CHILD NUTRITION DIRECTORS' PERCEPTIONS OF TECHNOLOGY USE IN CHILD NUTRITION PROGRAMS

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BY

PEGGY PRATT, B.S., M.S.

DENTON, TEXAS

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To the Dean of the Graduate School:
I am submitting herewith a dissertation written by Peggy Pratt entitled "Child Nutrition Directors' Perceptions of Technology Use in Child Nutrition Programs." I have examined this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nutrition.

Carolyn Bednar
Carolyn Bednar, Ph.D., Major Professor

We have read this dissertation and recommend its acceptance:

Robin Wantland
Teresa Pangan
C. Prasad
Chandan Prasad, Ph.D., Department Chair

Carolyn Bednar

Accepted:
Jennifer Martin
Dean of the Graduate School

DEDICATION

To my family and wonderful husband Greg,

for your endless encouragement and support.

I could not have completed this life goal without you.

And

To Dr. Carolyn Bednar and Dr. Junehee Kwon,

who spent countless hours teaching,

reviewing, and assisting me

with finishing this research project.

Your insight and encouragement will never be forgotten.

ABSTRACT

PEGGY PRATT, M.S., R.D., L.D.

CHILD NUTRITION DIRECTORS' PERCEPTIONS OF TECHNOLOGY USE IN CHILD NUTRITION PROGRAMS

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The purpose of this study was to investigate child nutrition directors (CNDs) perceptions of technology use in child nutrition programs (CNPs) in the Southwest Region of the United States. A questionnaire was developed by the researchers, validated by an expert panel using the Delphi technique, converted to an on-line format, and pilot tested. A randomized group of School Nutrition Association CNDs (N=500) along with a School Nutrition Services listserv were invited to participate via an on-line or a mailed questionnaire. Participants were asked to identify the types of technology/software they currently used. They also used Likert-type scales to rate effectiveness of software in assisting to meet goals, barriers to purchasing new technology/software, and importance of future technology/software purchases. A total of 111 CNDs completed the questionnaire.

Results revealed that 70.3% of respondents perceived themselves as having advanced or expert computer skills. Office and menu/food related applications, specifically word processing, email, and POS systems, were used most often. CNDs found technology/software to be very effective in meeting regulatory related goals related

to accurate state reimbursement claims, correct meal application processing/verification, and Coordinated Review Effort site visits. Older CNDs, with less education and who served fewer meals found inadequate funds, outdated computers, and lack of IT/administrative support to be barriers to purchasing new technology/software. However, CNDs with higher perceived computer skills and higher education levels were more likely to disagree with these barriers.

Overall, study respondents used a wide variety of technology/software programs to meet their operational needs. Results showed that CNDs with advanced/expert computer skills were utilizing the most technology/software ($p=0.000$), were more apt to rate technology/software as effective ($p=0.011$), and were less likely to agree with barriers to purchasing technology/software ($p=0.003$). Although these results are encouraging, there are still many CNDs who have not implemented technology/software applications that could reduce program costs and improve productivity. The child nutrition industry needs leaders who can develop mentorship programs, initiate computer skill building classes, and develop online training for this group of CNDs.

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CHAPTER I

INTRODUCTION

Child feeding programs such as the School Breakfast Program (SBP) and National School Lunch Program (NSLP) were developed to address the issue of childhood hunger. Currently, these two programs individually and collectively serve the nutritional needs of children across the United States. In fact, in 2007, the SBP operated in over 87,000 schools and served 10.6 million children while the NSLP operated in over 101,000 public and non-profit private schools and fed approximately 30.5 million children (United States Department of Agriculture, 2009). During fiscal year 2008, the SBP and the NSLP cost the United States 2.4 billion and 9.3 billion dollars, respectively, to operate and ensure that eligible children were fed a nutritious lunch and/or breakfast meal every day (USDA, 2009).

Participation in the SBP and the NSLP enables school districts to receive cash subsidies and donated commodities from the United States Department of Agriculture (USDA) for each meal they serve. In return, school districts are required to serve meals that meet federal nutrition guidelines and offer free and reduced meals to eligible children. Nutrition guidelines are tied to the USDA requirements for nutrition standards in meal planning for fat, calories, protein, iron, calcium, and vitamins A and C (USDA, 2010). School districts in some states must comply with more restrictive nutrition policies. In Texas, schools must meet additional nutrition guidelines in order to prevent

monetary fines from the Texas Department of Agriculture. In addition, as the Child Nutrition and Women, Infant, and Children Re-Authorization Act of 2004 requires, school districts must have a Hazard Analysis Critical Control Point (HACCP) program as well as a Wellness Program (USDA, 2004).

Due to the numerous government regulations and funding of Child Nutrition Programs (CNPs), technology and computer software programs have become increasingly important in terms of program costs. Initially, CNPs used technology for basic accounting purposes but they moved quickly into using menu management software to assist with the time and labor intensive task of meeting government requirements. Essentially, menu planning software helps CNPs participating in the SBP or the NSLP comply with the USDA nutrition guidelines. Menu planning programs can also assist when a CNP wishes to move from a Food Based Menu Planning System to a Nutrient Standard Menu Planning (NSMP) system which averages required nutrients over an entire week instead of using meal patterns like the Food Based Menu Planning System. Furthermore, menu planning software programs have the potential to assist with recipe and inventory management as well as production and purchasing systems.

Point of sale (POS) programs have also grown in popularity since they are capable of providing child nutrition directors with daily sales information. Consequently, directors are able to predict school performance and student participation rates for strategic planning and budgeting (Sackin, 2007). Additionally, this type of technology can improve accountability and productivity with better reporting and quicker decision making (Puckett, 2005). POS systems are also able to protect students' eligibility status,

improve participation by shortening cafeteria lines, and accurately manage government reimbursement issues (Lowe, 2005). Because reimbursement monies provide a large amount of revenue for many CNPs, it is imperative that POS systems compile accurate monthly participation rates for free/reduced and paid students in order for reimbursement claims to be submitted for funding on time (Little, 2002). Besides POS systems, there are other software programs that can provide simple solutions for HACCP, wellness requirements, training needs, and personnel management. In addition, new technologies can help increase student participation rates through digital displays and other media (e.g., signage, TV monitors, and web-based applications.)

In 1992, researchers White, Sneed and Martin predicted the need for CNPs to keep up with technological advances in order to stay competitive. The National Food Service Management Institute (NFSMI) Research Task Force (2000) also concluded that computer technology should be one of the ten significant research categories to be addressed in future research projects. The NFSMI (2002) went on to identify computer application knowledge as one of the core competencies needed for child nutrition supervisors and directors in 2000-2001. Fortunately, the technology industry listened to these predictions and responded to this growing need. Over the past 10 years, new technology and software has been developed to include programs such as on-line payment systems, meal application scanning software, and on-line temperature monitoring systems for CNDs to access and purchase as money becomes available. Furthermore, the internet has allowed CNDs to train and communicate with staff by using training websites and departmental intranets, in addition to providing nutrition education

to students via web cafés and enhancing video surveillance through web-cams for security purposes.

Operating CNPs involves the exchange of large quantities of government funds and resources. Consequently, commodities must be ordered and allocated, menus written, labor considered, and participation rates predicted almost six months in advance of the coming school year. In addition, each district and state expects CNPs to maintain accurate records, be fiscally responsible, and employ timely reporting schedules each month. Besides these expectations, CNPs must prepare food safely, ensure children are offered nutritious meals, and encourage healthy food choices for the future. All of these tasks must take place quickly, efficiently, and correctly if a CNP desires to stay competitive and viable. Therefore, the use of technology is an excellent way to achieve these requirements and goals with minimal time and positive outcomes.

