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Factors Impacting The Integration Of Technology In Education And In Business And Industry

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Biographical Sketch

Daisha V. Gaines was born June 22, 1984, in Randolph County, North Carolina. She received a Bachelor of Science degree in Business Management from the University of North Carolina at Pembroke in 2006. She is a candidate for the Masters in Instructional Technology.

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Abstract

The objective of the present study is to compare the challenges that teachers face in education to the challenges employees face in business and industry. It is essential to understand the limitations that teachers and employees face on a daily basis when implementing technology in their work environments especially since technology often results in rapid changes in all work environments.

This study is a qualitative study of five teachers in education and five IT employees in the business and industry sector. Male and female participants were selected based on a list of characteristics such as being between the ages of 25-40, working full-time, with at least a bachelor's degree, and with more than five years of experience. The teachers' and employees' views and thoughts about implementing technology in their work environments were collected using interviews and questionnaires.

CHAPTER 1

Introduction

In the past decade, we have all seen new technology emerge whether we are employees of corporations or teachers in education. We have also witnessed resistance to change and seen many employees and teachers forced to adapt new technologies in the workplace to increase efficiencies and produce favorable results. In order for any new strategy, program, direction, initiative, or idea to be successfully implemented, some form of change is necessary (McKenna, 2004). This study examined the differences between the challenges faced in business and industry to the barriers faced in education when implementing technology.

In the business and industry sector, the time spent and the type of technology training is greatly dependent upon the employee. Determining how much training is required for the implementation of new technology depends on the level of the employee and how intuitive or complex the application is ("Implementing Technology," 2002). Employees are continuously hired at different levels and their responsibilities vary. For instance, companies often require extensive technology training for managers compared to hourly help ("Implementing Technology," 2002). There is not one solution when it comes to the type of training companies provide their employees when learning new technology. Some companies offer computer-based training, others offer face-to-face classroom instruction, others provide on-the-job training, and others utilize a blended approach, offering computer-based training in conjunction with classroom instruction and on-the-job training. IBM has embraced the blended learning approach and has incorporated strategies for diverse learning styles, including a web-based On-Demand Model with just-in-time learning embedded in the workflow as well as face-to-face classroom session (Koller, V., Harvey, S., Magnotta, M., n.d.).

When it comes to education, the type of training provided to teachers often differs. Some teachers have experienced a blended learning approach when learning new technology. Koller et al. (n.d.) explains this approach has been used with teachers in K-12, post-secondary, and adult education. However, there is also evidence that many teachers do not receive any training at all prior to implementing new technology. Statham and Torell (1999) indicate that 90 percent of teachers reported that they were self-taught and did not receive any formal training before implementing technology in their classrooms (as cited in Ringstaff and Kelley, 2002). In other situations, teachers relied on their peers to teach them how to use new technology tools. Moursund and Bieledfelds (1996) reported that teachers are typically not provided with adequate training and depend largely on the guidance provided by a master teacher to learn how to integrate technology into their instruction (as cited in Ringstaff and Kelley, 2002).

Statement of Problem

With growing pressure to implement new technology in classrooms and in business, it is important to understand the limitations these individuals face. Business and Industry employees and teachers face many constraints when implementing technology. The purpose of this study was to understand and compare the constraints that are faced in business and industry and in education when implementing technology. This study also outlined the motivational factors that assist employees and teachers with deciding to introduce new technology in their work environment.

Purpose for Study

It is important to understand how the constraints that are faced in business and industry and in education compare when incorporating technology. Previous research indicated that teachers and employees must receive adequate training and resources in order for them to gain

confidence and acknowledge the importance of implementing technology in their work environments. Egbert, Paulus, and Nakamichi (2002) determined that when teachers receive adequate training and resources, their usage of technology, confidence, and attitudes toward technology improves. Oftentimes, the full potential of a system is not entirely recognized because employees may not buy into the new technology, or they were not provided with adequate training, and support ("Implementing Technology," 2002). In addition, various levels of employees require different levels of training when incorporating new technology ("Implementing Technology," 2002). Understanding the constraints and motivational factors for implementing new technology and alleviating these barriers would assist in moving companies and education forward.

Research Questions

Do business and industry employees and teachers experience different challenges when implementing technology? What barriers do teachers identify with regard to the implementation of technology? What barriers do individuals in business identify with regard to the implementation of technology? What factors inhibit technology implementation? What factors contribute to technology implementation?

Summary

As new technology continues to be introduced in our work environments, it is important that we understand the limitations that teachers and employees face in education and in business and industry. This study compared the challenges teachers face with the challenges employees face in the business and industry sector. In addition, this study also determined the motivational factors teachers and employees need in order to successfully implement technology in their work environments.

CHAPTER 2

Literature Review

New technology is continuously being introduced in many of our work environments whether we are employees in education or employees in the business sector. Oftentimes, these individuals are resistant to change and are forced to implement new technology in their work environments while being held accountable for producing favorable results. According to McKenna (2004), in order for any new strategy, program, direction, initiative, or idea to be successfully implemented, some form of change is essential. A review of literature was conducted to find the constraints that are faced in business and industry compared to the constraints faced in education as well as motivational factors for implementing new technology.

