upset others. Not skilled in human relations.					
Offers no cause for criticism. Accepted by coworkers.					
A positive factor in morale. Liked and respected.					
Gets along well at all levels, co-workers, lower level employees, and supervisors.					

*25. Dependability:

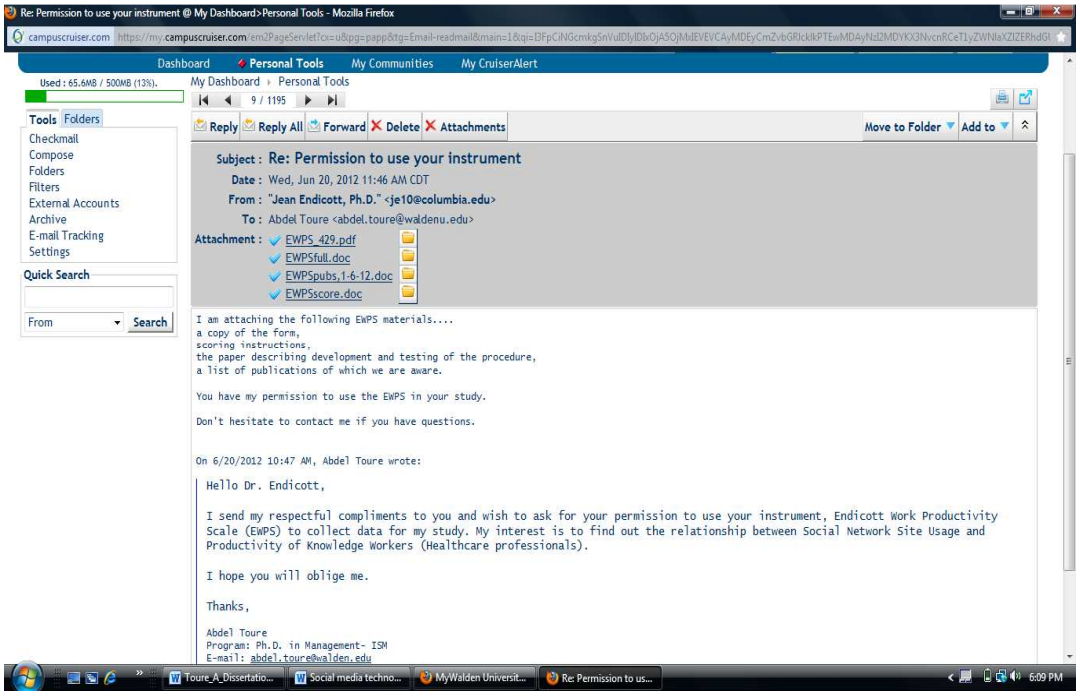
	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Unreliable. Excessive absence. Cannot be counted on.					
Requires little close supervision. Reliable.					
Attentive					

Just about always on the job working conscientiously.					
Industriousness of a high order. Always working hard. Completely dependable					