While many school districts have explored various options for technology use within their operations, some districts may still use antiquated systems and have limited access to technology. Likewise, a number of districts may be limited in implementing technology due to the lack of adequate or strong information technology (IT) departments to support their computer technology requirements (National Center for Education Statistics, 2005). In light of these possible barriers, it is surprising that the use of technology in school nutrition programs has not been widely researched. Furthermore, there is a lack of research and understanding of technology's impact on school districts in terms of costs, participation rates, effectiveness of use in meeting government standards, and needs for the future. Therefore, there is a strong need to understand what types of

technology and software are being used in school districts and investigate why some districts may still remain behind the trend of information technology.

Purpose

The purpose of this proposed research is to investigate the prevalence of technology use and directors' attitudes toward the use of technology in child nutrition programs in the USDA Southwest Region of the United States (i.e. Arkansas, Louisiana, New Mexico, Oklahoma, Kansas, Colorado, and Texas)

Null Hypotheses

$H0^1$ There will be no significant differences in types of technology and software used in child nutrition programs based on type of menu planning, number of meal equivalents served, child nutrition director (CND) education level, and CND computer knowledge level.

$H0^2$ There will be no significant relationships between types of technology and software used in child nutrition programs and the following variables: food cost per meal, labor cost per meal, CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level.

$H0^3$ There will be no significant differences in CNDs perceptions of the effectiveness of computer software and technology in assisting to meet department goals based on menu planning, number of meal equivalents served, CND education level, and CND computer knowledge/skill level.

$H0^4$ There will be no significant relationships between CNDs perceptions of the effectiveness of computer software and technology in assisting to meet department goals and the following variables: food cost per meal, labor cost per meal, CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level.

$H0^5$ There will be no significant differences in CNDs perceptions of the challenges or barriers to purchasing new technology and software programs for their departments based on: number of meal equivalents served, CND education level or computer knowledge/skill level.

$H0^6$ There will be no significant relationships between CNDs perceptions of the challenges or barriers to purchasing new technology and software programs for their departments and the following variables: CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level

$H0^7$ There will be no significant differences between CNDs perceptions of the importance of future technology and software acquisitions based on type of meal planning, number of meal equivalents served, CND education level or computer knowledge/skill level.

$H0^8$ There will be no significant relationships between CNDs perceptions of the importance of future technology and software acquisitions and the following variables: food cost per meal, labor cost per meal, CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level.

Assumptions

In this study we assumed that CND perceptions of the effectiveness of existing technology systems in their departments and district, barriers to purchasing of technology systems, and the importance of future technology purchases and their computer technology knowledge and ability level were identifiable and measurable. Furthermore, we assumed that the rating scales applied to the questionnaire were appropriate to accomplish the study objectives and that the CNDs would respond to the survey truthfully and to the best of their knowledge.

Definitions of Terms

- CATCH - A proven Coordinated School Health Program designed to promote physical activity, healthy food choices, and prevent tobacco use. (Luepker et al., 1996)
- Food Based Menu Planning – a menu planning system in which menus are developed using meal patterns over a week's time. CNPs comply with the specific component and quantity requirements by offering five food items from four food components. These components are: meat/meat alternate, vegetables and/or fruits, grains/breads, and milk. (USDA, 2010)
- Kronos – a personnel software program (Wikipedia, n.d.)
- Nutrient Standard Menu Planning – (sometimes called "NuMenus") is a computer based menu planning system that uses approved computer software to analyze the specific nutrient content of menu items automatically while menus are being planned. School menus are evaluated through the nutrient analysis of all foods

offered over a week's time (3 to 7 days) using weighted or unweighted averages based on the projected servings of each menu item. (USDA, 2010)

- PayPams - Online payment system (PayPams, n.d.)
- Nutri-Scan – Meal application scanning software (Nutri-Scan, n.d.)
- PCS – Point of sale and revenue control software system (PCS, n.d.)
- Software - A set of instructions, usually in the form of a program, which is executed by a computer to make the computer perform a task, such as word process, manage databases, or play games (Wikipedia, n.d.)
- Technology – Technology is human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities (Wikipedia, n.d.)
- Web Café – a website associated with a school districts' child nutrition department. Serves as a nutrition education and communication tool in regard to school breakfast and lunch meals. (Nutri-Cafe, n.d.)
- HACCP – Hazard Analysis Critical Control Point is a food production, storage, and distribution monitoring system for identification and control of associated food safety hazards. (Wikipedia, n.d.)
- SBP - School Breakfast Program is a federally assisted breakfast meal program (USDA, 2010)
- NSLP – National School Lunch Program is a federally assisted lunch program (USDA, 2010)

CHAPTER II

LITERATURE REVIEW

Overview of Child Nutrition Programs

Child feeding programs originated in the mid 1800's to address childhood hunger. Over time, these programs grew exponentially until the United States (US) Congress officially passed the Child Nutrition Act in 1966 making school lunch a federally assisted program. After many more years of legislation and refinement, the U.S. Food and Nutrition Service, under the direction of the United States Department of Agriculture (USDA), now administers four major domestic food assistance programs that primarily serve the nutritional needs of children. These programs consist of the National School Lunch Program (NSLP), School Breakfast Program (SBP), Child and Adult Care Food Program, and the Summer Food Service Program. States also play a role in administration of the NSLP and SBP through various state regulatory departments. Currently, all four food assistance programs work together to make sure adequate nutrition is provided for children across the US (USDA, 2008). This review of literature, however, will primarily focus on the SBP and the NSLP.

The SBP and NSLP represent a large portion of the US food and nutrition programs. The NSLP operates in over 101,000 public and non-profit private schools and residential child care institutions and in 2007 fed thirty million children daily. Likewise, during that same year the SBP operated in over 84,000 schools and served 10.6 million

children. In financial terms, the US spent approximately 11.7 billion dollars in 2008 to operate both the SBP and NSLP (USDA, 2009).

Participation in the SBP and the NSLP enables school districts to receive cash subsidies and donated commodities from the USDA, and fresh local produce through the Department of Defense (DOD) fresh produce program. In return, school districts must offer free or reduced price breakfast and/or lunches to eligible children. Furthermore, all meals served must meet the Dietary Guidelines for Americans, which recommend that no more than thirty percent of an individual's calories come from fat, and less than ten percent from saturated fat. In addition, school breakfasts and lunches must provide one fourth and one-third, respectively, of the Recommended Dietary Allowances (RDA) of protein, vitamin A, vitamin C, iron, calcium, and calories (USDA, 2008). Several states also have their own nutrition policies (i.e. Texas) which place further meal restrictions on child nutrition programs (CNPs) such as prohibiting the use of fried foods and setting portion size and fat content guidelines for foods considered to be of minimal nutritional value (i.e. cookies, chips).

Currently, there are many potential changes being discussed regarding CNP's as President Barack Obama has pledged an additional billion dollars in his 2010-2011 budget proposal to be used for reform of child nutrition programs and to end childhood hunger. In particular, new legislation could involve expansion of benefits to low-income children, increase reimbursement rates, cap indirect expenses, expand nutrition education, and emphasize an increase on use of computer systems to lower the error rate in free and reduced eligibility (Matz, 2010). Often with changes such as these, comes a need for

resources of time and money. Therefore, considering the U.S.'s current budget deficit, it will be interesting to see what comes of these proposed changes in the coming months.