Business and Industry Challenges

Technology can have an enormous impact on any business and as technology evolves, companies have to be able to contend with these new tools in order to attain success or even survive. As new technologies are introduced, the company's employees must be properly trained, prepared for implementation, and provided with adequate feedback. Also, employees should be informed in advance concerning any technology changes as well as any changes that may occur in their jobs. By providing employees with adequate time to mentally prepare for a change, it will be easier for them to understand the implications that could occur from the integration of technology and how it may impact their role. One issue that arises is that employees may not be informed about why the company is adopting a new tool. This could lead to confusion and doubt and could have a negative impact on job performance. In addition, leaders of the company need to understand the changes that will need to occur and the level of support their employees will need to ensure a smooth transition. Leaders also need to realize

how technology will affect their business environment while understanding the benefits of implementing new technology as well as knowing that when making any transition, planning and preparation is essential.

Companies experience many benefits when the decision is made to implement new technologies in their business such as maximized efficiencies, additional added value, and increased productivity. However, oftentimes the full potential of a system is not entirely recognized because employees may not buy into the new technology, or they were not provided with adequate training, and support ("Implementing Technology," 2002). Therefore, it is critical that companies not only purchase the right type of system, but it is equally important that all employees receive enough training to feel secure when operating the new system. It is important that the training offered to employees continues after the individual leaves the training environment. This level of support is critical for ensuring an employee embraces the new tool and does not revert back to old habits and techniques. Various levels of employees require different levels of training when incorporating new technology ("Implementing Technology," 2002). However, more and more companies are now attempting to limit the amount of time it takes to train their employees in the classroom and on-the-job due to a declining economy. "Implementing Technology" (2002) explains when companies are faced with an economic downturn and begin looking to cut overhead costs, training is one of the first budget cuts made. Although, when a company is looking to maximize a return on investments for implementing new technology; training should not be reduced in terms of cost or time. For example, a study conducted by ASTD explained that firms investing $1,500 per employee in training compared to companies that spend $125 experience on average 24 percent higher gross profit margin and 218 percent higher income per employee (Koller et al., n.d.). What is even more compelling is that

41 percent of employees who indicate their company offered poor or no training plan to leave that company within one year (Koller et al., n.d.). The bottom line is that if a company does not invest in adequate initial and ongoing training for their employees, they will not reap the benefits of implementing a new system.

Another barrier that employees face when a company decides to incorporate new technology is lack of trust. Tra (2011) acknowledges that a lack of trust in new systems and a lack of trust in leadership are two of the leading barriers preventing new technology from moving an entity forward. In order for any new system to function properly, there has to be a level of support from the employees who are tasked with managing the system. However, a lack of trust and a lack of leadership are not the only obstacles.

In addition, Tra (2011) also cited employees as another main obstacle for implementing new technology and driving change. Technology is an essential driver of change, although, it cannot solve all the challenges a business faces alone. In most cases, technology execution can be prevented when employees become reluctant to adapt the new technology or process. Therefore, businesses need to develop and execute a sound change management program that identifies and aligns employees and business leaders to ensure everyone in the company is informed about the direction and new tools the company is implementing (Tra, 2011).

Understanding that all employees and leaders need to be informed about changes taking place within a company leads to another constraint employee's face when new technologies are introduced, communication. The most significant challenge when developing a change management plan is communication (Tra, 2011). A clear vision and structure is critical when informing staff about new technology plans. Keeping all employees informed in the new process will guide them toward the change process and eliminate the anxiety and distress that is caused

by the unknown. Any gaps in communication will inevitably lead to problems. McKenna (2011) points out, bad news, rumors, and pessimistic thinking from employees will fill the gaps in communication. With limited information being provided to employees, they are left to form their own conclusions as to why technology changes occurred which causes the employees to become suspicious. These beliefs may be false, however, and without open dialogue; the employee is left to make his or her own assumptions.

Knowing that any new strategy or technology program requires a change in behavior led this researcher to investigate ways employees become motivated to embrace these challenges. McKenna (2004) points out employees will not change unless they feel a strong enough obligation to react. This obligation has to be vigorous enough to overcome their fear of change. Otherwise, the employee's obstinacy will arise and he/she will attempt to find comfort in the familiar and successful way of the past, which is why the first stage of change often results in no change at all (McKenna, 2004). It is through this past experience that many staff members have already created their own personal beliefs, views, and values. These beliefs can create an issue when there is pressure to move in a new direction and the employees would rather revert back to what is familiar and known rather than venture into unknown territories.

In order to move these employees toward change, the employees' perception of new technology and the company has to be altered by investing time, training, and resources to change their beliefs. Fear is another motivational factor for moving employees forward with change because it reflects the deep-seated human need for safety and security (McKenna, 2004). This fear could stem from the employee believing if new technology is not implemented then the employee's position would be in jeopardy, layoffs, cuts in bonuses, or other negative occurrences could result from not embracing a new system ("Failure to Communicate," n.d.). Abraham

Maslow highlighted in his hierarchy of needs, when fears arise that threaten our safety, we feel obligated to act (McKenna, 2004). Because of this fear of failure and showing these employees their livelihoods could be affected, many employees will change their beliefs and improve their outlook to accommodate the new technology.

Fulfillment is another motivational factor in which employees have a need for achievement and accomplishment. Employees that view technology as a way to help them achieve their goals often embrace technology challenges. Additionally, employees who believe they may have a better chance at a promotion will also accept new technology and will assist in moving the business forward.