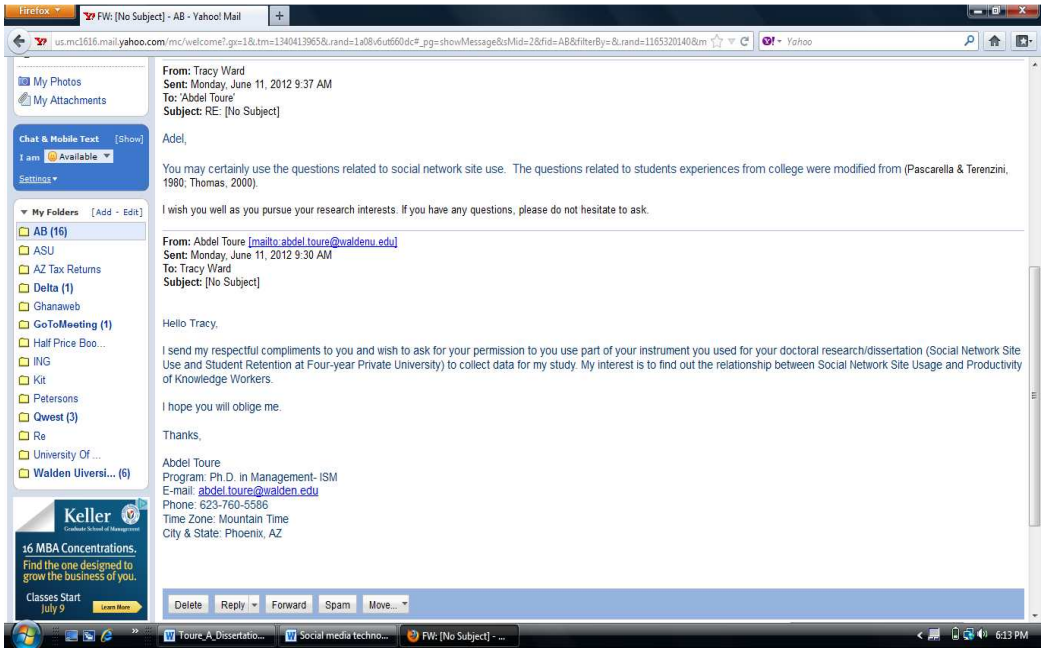
***26. Potential**

	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Doubtful will become competent in present job.					
Knows the present job, but not a likely candidate for going beyond it.					
Skilled worker now. Should be able to progress further.					
An employee who will surely go beyond present assignment. A person on the way up.					

Appendix B: Permission to Use the EWPS



Appendix C: Permission to use SNS instrument



FW: [No Subject] - AB - Yahoo! Mail

From: Tracy Ward
Sent: Monday, June 11, 2012 9:37 AM
To: 'Abdel Toure'
Subject: RE: [No Subject]

Adel,

You may certainly use the questions related to social network site use. The questions related to students experiences from college were modified from (Pascarella & Terenzini, 1980; Thomas, 2000).

I wish you well as you pursue your research interests. If you have any questions, please do not hesitate to ask.

From: Abdel Toure [mailto:abdel.toure@waldenu.edu]
Sent: Monday, June 11, 2012 9:30 AM
To: Tracy Ward
Subject: [No Subject]

Hello Tracy,

I send my respectful compliments to you and wish to ask for your permission to you use part of your instrument you used for your doctoral research/dissertation (Social Network Site Use and Student Retention at Four-year Private University) to collect data for my study. My interest is to find out the relationship between Social Network Site Usage and Productivity of Knowledge Workers.

I hope you will oblige me.

Thanks,

Abdel Toure
Program: Ph.D. in Management- ISM
E-mail: abdel.toure@walden.edu
Phone: 623-760-5586
Time Zone: Mountain Time
City & State: Phoenix, AZ

Appendix D: Consent Form

You are invited to take part in a research study of evaluating the diffusion of social network technology (SNT) and its overuse in the health care sector. The researcher is inviting registered nurses currently practicing in the United States to be in the study. This form is part of a process called “informed consent” to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Abdel Toure, who is a doctoral student at Walden University.

Background Information:
The purpose of this study is to examine the relationship between the usage of social network technology and productivity in the health sector.

Procedures:
If you agree to be in this study, you will be asked to:

- Participate by responding to a web-based self-administered survey questionnaire
- The questionnaire will take about 15 to 20 minutes of your time.____

Here are some sample questions:

1. How often do you update your status on SNT?

2. How much time do you use PC-based SNT to communicate with your supervisors at your job

   (institution)?

3. During the past week how frequently did you find it difficult to concentrate on the task at hand?

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at your job or Walden University will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

Risks and Benefits of Being in the Study:
Being in this study would not pose risk to your safety or wellbeing.

This potential benefit of this study will be to help health managers to implement policies that will help to boost productivity.

Privacy:

The researcher will be the sole person with access to the data provided and for maintaining confidentiality of the data. The researcher will not use your personal information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via abdel.toure@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott at 612-312-1210. She is the Walden University representative who can discuss this with you. Walden University's approval number for this study is 07-24-13-0154286 and it expires on July 23, 2014.

Please print or save this consent form for your records

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. I also understand that I am agreeing to the terms described above.

Curriculum Vitae

ABDEL R. TOURE

EDUCATION

Walden University, Minneapolis, Minnesota
Ph.D. in Information Systems Management **2014**
Dissertation: "*Evaluating the Diffusion of Social Network Technology and its Overuse among Knowledge Workers in the Health Industry*"

Kean University, Union, New Jersey
M.S. in Information Systems Management **2003**

University of Cape Coast, Cape Coast
B.Sc. Honors in Biology
Diploma in Education **1998**
Area of Concentration: Botany, Zoology
Minor: Chemistry
Dissertation: "*Production of Country Wine from Banana"*

TEACHING EXPERIENCE

Estrella Mountain Community College, Avondale, Arizona
Instructor – Computer Information Systems **2011 - Present**
Develop syllabus, provide face-to-face and online instructions including weekly labs, and administer all grades.

Maya High School, Glendale, AZ
Instructor - Science **2005 - 2011**
Developed syllabus and overall course structure, including weekly lab practicum, administered all grades, and mentored students

OTHER EXPERIENCE

Project Management Institute, Phoenix Chapter, North America
Volunteer as a webmaster **2014**

Judicial Service of Ghana, Accra, Ghana
High Court Registrar **1998 – 2000**

MEMBERSHIPS

Project Management Institute
Association of Information Systems