History of Technology in School Food Service

As much as 15 years ago, researchers predicted the need for school food service to keep up with computer technology in order to survive in an increasingly competitive environment (White, Sneed, & Martin, 1992). Consequently, the need for technology and its advantages remain paramount today. Technology in schools continues to rapidly change as CNP's are in constant pursuit of better ways to improve and refine labor intensive processes, increase productivity, lower costs, keep up with new federal and state regulations, and meet customer service demands (Lowe, 2005). The federal government and states are also following the technology trend by moving toward electronic recording systems for meal reimbursement claims, filing of free/reduced meal applications, and commodity allocation (Gryder, 2005).

Computer technology and the use of software programs in food service were first most notably used to save time and replace personnel (Bender & Matthews, 1989). Over the next few years, however, technology and software were developed to assist with the time and labor intensive task of menu management. The first menu planning program called Computer–Assisted Menu Planning (CAMP) became available in the mid 1960's. CAMP was developed at Tulane University and was designed to help food service directors' lower menu costs while meeting government standards regarding nutritive values, menu patterns, and frequency of offerings (Balintfy & Nebel, 1966).

Unfortunately, even after CAMP proved itself successful, few menu planning programs were available until the early to mid 1990's.

In 1984, Hiemstra and VanEgmond-Pannell decided to assess the actual number of computer users in school foodservice and found that fewer than 20% of school districts were using computers. These findings encouraged researchers Matthews, Bedford, and Hiemstra (1986) to investigate and report on what type of computer systems and supporting software specific to school food services were necessary to increase the number of users. They found that electronic spreadsheet and database programs were the most vital software programs needed in school food service because programs automated numerous labor intensive tasks related to inventory, purchasing, recipe analysis, menu planning, and cost containment.

It was not until the early1990's that the school nutrition industry began to see menu management systems emerge in greater quantity. Two different researchers at this time, Val Almelo, 1991, and Collins, 1992, suggested that CNDs needed a comprehensive computer package that not only handled menu management but also included inventory management, financial management, and point-of-sale terminals to collect data. Collins also felt that individualization to each school food service operation should be considered. One year later, Brewer, DeMicco, and Conn (1993), researched hardware and software use in school food service operations. The study, conducted with 266 school CNP directors in the Mid-Atlantic region, found that 60% of the directors used computers for at least one function while 40% of directors were still operating without computers at all. Moreover, most software programs were still being used for

word processing, spreadsheets, database management and telecommunication; only 28% of CNDs used computers for menu management and analysis. Furthermore, the researchers found that smaller school districts lacked district IT support and were not as equipped as larger districts to handle computer technology.

CNDs are now presented with a wide variety of technology and software systems to use in their programs. This is likely due to the inevitable expansion of technology responding to the identified needs of the child nutrition industry. These new technologies and software programs continue to have a positive impact on CNPs and provide a much needed level of support in a fast-paced environment.

Current School Food Service Technology

As the sophistication of school food service continues to expand, and as food service becomes more difficult to profitably manage, information and data management gains created through the use of technology have become increasingly valuable. Thus, many CNDs have already investigated how technology can be used to make better decisions and work smarter as well as how to use technology to cut back on labor and food costs (Sackin, 2007). In fact, many of these CNDs probably use technology as often as possible to meet federal and state requirements, improve accountability and productivity, and provide a fun and interactive learning environment for students. For other CNDs, however, acquiring new computer software and technology can be a struggle due to insufficient funds, shortage of space, lack of information technology support, too little administrative support and inadequate knowledge or exposure to new

technology. The following sections will discuss the current technologies available for CNDs to meet and attain their specific department goals.

Menu and Food-Related Applications

Menu management programs such as NuMenus and Nutrikids became extremely popular in 1996 when the USDA School Meals Initiative (SMI) was initiated. At that time, all school districts participating in the NSLP and SBP were asked to meet the Dietary Guidelines for Americans and use the USDA's Child Nutrition (CN) database to formulate menus (Begalle, 2002). In addition to meeting the SMI requirements, school menus were also expected to reflect the choices and preferences of children, support growth and development, and foster healthy eating patterns (Brown, 2002).Therefore, menu management programs were designed to allow users to enter nutrient data from a nutrition facts label, analyze recipes, modify menus for a 3-7 day school week, customize nutrient standards for specific age groups, and print nutrient composition reports for each recipe and menu cycle (USDA, 2008).

In the process of meeting these design challenges, the software industry realized that productivity tools need to be combined with the ability for CNDs to monitor and control costs. Consequently, programs were developed that allowed CNDs to cost each recipe and menu, maintain a nutritional analysis of each recipe and adjust recipes for ordering based on forecasted participation. Such tools were recently crucial when U.S. food prices rose 4% in 2007 and rose again by 3.5% to 4.5 % in 2008-2009 due to increases in commodity prices and fuel costs (Congressional Research Service, 2008).

Today, companies such as Nutrikids, Horizon, and PCS, offer "all-in-one" computer systems which link point of sale data with meal planning, production, ordering, and inventory, online payment, and vendor data. When purchasing and inventory management software programs are combined with menu management programs, they allow food and supply orders to be determined based on par stock levels and/or forecasted participation for each school. Once this inventory or forecasting is complete, food and supply orders can be sent directly to the vendor for purchase. Moreover, the bid analysis process is simplified since these programs can evaluate vendors simultaneously by producing price quote lists for comparison.

In addition, central warehouse and school site inventories can be improved by employing a perpetual inventory as well as tracking inventory expense allocation to each school. Therefore, CNDs who employ well-designed menu management programs can decrease department costs by streamlining the work of piecing a menu together, refining purchasing procedures, and increasing inventory turnover (Riell, 2000). As a result, fresh, high quality foods can be consistently served which have been shown to increase student satisfaction and participation rates (Glimore, Brown, &Hutchinson, 1998). All-in-one systems have also grown in recognition and are capable of providing CNDs and staff with extensive amounts of information regarding student eligibility, participation rates, menu item popularity, sales information, and student transaction reports which make them very attractive.

Additionally, POS systems by themselves have continued to evolve in functionality and resourcefulness. Therefore, CNPs have begun to seek new ways to use

this technology to reach more of their student population. In order to do this, POS stations are being added, or moved from traditional serving lines and repositioned closer to students and staff by using kiosks and vending machines. In secondary schools especially, kiosks are being strategically placed in lunchroom seating areas outside of the central cafeteria lines in order to allow students to purchase just a few items without having to stand in long meal lines. In 2006-2007, vending machines that dispense reimbursable meals moved into the spotlight, offering an easy way to feed students wanting to avoid long lunch lines or eat lunch between classes and activities held over the lunch hour. In both scenarios, all data is captured and linked to a central POS database without having to be in close proximity to the kitchen and can cut down on labor costs by eliminating staff needed to run registers (McLaren,2007).

Safety and Security Applications

Another important benefit of POS systems is their ability to protect students' eligibility status with numerical codes, which is a vital feature since the social stigma of eating a free or reduced priced breakfast or lunch may prevent eligible students from participating in the SBP or NSLP (Watkins, 2008, Pogash, 2008). To promote anonymity, some POS systems incorporate biometric technology which automatically confirms an individual's identity by comparing patterns of physical or behavioral characteristics. The advantage of biometrics in school nutrition is that biometric devices such as fingerprint scanners can replace ID cards and help food service staffs ensure that students buying lunches are doing so without identity fraud. In addition, CNDs can be sure that the meal count numbers being claimed are correct. For this reason, it has been

postulated that biometric technology might become a government requirement in the near future (White, 2007).