Teacher Challenges

In today's classrooms, computer-based technology is a critical component of any modern curriculum (Ringstaff and Kelley, 2002). As such, we are seeing an increase in legislative and consumer pressures where teachers are beginning to feel the demands for incorporating flexible technology into curriculum materials (Wahl and Duffield, 2005). Studies have shown that some of those demands are emerging from the skills students need to thrive in the 21st century such as being able to effectively use technology. The advancement of these skills includes accountability, collaboration, communication, creativity, critical thinking, ethics, global awareness, innovation, leadership, problem solving, productivity, and self-direction (Nagel, 2010). There are also financial benefits to incorporating technology in the classroom. Properly implementing technology can be revenue positive at all levels including federal, state, and local ("Technology for Learning," 2010). However, given such pressure, teachers are at times reluctant to change. Pearson and Somekh (2006) acknowledge there is a growing concern that teachers are not utilizing these technologies (as cited in Honan, 2010). Ertmer (1999) describes

two obstacles to technology integration, those barriers that are intrinsic to the teacher including perception of technology and extrinsic barriers such as lack of access to training, software, support, and time (as cited in Chen, Looi, and Chen, 2009).

According to Sivin-Kachala and Bialo (2000), even in the late 90s, technology spending tripled in K-12 schools in the United States; estimates suggest that capital in excess of $6 billion was spent from 1999-2000 (as cited in Rindstaff and Kelley, 2002). Although there has been a significant increase in the amount of money spent for technology in United States schools, if the teachers are unwilling to implement these resources, then all the spending is valueless. Perhaps by looking at the reasons why some teachers decide not to utilize the technology resources they are provided with will allow us to understand what changes need to be made in order for the technology to be effective. According to Ringstaff and Kelley (2002), some of the causes may be that integrating technology is difficult and time-consuming; only those teachers who believe that technology will significantly benefit their students will decide to take on these challenges. Teachers must also feel confident that they can successfully implement these new resources into their instruction. Research in teacher technology usage shows that teachers gain confidence and their attitudes toward technology improves when they are provided with adequate training and resources (Egbert, Paulus, and Nakamichi, 2002). Furthermore, in order for technology to become an integral part of a teacher's instruction, they must see the benefits of using the tools. If teachers do not perceive that there is sufficient evidence that technology enhances their teaching, many teachers may not change their practice to include the new technology (Egbert et al., 2002). Additionally, if the teacher's perception of technology does not change and he or she chooses to begin implementing it in the classroom, the students can often become distracted and uninterested (Baloian, Pino, and Hoppe, 2008).

Not only is the teacher's perception of technology important to successfully implementing technology in the classroom, but ensuring those teachers are adequately trained is another factor affecting the effectiveness. Chen et al. (2009) explained that technology training must align with the teacher's knowledge, goals, and beliefs. Historically, when curriculum changes were made, the curriculum was only successful when the teachers driving this transformation were fully educated. Studies conducted by Ringstaff and Kelley (2002) concluded teachers who receive formal training about how to use the technology tools in their classroom use it more frequently which often leads to improvements in student achievement. After these studies surfaced, researchers and educators started acknowledging that insufficient teacher training is a significant barrier to successful technology integration (Ringstaff and Kelly, 2002). Now they agree, in order for technology to support student learning, the teachers responsible for implementing these resources must be fully trained. Wahl and Duffield (2005) support this idea and suggest that not only does the teacher need to buy into the training programs, but administrators and technology committees must invest in teacher training in order to extract the full value from these resources. It is also important that school administrators offer training that is convenient and accessible for teachers to attend. The National Staff Development Council (2004) recommends professional development for teachers and explains that for development to be successful, it should be ongoing at the school site (as cited in Cobb, 2010). For instance, schools could offer one-hour training sessions after-school where the teachers can explore; plan how to integrate the technology; share ideas with other teachers; and have an opportunity to locate mentors within their districts who have expertise using technology to customize curriculum (Wahl and Duffield, 2005). Training that is offered at the teacher's school and only requiring an hour of his or her time can ensure more participation and in turn will mean

that more teachers are taking these technology tools back to their classrooms. Ringstaff and Kelley (2002) agree that when teachers are learning to integrate technology into their classrooms, the most important components of the training include opportunities to explore, reflect, collaborate with peers, work on authentic learning tasks, and engage in hands-on, active learning. In addition, a recent survey conducted by the CMSD Office of Research and Assessment (2007) agrees that teachers who formerly expressed discomfort using technology had a much greater comfort level with using the software after having an opportunity to collaborate with others; engage in professional development activities; and have time to use the technology tools effectively (as cited in Cobb, 2010).

In addition to ensuring teachers receive adequate training; they should have sufficient access to technology in order for them to successfully integrate technology in their classrooms. Ringstaff and Kelley's (2002) study found that it is not uncommon for many schools to still be using computers that are over a decade old and are now obsolete by today's technology standards. In order for teachers to use the technology they learned, they must have machines that are prepared to handle new technology. This means having access to computers in their classrooms that can connect to the Internet by a high-speed, direct connection (Ringstaff and Kelley, 2002). Perhaps the lack of computers and connectivity to the Internet is a major reason teachers decide not to implement technology in their classrooms even after they have been successfully trained. For example, Grau (1996) found that following a semester-long technology training course, only 22 percent of teachers rated their computer skills as above average (as cited in Egbert et al., 2002). What was even more disturbing was that Grau's (1996) study found that 25 percent of participants surveyed said that they did not embrace computers at all during their first year of teaching (as cited in Egbert et al., 2002). This study shows that even

new teachers who are knowledgeable and accustomed to using technology also choose not to utilize these resources in their classrooms.