Speaking of requirements, food safety has become another concern for CNPs. As the US strives to keep the nation's food supply safe due to several recent foodborne illness outbreaks, CNPs are subject to additional government regulations. HACCP programs are now mandated as part of the Child Nutrition and WIC Reauthorization Act of 2004. The Act requires CNPs ensure all food products served are monitored from the time of receipt through service using proper food safety principles. Unfortunately, this job can be labor intensive and fraught with paperwork. Many districts, therefore, have turned to sensor technology to handle this task and make it easier to collect and manage the enormous amounts of data generated from multiple kitchen sites.

Companies such as Fresh Loc and Food Horizon offer a new line of quick, accurate temperature sensors in addition to data loggers, probes, and chillers to ensure that school districts are keeping food safe. E-mail or text messages are used to alert assigned personnel of temperature discrepancies in the districts refrigerators or freezers, so potential spoilage and loss can be prevented. Personal Digital Assistants (PDA) are additionally being used to monitor and record food temperatures during cooking, cooling and service. Probes are attached to the PDA and record the date, time, and temperature of each food item. This data is then uploaded to a central database, stored on a server, and accessed via the internet (Williams, 2006). Consequently, these types of sensors and thermometers can translate into labor savings, loss prevention, and improved public perception.

Moreover, using technology to address safety and security can save thousands of dollars each year by minimizing losses of money and food due to theft. For example, Carrollton-Farmers Branch Independent School District (CFBISD) estimates they have saved thousands of dollars by following the lead of other Texas school nutrition departments such as Spring ISD, and installing security cameras throughout its kitchens in order to monitor money counting, POS transactions, production and storage areas, and the rear loading docks. To illustrate, Melanie Konarik, Spring ISD's child nutrition director, can monitor via the Internet department security cameras at any time during the day, making it easy for her to see what is happens in school kitchens in "real time". Also, she can review camera recordings of past incidents of employee or student theft. Similarly, Rachelle Sherrin, child nutrition director at CFBISD, installed over 100 cameras during the summer of 2007 and has since seen many improvements in money handling, inventory levels, productivity, and revenues (personal interview, April 8, 2010).

Financial Management and Regulatory Applications

Safety and security is not the only area of child nutrition that has benefitted from technology and software programs. The use of technology and software for financial management, reporting, budgeting and business growth is also of great significance as it enables accountability. CNP directors are expected to comply with federal and state regulations and are regularly held responsible by state agencies, school administrators, and tax payers to maintain accurate records and financial data. Financial management applications, therefore, assist with managing revenue and expenses for each school site and are invaluable. These software programs, which incorporate spreadsheets for

tracking meal counts, meals charges, sales, refunds, and total daily revenue, can lead to better purchasing decisions and accurate reimbursement claims (Sackin, 2007). In fact, financial management is considered so important that the National Food Service Management Institute developed financial management software specifically targeted for school food service professionals (NFSMI, 2008).

Education Applications

The Child Nutrition and WIC Reauthorization Act of 2004 also required each school district participating in the SBP or NSLP to implement a wellness program. One way for a district to comply with the Act is to implement internet virtual cafeterias which serve as an excellent nutrition education tool for parents, teachers, and students. For example, users can choose what they want to eat for the day by dragging and dropping the food item to a virtual tray. As this is done for each food item, the nutrients (calories, protein, fat, and vitamins/minerals) and amount of money charged for each item changes according to what is placed on the virtual tray. Some virtual cafeterias go even further and use the CATCH teaching method (Luepker et al., 1996) of separating foods into Slow, Go, and Whoa categories depending on their nutrient content.

To support the need for this type of technology, which can be costly, CNP directors can utilize recent research suggesting that interactive computer programs when offered to students in addition to traditional teaching methods, may be beneficial in helping students stay active and make better food choices. For example, Bouwman et al., (2005) and Haerens et al., (2006) both found that personalized nutrition communication with students via the Internet is promising in terms of providing an interactive option that

is flexible for busy lifestyles. Leiberman (2001) also found that childrens health can be improved by using interactive health games. Similar results have been found by others as well. For instance, Long and Stevens (2004) studied the effects of classroom and World Wide Web (WWW) educational intervention on self-efficacy for healthy eating of middle school children. The results indicated that students who had WWW- based nutrition education and ten hours of classroom curriculum scored higher for self-efficacy in the areas of healthy eating (eating more fruits and vegetables and lower fat), more dietary knowledge, and healthier usual food choices than those students who did not receive the education.

Training Applications

Unfortunately, the benefits of any technology/software utilized in child nutrition, whether it be menu applications, safety and security applications, financial applications, or educational applications is limited without qualified users. Therefore, CNDs have a responsibility to not only seek training themselves, but also provide training for their staff in the area of computer technology and software (Certo, 2000 and ADA Practice Paper 2005). Several studies have been conducted on computer training of school foodservice personnel and the data indicates that computer classroom training and distance education can improve computer knowledge and skills. Research also shows that school foodservice professionals' desire to continue to enhance their abilities and are interested in continuing education opportunities.

Gould and Barrett (1998) administered two computer skills classes for CNP personnel and discovered that 70% of the participants in the introductory class had never

had a computer class and only 57% of the students in the advanced class had had previous computer experience. After taking the two computer classes, computer knowledge ratings were significantly higher than pre-class computer knowledge ratings for 15 computer based learning objectives ($p<001$). Two additional studies, by Yoon, Huss, and Brown (1998) and Sullivan, Harper, and West (2001) also found that school foodservice managers and workers were highly interested in computer training courses as part of their professional development portfolio.

Furthermore, Shanley, Thompson, Leuchner, and Zhao (2004) found that distance education for a group of 50 individuals taking a food safety course was as effective a tool as traditional classroom-style education in food safety and sanitation as measured by national examination pass rate results. More recently, a study done by Zoellner and Carr (2008) found that web-based training was an excellent way to meet the various learning needs of CNP directors. The researchers found that the majority of CNP directors did have the technology infrastructure to support web-based training and 90% of them reported an interest in using web-based training to acquire more knowledge and to further improve skills. Some companies, such as Horizon, have already developed web-based trainings such as Trainsmart, a food safety program in order to capture this growing market. Not only does Trainsmart provide a convenient style of learning about food safety , but it is also an efficient way to save time and money as well as meet requirements for yearly Hazard Analysis Critical Control Point (HACCP) training requirements (Lowe, 2008).

Miscellaneous Applications

In terms of education, on-line payment systems can often work in conjunction with virtual cafeterias as a constructive way of communicating between CNPs and parents. For instance, on-line payment systems permit parents to put money on their children's meal account, check meal balances at any time, and receive reminder emails when the account balance is low (Oehlsen, 2007). Furthermore, many systems are built with the ability to let parents see what their children are eating in the cafeteria each day and to set diet restrictions, which is especially useful for those children with allergies (Prepared Foods, 2008). Utilizing on-line payment systems has the potential to make bad checks a worry of the past and is increasing the ability of CNPs to become cashless. In fact, some school districts have seen an increase in revenues of up to 20% over a three year span due to on-line payment systems because buying lunch is more convenient (Deluzuriaga, 2006).

In addition to using the Internet for communicating with parents and students, CNPs are turning to intra-district networks (intranets) to improve communication between central office and kitchen managers. Because most CNPs have multiple sites, intranets enable CNDs to post policies, financial records, forms, announcements, and surveys on one central site for managers to access. In turn, kitchen managers can respond to problems in the kitchens by using modules designed to report kitchen equipment and supply needs, technology problems, vendor issues, work order requests, substitute needs, as well as participate in discussions with each other via a community discussion board.

Plus, intranets can eliminate many of phone calls and paperwork, which translates into time savings and increased productivity.

Besides improving communication, personnel management programs can also give CNDs greater control over their department's labor costs. Many programs track labor hours by school, assist with scheduling, monitor employee benefits, and use the computer as a time clock. Over time, these features can reduce production shortages or surpluses and can eliminate clerical positions needed for manual calculations. Furthermore, by the establishment of measurable financial and personnel standards through technology, CNDs can assess and benchmark their own food service operations. Such actions can also lead to brainstorming about why certain schools are exceeding or failing and can act as a catalyst for needed change.

Challenges and Barriers to Acquiring Technology

According to the National Food Service Management Institute (NFSMI) Research Task Force (1999) computer technology was one of the ten significant research categories to be addressed in future research projects. In addition, the NFSMI, as early as 2000-2001, identified computer application knowledge as one of the core competencies needed for child nutrition supervisors and directors. Therefore, the school foodservice industry appears to be aware of the need for computer technology and its apparent benefits.

The US Department of Education also acknowledges the need for technology. Through a recent initiative, the Department of Education has urged schools districts to take steps to improve e-learning, broadband access, and the use of digital content and integration of soft data systems (National Education Technology Plan, 2004). As

mentioned earlier, while some school districts have explored various options for technology in their operations, numerous districts are still using outdated systems and have limited access to technology (NCES, 2005). In 2005, the National Center for Education Statistics released a report stating that only 37% of school districts employed a full-time, salaried technology coordinator. Regardless, minimal technology utilization in districts may be significantly due to inadequate space for hardware in offices or cafeterias, inadequate wiring infrastructure, and lack of compatible software. Inevitably, such deficiencies are expensive to address. Lack of funding has historically been a source of frustration to many CNDs, and the near future promises little hope in that regard as school districts tighten budgets.

In a recent survey conducted by the School Nutrition Association in 2009, over 75% of CNDs (n=1200) were concerned about government funding and the cost of food and labor (SNA, 2009). Adequate funds for potential technology purchases such as hardware/ software, training, and maintenance fees may likely be of a continuing concern for directors desiring to purchase new technology or upgrade current programs. Administrative and school board approval may be additional deterrents if funds needed for new technology or software have to be supplemented from the district's general fund. Finally, lack of computer skills and uneasiness around computers and technology can be a barrier for some CNDs. Subsequently, these CNDs are at risk for remaining behind in identifying creative and efficient ways to operate their child nutrition programs.

CHAPTER III

METHODOLOGY

The Texas Woman's University (TWU) Institutional Review Board (IRB) reviewed methods used in this study, and an approval to use human subjects in research was obtained prior to contacting participants.

Sample Selection

The target population was CNP directors' in the Southwest Region of the United States. The Southwest Region included the states of Arkansas, Louisiana, New Mexico, Oklahoma, Kansas, Colorado, and Texas. The sample was taken from the School Nutrition Association's (SNA) member database of CNP director's in the Southwest Region. There were approximately 630 CNDs listed in the SNA database and a sample of 500 participants was selected using Excel for randomization. Over-sampling of major city districts was conducted due to the small number of these types of districts. For this research, a major city district was considered a district residing in a city with $\geq$ 200,000 people. Over-sampling was done by including all CNP directors (n= 23) in the Southwest Region sample who were operating districts categorized as Major City Districts in the SNA member database. Due to a lower than expected survey return rate, the American Dietetic Association's School Nutrition Services Dietetic Practice Group members was also contacted for participation via the group's listserv.

Instrument Development

A list of questions related to technology use in CNPs was developed based on literature review, input from two CNDs, four committee members, and the researcher's personal work experience as the Assistant Director of Student Nutrition at Carrollton-Farmers Branch ISD. Input from CNDs and committee members was collected through telephone conversations, emails, and personal one-on-one meetings.

Demographic questions in Section I of the questionnaire asked about school district size, participation in federally funded school nutrition programs, number of staff in the department, and department food and labor cost information. Other questions focused on the CND and included number of years employed as a CND, number of years employed in CNPs, age, level of education, credentialing [(i.e. registered dietitian (RD), school nutrition specialist (SNS)], and perceived computer knowledge and skill level. Demographic information was asked using short answers or multiple choice/selection-type questions.

Following the demographic questions, Section II of the questionnaire asked CNDs to identify what types of software applications were currently being used in their CNP. This question was formatted as a multiple answer question (e.g., types of technology used, types of software used), and software applications were categorized into the following groups: office applications, menu and food-related applications, state reporting and meal applications, training and education applications, safety and security applications, and miscellaneous applications. Each group contained three to five specific

software applications. This was done for organizational purposes and to simplify the answering process for participants.

Section III - A of the questionnaire asked participants to rate how effective their current technology and software programs were in terms of helping them attain department goals. Categories used in this section included financial management, menu and food management, safety and security, regulatory requirements, labor management, communications, and miscellaneous needs.

Lastly, Section III - B asked participants to identify challenges or barriers to purchasing new software or technology while Section III- C asked participants to indicate what technology or software they thought would be most important to purchase in the future. All questions in Sections III were Likert-type questions (e.g., perceived effectiveness, level of agreement with statements about barriers, and perceived importance).

Expert Panel Review

After the questionnaire was developed, the Delphi technique (Linstone & Turoff, 1975) was used with a panel of child nutrition experts to assess the validity of the questionnaire. These experts were identified by suggestions from area CNDs and professional organizations such as the North Texas Child Nutrition Directors Association and the Texas Association for School Nutrition. Fifteen experts were invited by email to serve as panel members. Along with the email invitation, a $20 gift card to Wal-Mart was also used as an incentive to encourage participation. Of the fifteen invited experts, nine agreed to participate and were sent the initial questionnaire. The participants were

asked to review the questionnaire for validity and inclusiveness of questions as well as to provide feedback.

After feedback was received, the expert panel's suggestions and comments were summarized and the questionnaire was restructured. The revised questionnaire was then sent to the panel again for additional comments. After the questionnaire was sent for the second time, no additional comments were made; therefore it was assumed that all expert panel members involved were in agreement with the restructuring changes. Additional suggestions, however, were made by two committee members, a statistician, and the researcher in regard to grouping, readability, and consistency of several questions. Revisions were made following these suggestions and the questionnaire's content was finalized. The questionnaire was then formatted and converted into an on-line version through PsychData in order to prepare for the pilot study.

Pilot Study

A pilot study was conducted to evaluate the internal reliability of the questionnaire. The questionnaire was sent to 21 CNDs in the North Texas regional area who were not part of the study sample. To increase participation, five $20 gift cards to Wal-Mart were given in a drawing as an incentive to five participating directors. Twelve directors volunteered to participate and were asked via email to complete the questionnaire on-line and to provide concerns and suggestions regarding the content, format, and readability of questions.

Once the pilot study data collection was completed, data was entered into SPSS for internal reliability analyses. Inter-rater and inter-item reliability tests were conducted

using Cronbach's alpha analyses on Sections III only. Because Section III -A was broken into categories for rating the effectiveness of software and technology, we conducted a Cronbach's alpha analysis on each category. The inter-item reliability results were as follows: financial management $\alpha \geq 0.72$, menu and food management $\alpha \geq 0.93$, safety and security $\alpha \geq 0.79$, regulatory $\alpha \geq 0.83$, labor management $\alpha \geq 0.95$, communication $\alpha \geq 0.808$, and miscellaneous $\alpha \geq 0.95$. An average was also done for all of the above categories in Section III and the result was $\alpha \geq 0.85$. Furthermore, Section III-B of the questionnaire which related to the level of agreement with statements regarding different barriers and challenges to purchasing software or technology had a Cronbach's alpha score of $\alpha \geq 0.715$ and Section III-C regarding the rating of importance of future software or technology purchases had a score of $\alpha \geq 0.78$. In addition to the Cronbach's alpha outcomes, recommendations from the participants were included in the final revision of the questionnaire.