Offering teachers initial technology training and access to appropriate equipment is critical; however, it is equally important to offer them ongoing training and support. Wahl and Duffield (2005) recommended that schools should spend 30 percent of their budget on equipment and 70 percent on the supporting ongoing training and technical assistance for teachers. If teachers are given the necessary support they require, they will be more willing to come to future training sessions to expand their knowledge and the application of using other technology resources in the classroom. In order to encourage teachers who are engaged in learning through technology, support must be maintained to offer just-in-time and contextual support to bridge the gap between professional development and implementation in the classroom setting ("Strategies for Successful Development," n.d.). By providing ongoing support, teachers are less likely to get discouraged with the new technology and decide not to use it. Also, to ensure successful technology implementation, it is important that teachers have a supportive school environment. This includes encouragement from the principal, head of department, technology staff, school council, parents, and fellow teachers (Barnes, 2005). When a teacher feels he or she has the support of the school, the teacher is more likely to try implementing new technologies without fear of failure. Also, having the support of peers can boost the confidence of teachers and assist them with trying new ideas. Moursund and Bielefeldt (1999) reported that new teachers often do not have the opportunity to regularly use technology and typically are not provided with guidance by an experienced teacher about how to integrate technology into their instruction (as cited in Ringstaff and Kelley, 2002).

Although teacher training was the most significant factor influencing the effectiveness of implementing technology, the timeliness of this training was another key factor in its success (Ringstaff and Kelley, 2002). Oftentimes, many teachers leave professional development workshops feeling frustrated and overwhelmed due to the amount of material that is covered in a condensed time frame. Filer (2010) explains that the availability of instructional technology alone does not guarantee improved comprehension, but challenges teachers to make the best use of technology. In order to use technology effectively, the training sessions need to be focused and also allow ample time for teachers to practice using the new tools. Without dedicated practice time, the new technology will not be used in a school or district ("Strategies for Successful Development," n.d.). Providing teachers with adequate training does not only mean giving them access to training sessions, it also includes providing workshops during the school year when they can integrate what they have learned in their classroom. For example, there has been much debate about providing training during summer vacations, because teachers are away from the context of their classrooms and will not be able to incorporate what they have been taught until the next school year (Hsiung, 2002). Also, critics of training during summer vacations seem to reject the idea of offering teacher professional development away from the teaching environment, but encourage sessions being taught by teaching colleagues or other mentors within a school system (Hsiung, 2002). Research has found that professional development is most effective when offered on site, especially when partnered with practice or inquiry, which was found to be beneficial at changing teachers' attitudes and self-reports of technology proficiency ("Strategies for Successful Development," n.d.).

Summary

This review of literature concludes that it is critical for employees of business and industry environments and teachers in education to receive adequate training and resources in order for them to gain confidence and acknowledge the importance of implementing technology in their work environments. Both teachers and employees are under pressure to incorporate new technology due to the benefits these tools provide. However, there are many barriers both face that prevent them from being able to integrate these tools. It is important to understand why both sides may be reluctant to change. They both need to understand the benefits the new tools will provide them. Also, they need to receive training that is aligned with their goals, knowledge and understanding. Additionally, they need to feel confident in their ability to apply the new technology in their jobs by allowing them adequate practice time during training. They also require on-going support and training as well as a supportive work environment.

In addition to the constraints that both teachers and employees face, teachers also encounter issues with the accessible and convenience of training workshops. For example, teachers benefit from training sessions that are ongoing and offered on-site at their school. They also face challenges when training sessions do not promote active learning. Instead, teachers retain more information when their training sessions include active learning and being able to collaborate with their peers. Another barrier teacher's face is not having access to the new tools they learned in a training session once they return to their classrooms. It is important that teachers have the tools and equipment available to them once they leave the training environment.

Business and industry employees also encounter their share of challenges such as a lack of trust in new technology and in their company's leadership. This is why a change management

plan is essential in order to align the business leaders with the employees and to inform them of the direction the company is heading. Communication is another constraint business and industry employee's face. A clear vision and structure is important when new technology is implemented and without it, the employees are left to make their own assumptions of why the company is choosing to adapt new technology.

According to the literature, teachers and employees face similar challenges in their workplace when integrating new technology. Although, there are also barriers that teachers encounter in their classrooms that employees do not face in business and industry and vice versa. However, both employees and teachers perceptions of technology can change if they receive the support and training necessary to ensure success.

CHAPTER 3

Research Design

In order to determine the challenges teachers faced compared to the constraints employees in business and industry faced when implementing technology, a qualitative study was conducted. During this study, five teachers and five employees in the business and industry sector were interviewed in order to gain an understanding from their respective point of view. The interviews were based on a questionnaire which asked open-ended and probing questions (See Appendix). Threats and limitations were also considered to ensure they did not hinder the study.

Research Questions

Do business and industry employees and teachers experience different challenges when implementing technology? What barriers do teachers identify with regard to the implementation of technology? What barriers do individuals in business identify with regard to the implementation of technology? What factors inhibit technology implementation? What factors contribute to technology implementation?

Research Design

A Qualitative study was used to collect information from both teachers and IT employees in business and industry. Each participant was interviewed and asked open-ended and follow-up questions based on the literature review and the answers received during the interview. This study gave each participant the opportunity to elaborate and explain their feelings and the challenges they face when new technology is integrated in their work environment. This study provides a clearer understanding about the situations encountered by the individuals interviewed (Fraenkel and Wallen, 2009).

Population and Sample

The desired population for education is all K-12 teachers in North Carolina, but this is not possible so the accessible population was teachers in a school district in central North Carolina. The desired population for business and industry was all employees working for several corporations in North Carolina, but this was not possible, so the accessible population was IT professionals employed with a Fortune 500 company in central North Carolina. Purposeful sampling was used to select five teachers from a central North Carolina school district and five IT professionals from a Fortune 500 company in central North Carolina. The purposeful sample was used to select teachers and employees that are between the ages of 25-40, both male and female, working full-time, with at least a bachelor's degree, and with more than five years of experience in their field.

Instrumentation

Teachers and employees were interviewed and asked open-ended and follow-up questions and qualitative data was collected concerning technology innovation, implementation, and integration.

Procedures and Data Collection

Each of the five teachers and the five business professionals were selected based on their age, years of experience, education level, and job status. All teachers and business professionals volunteered to participate in the study after the researcher explained the purpose of the study. The researcher purposefully selected specific individuals to ensure the sample consisted of parrticipants that could answer the research questions. The teacher participants were from a school district in central North Carolina. The business professionals were from a Fortune 500 company in central North Carolina in the Information Technology department.

Face-to-face interviews were conducted with each participant to collect qualitative data concerning technology implementation and integration. The interview was based on the list of research questions that were asked to both groups. To begin the interviews, a few key questions were asked from both the teachers and business employees. Both groups were asked to describe their experiences with acquiring new technology proficiencies, the challenges they faced, and the level of support they received once they returned from training. The interviews were semi-structured which allowed each participant to elaborate on his or her answers. In addition, the interviews were not audio taped; however, field notes were taken during each session. After each interview, the information was organized and then analyzed.

The information from this study was presented as a description of the constraints teachers and employees in business and industry experienced when introducing technology in their work environments. This study was also an inductive study because it strived to discover trends and patterns when technology is implemented in the classroom or in the business environment.

Qualitative data was collected during the interview using a questionnaire with open-ended questions regarding 1) how often the teacher/employee uses technology; 2) the years of experience; 3) how many technology courses he/she has completed; 4) if he/she has a graduate degree; 5) his/her origin and gender; 6) concerns regarding implementation and integration of technology; 7) and changes he/she has made when implementing these tools.

Data Analysis

Data analysis was done through determining major trends and common characteristics of teachers and employees through interviews and questionnaires by looking at patterns within the answers. The interviews in particular provided insight into the employees' and teachers' perspectives about the challenges they face when implementing technology.

Data collected during the interviews was analyzed by looking for patterns within the business workers' group and within the teachers' group. After problems within each group were determined, the problems experienced by each group were compared to determine whether they experience common or different sets of problems with technology use in their workplaces.

Threats to the Study and Limitations of the Study

One of the main threats identified was researcher bias. One of the reasons that we do so as researchers is to help us step back from the study. Participants that were selected included both male and female, between the ages of 25-40, that worked full-time, with at least a bachelor's degree, and with more than five years of experience. Another threat was subject bias due to subjects often giving researchers answers they think the researcher wants. This bias was mitigated during the interview by asking probing questions to ensure the participants knew that their own opinions were important and not what they may have perceived the researcher wanted to hear. Instrumentation was another threat identified. This threat was excluded by ensuring the participants did not receive the same probing questions as other participants since different people may interpret the questions differently and their earlier responses may differ.

Generalizability is a limitation to this study because of the small sample size that was limited to two organizations since the data most accurately reflected those environments, not necessarily all environments. Another limitation was that the employees sampled were from the same company and the teachers were from the same school district.

Summary

To determine the constraints that teachers faced in education compared to the challenges employees faced in business and industry, a qualitative study was used in other to collect information from both groups. Five teachers and five IT professional were interviewed. During

the interview, each participant was asked open-ended and probing questions to gain an understanding from each individual's perspective. Threats and limitations were noted and steps taken to minimize their impact on the study.

CHAPTER 4

Findings

The purpose of this study was to explore the constraints workers in business and industry and teachers face when implementing new technology and compare those constraints. In addition, motivational factors of both groups were explored. By better understanding the constraints and motivational factors for implementing new technology and providing tools to alleviate these barriers, companies and schools can improve technology implementation in their institutions. This chapter presents the key findings obtained from 10 in-depth interviews. Five of the interviews were conducted with teachers in education and the other five interviews were conducted with IT professionals working in a corporate environment.

Employees in Business and Industry Findings

The majority of the business professionals interviewed indicated a lack in management's communication and planning as a main obstacle faced when introducing or upgrading new technology. These employees stated they were often sent to training sessions to learn new technology only to return to work and realize there was no plan for incorporating the new tools in their company. In one instance, a Network Systems Manager stated that he took a week long training course to learn Microsoft's SMS Server 2.0 and once he returned to work, he soon realized there was no strategy for implementing this new system. He felt the training he received was worthless and a waste of his time since it was never applied. In another interview, a Product Support Specialist explained that he was sent to a two week training class on VMware and once he returned to work, he was told that he was only supposed to serve as a backup to the primary specialist. However, he never had the opportunity to utilize what he learned in the training and soon the knowledge he gained was lost.