Data Collection

The questionnaire was initially sent as a paper copy with a cover letter to 500 CNP directors. In addition to the paper copy, a web-based version was available for convenient data entry through PsychData. The cover letter included a link to the PyschData website as well as the survey number for participants who preferred to answer the survey in an on-line format. A postcard was mailed to all 500 CNP directors two weeks after the initial mailing to remind the recipients to return the survey and/or thank them for responding to the survey. Two weeks after the postcard was sent, a follow-up email was sent to each respondent who had an email address and who had not

participated in the study (n=243). At this time, an email was also posted to the American Dietetic Association's School Nutrition Services Dietetic Practice Group listserv inviting members who were school nutrition administrators to participate in the study. An additional time of two weeks was given for each respondent to answer the questionnaire. A total of 6 questionnaires were completed from listserv members.

Statistical Analyses

SPSS was used for statistical analysis. Descriptive statistics such as frequencies mean scores, and standard deviations were calculated to summarize data. For HO^2, HO^4 and HO^8, Pearson's correlation coefficients were calculated to examine the differences in data distribution for the variables of number of meal equivalents, food cost per meal, labor cost per meal, CND age, years of CND experience, CND computer skill level, and CND education level, compared to types of technology currently used, effectiveness of current technology used, barriers to purchasing technology/software, and the importance of future technology/software purchases.

Pearson's correlation coefficients were also used with HO^6 in the same way but the labor cost or food cost variables were not used. All Likert-type questions were evaluated by central tendency (mean) of the responses. For HO^1, HO^3, and HO^7, MANOVAs were used to compare differences between menu planning, number of meal equivalents served, CND education level, and perceived computer knowledge/skill level with types of technology currently used, effectiveness of current technology use, barriers to purchasing technology/software, and the importance of future technology/software

purchases. MANOVA was also used with HO^5 in the same way but meal planning not used. Statistical significance was set at $p < 0.05$.

CHAPTER IV

RESULTS AND DISCUSSION

Response Rate

From the 500 questionnaires sent through the mail to SNA CNDs and from the invitation distributed to the American Dietetic Association (ADA) School Nutrition Services Dietetic Practice Group listserv, 118 were returned. Of these, 111 questionnaires were usable for data analyses including 105 from the SNA mailing list and 6 from the ADA listserv. Fifty three respondents started the questionnaire online but did not finish it by the specified deadline. Seven questionnaires were from respondents who did not fully or accurately complete the questionnaire.

Demographic Characteristics

Demographic characteristics of the community size where respondents worked are listed in Table 1. Most respondents stated that they worked in suburban (2,500-50,000 people, 36%), rural (<10,000 people, 22.5%), or small metropolitan communities (50,100-500,000 people, 19.8%). All respondents reported participation in the National School Lunch Program with 62% of respondents serving almost 5,000 reimbursable lunch meals per day. All but one respondent stated they participated in the School Breakfast Program with 51.3% serving $\leq$ 1500 reimbursable breakfast meals per day. Over half of the respondents (61.3%), used Traditional Food Based Menu Planning with only 27.9% using Nutrient Standard Menu Planning. Furthermore, 51.3% of respondents

reported their daily food cost per meal to be within $1.00 to $1.49 and 47% of respondents reported their labor cost per meal to be within the same dollar range. Of the 111 respondents, 26 (21.6%) indicated they had earned a high school diploma or an Associate's degree, 50 (45%) had a Bachelor's degree or some grad school, and nearly 35 (31.5%) held a Master's degree or higher (see Table 2). More than a third of respondents (36.0%) reported being School Nutrition Association certified and over a fourth of respondents (27.9%) were registered dietitians or school nutrition specialists (27.0%). In addition, the majority of respondents (52.2%) were between 50-59 years of age and had worked in their current CNP for ≤ 10 years (52%). Remarkably, 36.9% of respondents stated they had worked as CNDs for 16 or more years and had been in their current CNP for the same number of years.

Table 1

Demographic Characteristics of Child Nutrition Programs

	N	%
Size of community (n=111)		
Rural (<2,500)	10	9.0
Rural (<10,000)	25	22.5
Suburban (2,500 - 50,000)	40	36.0
Small Metropolitan (50,000 - 500,000)	22	19.8
Medium Metropolitan (500,000 - 1 million)	7	6.3
Large Metropolitan (>1 million)	7	6.3

(continued)

Table 1, continued

Demographic Characteristics of Child Nutrition Programs

	N	%
Participation in the NSLP (n=111)		
Yes	111	100
No	0	0
Participation in the SBP (n=111)		
Yes	110	99.1
No	1	.9
No. of meal equivalents for lunch (n=110)		
≤ 1,500	28	25.5
1,501- 4,999	34	30.9
5,000 – 9,999	20	18.1
≥10,000	28	25.4
No. of meal equivalents for breakfast (n=109)		
≤ 1,500	56	51.4
1,501- 4,999	31	28.4
5,000 – 9,999	7	6.4
≥10,000	15	13.8
Type of meal planning (n=111)		
Traditional food based	68	61.3
Nutrient standard	31	27.9
Enhanced food based	9	08.1
Other[a]	3	02.7

(continued)

Table 1, continued

Demographic Characteristics of Child Nutrition Programs

	N	%
Daily food cost per meal (n=111)		
≤ $0.99	26	23.4
$1.00 - $1.49	57	51.4
$1.50 - $1.99	16	14.4
≥ $2.00	12	10.8
Daily labor cost per meal (n=79)		
≤ $0.99	30	37.9
$1.00 - $1.49	33	41.7
$1.50 - $1.99	16	20.2

Note. [a]Other include: Both traditional and enhanced, 3 steps for healthy school meals

Table 2

Demographic Characteristics of Child Nutrition Directors (N=111)

	N	%
Level of Education		
High school graduate/diploma	24	21.6
Associate's degree	2	01.8
Bachelor's degree	33	29.7
Some graduate school towards Master's	17	15.3
Master's degree	30	27.0
Some graduate school towards Doctorate	4	3.6
Doctoral degree	1	.9

(continued)

Table 2, continued

Demographic Characteristics of Child Nutrition Directors (N=111)

	N	%
Credentials[a]		
Registered Dietitian	31	27.9
Licensed Dietitian	19	17.9
SNA Certified	40	36.0
School Nutrition Specialist	30	27.0
Certified Dietary Manager	5	4.5
Other[b]	28	25.2
Age		
25-39 years	13	11.7
40-49	27	24.3
50-59	58	52.2
≥60	13	11.7
No. of years working as a CND		
≤5 years	23	20.7
>5 and ≤10	29	26.1
>10 and ≤15	18	16.2
>15	41	36.9
Perceived computer knowledge and skill level		
Basic user	8	07.2
Average user	25	22.5
Advanced user	73	65.8
Expert user	5	04.5

Note. [a] Some respondents held more than one certification. [b] Other:TASN certified, Serv Safe, various state, district, and food industry certifications.

Demographic information showed that almost three-quarters of respondents (70.3%) perceived themselves as having advanced computer knowledge and skills. As defined in the questionnaire, an advanced user was someone who could easily use all Windows applications as well as operate multiple software programs (POS, menu analysis, and inventory) and web-based applications such as online payment systems, purchasing, and web-training. In contrast to the respondents who defined themselves as advanced users, 30.7% of respondents felt they were basic to average users who were only comfortable with keyboard/mouse usage, basic word processing and accounting programs, surfing the Internet, accessing email, and using school district databases.