Another issue these business professionals faced was how soon the new technology resources were available to them once they left the training environment. For example, a Senior Programmer commented that oftentimes it was several weeks or even months between when he received training and when the technology was actually available to him to use and practice. Several other employees said they felt discouraged when they returned to work and were not able to apply what they learned in training due to not having the programs available. A Network Systems Manager explained, "There have been times when I have sent my direct reports to training and was told that once they returned, they would have full access to a system, only to find out that the system was not ready for testing once they returned from training." In some cases when there was a large lag time between when the employees were trained and when the system was ready for testing, he had to "provide his employees with refresher training sessions."

However, the majority of the employees stated that they felt the training they received did prepare them for implementing the new technology once they returned to work. They also felt the length and timing of the training was sufficient. For example, one IT Support Specialist described a training course he attended where the group used data and scenarios from a fictitious company to learn how to apply the technology. Also, after attending the training sessions, additional training was also provided onsite within his company using real data which made this training much more efficient.

All 5 employees from business and industry commented on having professional services available to them once they returned from training which assisted them in ensuring the new technology was implemented correctly. Companies routinely purchase professional service contracts ranging from three different support and cost agreements. For instance, a bronze contract may mean support Monday-Friday from 8:00 a.m. to 5:00 p.m. with no after hours

support with an estimated annual cost of $25,000-$40,000. A silver level contract may mean support Monday-Friday from 8:00 a.m. to 5:00 p.m. with limited after hours support with an estimated annual cost of $45,000-$60,000. A gold level contract would have 24 hour/7 days a week service with a guarantee to respond within a specific number of hours. The estimated cost of a gold contract would be $65,000 to $80,000 annually. The reason companies choose to invest in this type of service is to ensure their employees have the support required to keep the new technology running efficiently and to provide their employees with the assistance they need if issues occur.

All of the business and industry employees interviewed explained there were many incentives given for attending technology training sessions and implementing new technology. In all cases, the training classes were fully paid for by the company. In addition, these employees attended the training sessions during company business hours and were given mileage compensation. In some instances where the training sessions were provided offsite and the employee was required to fly to attend the training sessions, the airfare, hotel stay, meals, and rental car were provided to the employee at no charge. Additionally, many of these employees were promoted or received an increase in salary for becoming familiar with new technology and increasing efficiencies in their work environments. For example, an IT Support Specialist explained that a new position was created for him after he attended a Viraynet training course and learned how to implement the system for his company. Prior to being promoted, he worked as a Maintenance Dispatcher and after learning the new system and becoming the point of contact at the corporate office for Viraynet, he was given the option of moving into the IT Support Specialist role with increased responsibilities, an additional week of vacation, and over a $5,000 pay raise.

Teacher Findings

The teachers interviewed provided a list of shared constraints and motivational factors they experienced when implementing new technology in their classrooms. Some of the common barriers included a lack of time to practice and adapt new technology. Another issue was a lack of resources provided to these teachers once they returned to the classroom. The age of their computers was another concern as well as a lack of computer technicians to support those computers.

The overwhelming majority of teachers indicated that the training they were provided did not allow them enough time to practice and adapt the new technology before they were expected to use the new tools. In turn, the teachers had to invest their own personal time in learning the new tools before they felt prepared enough to integrate the new technology in their teaching. These teachers also indicated that they felt self-taught since the training they were provided was too short in duration and too limited to be valuable.

In addition, all 5 teachers interviewed indicated the lack of resources provided to them was a deterrent to integrating technology. In all instances, there was little to no support offered to these teachers once they returned from the training environment back to their classrooms. Some teachers choose not to introduce the new technology because they were not given support and did not feel confident or see the benefits the new technology would provide to their students.

Another issue all 5 teachers commented on was the age of their computers. For instance, these teachers said that their computers were outdated and not adequate enough to meet the demands of new technology. Since their laptops were outdated, the teachers found it difficult to introduce the new technology they learned in training into their own classrooms.

The majority of teachers also complained that their school was continuously purchasing new technology without a sufficient number of computer technicians to help with getting the programs set-up on teachers' laptops or assisting with teachers and/or students computer issues. For instance, one teacher stated that her school had approximately 50 teachers and over 600 students with laptops and only one computer technician to support all of these computers. The school once had two support technicians, but with recent budget cuts, one of the technician positions was eliminated. This has left this school without the support these students and teachers need to ensure technology is working properly. One teacher stated that since her laptop often failed her and the technician was almost always unavailable, "she always had a back-up lesson plan just in case." She recalled a recent incident that occurred on a Friday when she was planning to show her class video on Arthur's purpose and when she went to play the video on her laptop, the screen went black. She tried contacting the technician, but was unsuccessful. Instead, she ended up using the lesson she had prepared for Monday which did not require the use of her laptop.

All of the teachers interviewed indicated they were observed and evaluated on how well they implemented new technology in their classrooms due to their school district's goals for providing students with 21st century skills. However, there was little motivation on the teachers' part for doing so since they felt they were not provided with enough compensation. For example, several teachers complained that their school district did not have early release days like some of the other districts in surrounding counties where the students were released from school early and the teachers stayed to learn new technology. Instead, these teachers were given the option of attending technology training afterschool every first Monday in the month, but were not provided with any overtime pay, compensation for attending the class, or

reimbursement if the training required travel. The only incentive offered to these teachers included an opportunity to use the training classes as credits toward their teaching license.

Summary

The constraints and motivational factors faced by teachers in education are quite different from those faced by employees in business and industry. Many of the challenges teachers experience include outdated computers, a lack of practice time, resources, and computer technician support. In addition, teachers are also given little to no incentives for attending technology training sessions. They are required to attend these training sessions on their own time without being offered any compensation or mileage reimbursement.

Employees in business and industry have their own set of challenges such as a lack in management's communication and planning and resources not being available once they return to work. However, there are many incentives these employees are given to motivate them to attend technology training classes. One of the incentives is that trainings are being provided on company time and fully paid for by the company. Additionally, if the trainings are offered offsite, the employees are provided with mileage reimbursement, airfare, a hotel stay, meals, and a rental car at no expense to the employee. Also, these employees have often been promoted or given an increase in salary for attending technology training sessions and increasing business efficiencies.

However, unlike the teachers who stated they did not have ample time to practice before being required to implement new technology, the employees in business and industry felt the training they received was sufficient in length and timing. Also, unlike the teachers, the business and industry employees felt they had the resources they needed once they returned from training

to ensure they implemented the new technology correctly through the professional services contract their company provided.

CHAPTER 5

Conclusions and Recommendations

The research indicates there are many challenges and motivational factors faced by both employees in business and industry and teachers in education when implementing new technology. However, the research also suggests the barriers faced by employees are different than those experienced by teachers. There are also some advantages to being a business and industry employee as opposed to a teacher such as the incentives given for attending training sessions. Understanding the constraints that are faced by both groups and comparing the two lead the researcher to determine some recommendations for eliminating barriers and increasing motivation.

Business and Industry Conclusions and Recommendations

Employees in business and industry encounter several obstacles when implementing new technology in their work environment. One challenge is a lack of communication and planning from management. Another issue is that these employees are often sent to training without the company having a clear plan or direction for how the new technology will be utilized. However, one advantage these employees receive is that they are provided with many incentives to continue going to technology training sessions.

Employees interviewed in this study stated a lack in management's communication and planning was one of the main obstacles faced. This agrees with previous research that businesses need to develop and execute a sound change management program that identifies and aligns employees and business leaders to ensure everyone in the company is informed about the decisions the company is making and how implementing new technology will benefit the company and the employee (Tra, 2011). These employees should be provided with a change

management plan that explains the purpose and the benefits the new technology will provide in order to eliminate rumors and fears. Otherwise, McKenna (2011) points out, bad news, rumors, and pessimistic thinking from employees will fill the gaps in communication. Also, to remove the barrier of management not having a clear plan or communicating the plan, employees should only be sent to training if the goal and vision for the new technology has been identified. This also includes communicating the benefits and goals of the new technology to the employee and detailing how his or her job would change once the technology is implemented.

Another deterrent this research identified is that employees in business and industry frequently return from training only to find the new technology they learned is not currently available to them. To ensure learning is transferred from training to the employees work environment, the technology needs to be immediately available and ready to be incorporated in their daily work routines. Otherwise, as McKenna (2004) explains, the employee's obstinacy will arise and he/she will try to find reassurance in the comforting and familiar way of the past, which is why the first stage of change often results in no change at all.

Planning is another solution for ensuring the technology is available immediately to the employee once they return from training. If management has a clear plan for how and when the new technology should be incorporated, then they would only send their employees to training when the new technology is ready for implementation. This will ensure that learning is transferred from the training session to the company.

However, with all the barriers that are faced by these employees, the research also indicates that they are provided with many motivational incentives for implementing new technology. The classes are provided during company time and fully paid for by the company.

In addition, these employees receive mileage reimbursement and in many cases promotions or salary increases.

Teacher Conclusions and Recommendations

Teachers also encounter their own set of challenges when implementing technology in their classrooms. Some of those difficulties include the need for additional practice and application time, more resources, better computer systems, and more technician support to ensure technology is transferred from training to their instruction. Also, these teachers are not given the incentives needed to encourage them to continue attending technology training classes.

One barrier this research discovered is that teachers are not receiving trainings that include ample time to practice and adapt the new technology before they are required to incorporate the new technology into their instruction. Ringstaff and Kelley (2002) concur that when teachers are learning to integrate technology into their classrooms, the most important components of the training include opportunities to explore, reflect, collaborate with peers, work on authentic learning tasks, and engage in hands-on, active learning. A survey conducted by the CMSD Office of Research and Assessment (2007) also indicated that teachers who expressed discomfort when using technology had better ease with using the software after having an opportunity to collaborate with peers, engage in professional development activities, and have time to use the technology tools effectively (as cited in Cobb, 2010).

A remedy for the need teachers have concerning training would be to build in more time for practice and reflection. As a result, the duration and frequency of the training classes would increase. This would assist the teachers in feeling prepared before leaving the training environment without having to spend their personal time attempting to learn the new technology without any support.

Research also supports another barrier teacher's face when implementing new technology which is a lack of resources provided to them once they return to their classrooms. Research by Egbert, Paulus, and Nakamichi (2002) determined that teacher technology usage, confidence, and attitudes toward technology improved when they were provided with adequate training and resources. If the goal is for technology to become an integral part of a teacher's instruction, they must first see the benefits of using the tools. Therefore, it is critical that teachers are provided with the reasons as to why new technology will benefit them and their students. On the other hand, if teachers are not given sufficient evidence that technology enhances their teaching; many teachers may not change their practice to include the new technology (Egbert et al., 2002).

The school district could assist in providing a solution for the lack of resources teachers experience once they return from training. A recommendation would be for schools to provide teachers with follow-up support and/or training after they return to the classroom. This type of follow-up training should come from a master teacher in their school which could show them how to incorporate new technology into their instruction and to answer any questions they may have about using the new resources.