In terms of current technology use (see Table 3), office applications were used most often with a category average of 82.7%. Of the office applications listed, word processing and email were used by 98.2 % of respondents, while the second most frequently utilized types of applications were menu/food related with POS and menu planning systems being used by 91.0% and 78.4% of districts, respectively. The internet usage by CNPs was significant as well, with over half of all respondents employing online applications including: online training programs (61.3%), online meal application reporting (52.2%), and online payment systems (51.4%). Few respondents, however, were using technology in the areas of reimbursable meal vending machines (4.5%), student nutrition education software (5.4%), and virtual cafés (9.0%).

Table 3

Technology/Software Utilization in Child Nutrition Programs (N=111)

	N	%
Office Applications		
Word processing	109	98.2
Spreadsheet/financial management (i.e.Excel)	104	93.7
Presentation (i.e.Power Point/Mac)	90	81.1
Email (i.e. Outlook)	109	98.2
Database management (i.e. Access)	47	42.3
Menu and Food Related Applications		
Menu planning	87	78.4
Inventory manager	48	43.2
On-line purchasing	75	67.6
Point-of-sale	101	91.0
Reimbursable meal vending machines	5	4.5
Other (In-house program, Master Cook, Power Lunch)	6	5.4
State Reporting and Meal Application		
Free/reduced meal application	13	11.7
Meal application scanning	27	24.3
On-line meal application reporting	58	52.2
On-line reimbursement claim reporting	13	11.7
Training and Education Applications		
Student nutrition education	6	5.4
On-line training (webinars/web-based training modules)	68	61.3
Website manager (virtual café)	10	9.0
Web-based department intranet	44	39.6

(continued)

Table 3, continued

Technology/Software Utilization in Child Nutrition Programs (N=111)

	N	%
Safety and Security Applications		
On-line food training monitoring	19	17.1
Biometrics (i.e. finger scanning)	17	15.3
Security (web-cam viewing)	29	26.1
Miscellaneous Applications		
On-line payment systems	57	51.4
Personnel management (i.e. Kronos)	40	36.0
TV's, digital media for marketing	21	18.9

The Questionnaire

Child Nutrition Director's Perceived Effectiveness of Current Technology/Software Utilization in Meeting Department Goals

For this section of the questionnaire, a Likert-type rating scale was used; a "1" was considered to be "not effective at all" and "5" was considered to be "very effective." Respondents found technology to be most effective in helping them meet regulatory related goals such as reimbursement claim reporting (Mean=4.72, standard deviation [*SD*] =0.61), meal application processing and verification (Mean=4.64, *SD* 0.75), and in passing Coordinated Review Effort (CRE) visits (Mean=4.39, *SD* 0.97). This finding is likely due to the fact that these goals are required and if not completed, the CNP would

not be able to receive federal funding. Mean scores and standard deviations of technology effectiveness are shown in Table 4.

Table 4

Child Nutrition Director's Perceived Effectiveness of Current Software/Technology in Helping to Meet Department Goals (N=111)

	Mean±*SD*[a]
Financial Management	
Monitoring Financial Information (i.e.Sales/Expenses)	4.34±1.01
Budgeting/Strategic Planning	4.06±1.21
Controlling Food Costs	3.90±1.51
Controlling Labor Costs	3.78±1.18
Menu and Food Management	
Menu Planning and Analysis	4.31±1.11
Food Production Processes	3.96±1.18
Inventory Management	3.78±1.33
Waste Reduction	3.27±1.27
Safety and Security	
Student Identification Security	4.15±1.09
Food Safety	3.44±1.20
Food Theft	3.04±1.41
Regulatory	
Accurate State Reimbursement Claim Reporting	4.72±0.61
Accurate Meal Application Processing and Verification	4.64±0.75
Coordinated Review Effort (CRE) site visit	4.39±0.97

(continued)

Table 4, continued

Child Nutrition Director's Perceived Effectiveness of Current Software/Technology in Helping to Meet Department Goals (N=111)

	Mean±*SD*[a]
Labor	
Personnel Management (i.e.Time/Attendance, Benefits)	4.30±6.04
Employee Productivity	3.58±1.18
Employee Training	3.52±1.27
Communication	
District and Department Communication	4.26±0.98
Parent/Student Communication	3.86±1.16
Student Nutrition Education	3.62±1.31
Student Marketing	3.57±1.37
Miscellaneous	
Innovation and Creativity	3.63±1.52
Customer Satisfaction	3.49±1.52
Improved Participation Rates	3.34±1.21

Note. [a] Scores rated on a scale of 1-5 with 5= Very effective and 1= Not effective at all

In addition, respondents found technology to be highly effective in monitoring financial information (Mean=4.34, *SD*=1.01), menu planning/analysis (Mean=4.31, *SD*=1.11), and personnel management (Mean=4.30, *SD*=6.04). These findings imply that financial control, menu management, and personnel related activities are of utmost importance and technology/software is very effective in helping CNDs run a productive CNP. These results also validate the work of Matthews, Bedford, and Hiemstra (1986)

who found that electronic spreadsheet and database programs were the most useful software programs in school food service as they automated labor intensive tasks including menu planning/analysis and cost containment. Likewise, it confirms research by Val Almelo, 1991, and Collins, 1992 who suggested that CNDs need a computer package that handles menu management, inventory, financial management and POS's to collect data. These findings also indicate that the financial management software developed and specifically targeted to CNDs by the NFSMI in 2008 is effectively being used (NFSMI, 2008).

Less effective types of technology/software, however, were related to waste reduction (Mean=3.27, *SD*=1.27) and food theft (Mean=3.04, *SD*=1.41), suggesting that respondents did not feel these goals needed immediate attention or respondents may not be using technology to monitor or control them. Overall, it is important to mention that technology/software was rated at a Mean effectiveness of 3.0 or higher for all department goals, therefore, technology/software was considered to be at least somewhat effective by most respondents.

Child Nutrition Directors' Perceived Agreement/Disagreement with Barriers to Purchasing New Technology and Software

A Likert-type rating scale was also used in this section with "1" considered to be "strongly agree" and "5" considered to be "strongly disagree." Results in Table 5 show that most respondents were close to disagreeing with the barriers of unsupportive administration (Mean=3.96, *SD*=1.02), kitchen wiring issues (Mean=3.91, *SD*=1.10), inadequate kitchen space (Mean=3.90, *SD*=1.15), or out-dated computers (Mean=3.90,

SD=0.99) when trying to purchasing new technology or software. Many CNDs, however, did slightly agree with the barrier of not having enough money to purchase new technology (Mean=2.90, *SD*=1.37).

Table 5

Child Nutrition Directors' Perceived Agreement/Disagree with Barriers to Purchasing New Software or Technology (N=111)

	Mean±*SD*[a]
The administration for the district does not support technology in my department.	3.96±1.02
The district does not have the wiring capabilities for new technology or computers.	3.91±1.10
There is not enough space in the school kitchens to add computers.	3.90±1.15
The district's computers are too old to run the newer technologies and programs.	3.90±0.99
The district does not have well trained or strong technology department.	3.74±1.20
I do not know enough about new technology or software programs to purchase them.	3.71±0.99
The district does not have a supportive technology department.	3.64±1.19
It will cost too much money to update my old software programs to new programs.	3.35±1.22
Training my staff on new technology or software is too time intensive.	3.23±1.11
I do not have enough money to purchase new technology or software programs.	2.90±1.37

Note. [a] Scores are 5= Strongly Disagree, 4= Disagree, 3= Neutral, 2= Agree, 1= Strongly Agree

Overall, respondents remained relatively neutral in regard to the barriers of purchasing technology and software. The researchers did not expect this outcome, and feel the results may be due to the fact that most respondents considered themselves to be advanced users and were more confident with their computer skills than expected. Too, a majority of respondents (55%, n=62) stated that they were working in suburban or small metropolitan communities where IT departments may be more advanced in technology use and therefore, more likely to support and embrace new technologies and software. Besides working in larger communities, some respondents could be employed by in wealthier districts, therefore allowing them to put money into a fund balance for later technology purchases. As well, CNDs with longer tenure in their CNPs may have had sufficient time to develop a strong rapport with the administrative staff and school board, enabling them to gain the support needed for technology purchases.