In addition to teachers needing support once they return to their classrooms, they also need computers that will meet the demands of new technology. According to Ringstaff and Kelley's (2002) study, it is not uncommon for many teachers to still be using computers that are over a decade old and are obsolete by our current technology standards. In order for teachers to use the technology they learned, they must have machines that are adequately equipped to handle new and evolving technology. This means having access to computers in their classrooms that can connect to the Internet by a high-speed, direct connection (Ringstaff and Kelley, 2002).

A solution to the computer issue many teachers face would be for the school districts to revise their budgets to include additional money for upgrading or replacing teacher laptops. Teachers should only be given laptops that can meet the requirements of new technology. Since technology is constantly changing and evolving and many of their tools are quickly becoming obsolete, the school would also need a plan and budget for upgrading laptops at least annually.

This research also determined that teachers must have the necessary technical support to ensure their computers are working effectively. Research conducted by Wahl and Duffield (2005) recommended that schools should spend only 30 percent of their budget on equipment and the other 70 percent on sustaining ongoing training and technical assistance for teachers. For example, teachers are encouraged to use technology when they have just-in-time and contextual support that bridges the gap between the training environment and implementing the new tools in their classrooms ("Strategies for Successful Development," n.d.). By providing ongoing support, teachers are less likely to get discouraged with the new technology which often results in teachers deciding not to use it.

Recommendations for ensuring teachers are provided with the level of support they need from technology technicians would be to have a sufficient number of technicians for all students and teachers. This includes making sure the technicians can offer teachers support that is timely and onsite. School districts should also take into consideration that the support technicians not only assist teachers, but also the students with laptops. Instead of slashing the budget for support technicians, schools should determine the needs of the teachers and students with laptops to ensure they have a sufficient number of technicians to handle all requests in a prompt manner.

Another area this research suggests is that the lack of compensation is one of the main discouraging factors for teacher motivation. This was primarily due to teachers having to invest

their personal time and money in order to learn new technology. They are not provided with any incentives such as promotions, paid time-off, or even given mileage reimbursement for attending these training sessions. Additionally, the education system should review the types of incentives given to employees in business and industry and modify their programs to incorporate more motivational factors. Teachers should not have to spend their own time and money to learn new technology. Instead, they should be incentivized by each class being paid for, having additional time-off, paid mileage, and being given an increase in salary.

Comparison of Business and Education

This research also identified several advantages that employees in business and industry had over teachers in education. One of the advantages was that employees felt as though they had received adequate training. These employees also believed the resources provided to them once they returned to work was sufficient for ensuring the technology was implemented correctly. The research supports that employees in business and industry feel that they are receiving sufficient training that is preparing them to incorporate new technology once they return to work. However, the literature disagrees. According to "Implementing Technology" (2002), when companies are faced with an economic downturn and begin looking to cut overhead costs, training is one of the first budget cuts made. One area where both the research and literature review agree is that teachers are not receiving the types of training they need to implement new technology and are often having to use their personal time to learn the new tools. Wahl and Duffield (2005), recommend that schools could offer one-hour training sessions after-school where the teachers can explore, plan how to integrate the technology, share ideas with other teachers, and have an opportunity to locate mentors within their districts who have expertise using technology to customize curriculum. Another advantage this research supports is

that employees in business and industry are being provided with professional services once they leave the training environment to deal with issues and provide support. The literature agrees that teachers also could benefit from having this level of support once they return to their classrooms. For instance, The National Staff Development Council (2004) advises that teachers not only need professional development, but they also need ongoing support at the school site for new technology to implemented successfully (as cited in Cobb, 2010).

Summary

This research identified many constraints and motivational factors faced by both employees in business and industry and teachers in education. By understanding these barriers and comparing the two groups, this research began to support the notion that teachers encountered additional challenges when compared to the business and industry employees.

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Appendix

Research Questions

Exempted 11-19-2012

Interview Questions asked to participants:

1. Can you describe some of the technology training classes you have attended in the last 5 years that helped you integrate a new technology resource?
2. Was the training class offered on-site or off? (For teachers- during the school year?)
3. How many days did you attend?
4. Did you receive any information on the new tool prior to the training?
5. Did your boss/principal provide information on how the new tool would be used or how your role may change after you received training?
6. What was the style of training you received? Was it a collaborative, reflective, and active learning environment?
7. Were you provided with compensation for these classes? If not, did you ask for compensation and approval?
8. Did you take these classes while on the clock?
9. Overall, how would you rate the training you received with 1 being not adequate and 5 being exceeding your expectation?
10. Do you have a particular class that you would you say was the best? Why?
11. Did the instructor of this class do anything different than instructors of previous classes did?
12. How did your boss/principal perceive this training class?
13. For the majority of these classes, did you feel you had sufficient time to practice?

14. Do you feel you were provided with adequate training to fully execute the new technology tool once you returned back to work?
15. What was the support like once you got back to work?
16. Once you returned, did you have access to the new technology?
17. Were you provided with feedback once you returned from training to ensure you implemented the new technology correctly?
18. What difficulties have you experienced when you are implementing/integrating new technologies?
19. Have you experienced problems with the use of a new technology after training?
20. Have you experienced problems with the hardware? If so, what kinds of problems (i.e. for teachers this might be blocked websites, in business it could be down-time for needed accounting software).
21. Have you experienced problems with co-workers when implementing new software?
22. Have you experienced problems with your supervisor when new technology is implemented?
23. Are there problems that you had with the integration of new technology that you would like to identify?