Child Nutrition Directors' Perceived Importance of Technology/Software Programs for Future Purchase

A Likert-type rating scale was again used in this section of the questionnaire with a "1" considered to be "not important at all" and "5" considered to be "very important." Menu planning and analysis (Mean=3.85, *SD*=1.32), point-of-sale (Mean=3.80, *SD*=1.48), and inventory management software (Mean=3.78, *SD*=1.24) were rated by respondents as the three most important future software purchases (see Table 6). Clearly, all of these software programs relate to the category of menu and food related applications. This finding indicates that technology/software applications which help manage time and labor intensive responsibilities such as menu writing, inventory

tracking, and monitoring food sales are top priorities to CNDs. These findings also reinforce the idea that well designed menu programs can decrease department costs by streamlining the work of combining menu items, refining purchasing procedures, and increasing inventory turnover (Riell, 2000).

Taken as a whole, 13 out of 19 programs had a Mean of >3.0 which indicates that respondents think a majority of technology and software available to CNPs is somewhat important to purchase in the future in order to meet department goals. Further, Table 6 also shows that respondents plan to purchase at least 2 new forms of technology in the next two years. Although a large group of respondents were already using many types of applications as evidenced by previous date, they still rated them as important future purchases. This implies that CNDs recognize the need for technology/software and are aware of the need to purchase more as regulations and trends change. In contrast, reimbursable meal vending machines, virtual cafés, biometrics, and digital media for marketing purposes were not rated as very important to meeting future department goals. This result may be due to the fact that these newer, more expensive types of technologies are used to enhance CNPs rather than meet the fundamental needs of the food service operation. It could also be true that some CNDs still need to purchase basic types of technology/software before allocating funds to purchase technology viewed as more of an "added value" and not a necessity. In the area of biometrics, however, this may change as the government has considered requiring finger scanning as a means of identification (White, 2007).

Table 6

Child Nutrition Directors' Perceived Importance of Technology/Software Programs for Future Purchase (N=111)

	Mean±*SD*[a]
Menu Planning and Analysis	3.85±1.32
Point-of-Sale	3.80±1.48
Inventory Management	3.78±1.24
Free/Reduced Application	3.60±1.59
Online Payment (i.e. PayPams)	3.60±1.49
Word Processing (Word, etc.)	3.46±1.46
Online Purchasing	3.53±1.33
Financial Management (Excel, Quicken, Quickbooks)	3.43±1.48
Online Training	3.24±1.18
Online Food Temperature Monitoring (via Sensors)	3.13±1.23
Personnel Management (i.e. Kronos)	3.09±1.39
Meal Application Scanning	3.07±1.51
Security (web-cam viewing)	3.06±1.30
Web-based Department Intranet	2.99±1.28
Student Nutrition Education	2.94±1.13
TV's, Digital Media for marketing	2.81±1.28
Biometrics (i.e. finger scanning)	2.77±1.29
Website Manager (Virtual Café's)	2.66±1.17
Reimbursable Meal Vending Machines	2.13±1.20
Number of software/ technology programs planned for purchase in next 2 years	2.44±1.10

Note. [a] Scores are rated on a scale from 1 - 5 with 5=Very important and 1=Not important at all

Correlations

Pearson correlation coefficients were calculated to examine correlations between the six independent variables of 1) food cost per meal, 2) labor cost per meal, 3) CND age, 4) years of work experience as a CND, 5) perceived computer skill level, and 6) education level and the dependent variables of 1) types of technology/software used in CNPs, 2) the effectiveness of existing technology on meeting department goals, 3) barriers to purchasing new technology/software, and 4) importance of future technology/software purchases. The following paragraphs discuss the correlations between independent variable and dependent variables with supplemental reference tables.

Food Cost

Two relatively weak positive correlations were found between CNPs with higher food costs and the total number of state reporting and meal applications used ($r = .299$) and total number of office applications used ($r = .210$) to meet department goals (see Table 7). Food costs do not necessarily affect the use of these two application categories and can vary for a variety of reasons in each district. Consequently, it is difficult to evaluate exactly what this data means. No statistically significant relationships existed between food cost and technology/software effectiveness or the importance of future technology purchases (see Table 8 and Table 9).

Table 7

Correlation Coefficients between Food Cost and the Types of Software/Technology Used in Child Nutrition Programs (N=110)

	r	p
State Reporting and Meal	.299*	.002
Office	.210*	.002
Miscellaneous	.034	.729
Safety and Security	.009	.924
Menu and Food	.016	.873
Training and Education	-.071	.465
Total	.122	.209

Note. * $p < .05$

Table 8

Correlation Coefficients between Child Nutrition Program Food Cost and the Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Financial Management		
Controlling Food Costs	-.131	.177
Controlling Labor Costs	-.042	.665
Monitoring Financial Information (Sales/Expenses, etc.)	.025	.800

(continued)

Table 8, continued

Correlation Coefficients between Child Nutrition Program Food Cost and the Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Menu and Food Management		
Inventory Management	-.174	.072
Food Production Processes	-.094	.335
Waste Reduction	-.090	.354
Menu Planning and Analysis	.006	.950
Safety and Security		
Food Theft	-.130	.180
Food Safety	-.052	.593
Student Identification Security	-.090	.354
Regulatory		
Accurate State Reimbursement Claim Reporting	-.010	.918
Coordinated Review Effort (CRE) site visit	-.104	.283
Accurate Meal Application Processing and Verification	.058	.553
Labor		
Employee Productivity	-.188	.051
Personnel Management (Time/Attendance, Benefits)	-.115	.236
Employee Training	-.106	.276
Communication		
District and Department Communication	-.080	.413
Student Nutrition Education	-.033	.733
Parent/Student Communication	.000	.997
Miscellaneous		
Innovation and Creativity	-.141	.144
Improved Participation Rates	-.124	.200
Student/Staff Marketing	-.049	.615
Customer Satisfaction	-.026	.788

Note. $*p < .05$

Table 9

Correlation Coefficients between Food Costs and the Perceived Importance of Future Computer Technology/Software Purchases for Child Nutrition Programs (N=110)

	r	p
Free/Reduced Application	.101	.299
Meal Application Scanning	.093	.336
Inventory Management	.091	.347
Online Purchasing	.082	.398
Reimbursable Meal Vending Machines	.072	.457
Student Nutrition Education	.067	.492
Point-of-Sale	.063	.520
Security (web-cam viewing)	.057	.557
Word Processing (Word, etc.)	.051	.600
Website Manager (Virtual Café's)	.047	.628
Menu Planning and Analysis	.040	.684
Financial Management (Excel, Quicken, Quickbooks)	.022	.823
Personnel Management (i.e. Kronos)	.016	.867
Online Training	.011	.907
Biometrics (i.e. finger scanning)	-.071	.463
Online Food Temperature Monitoring (via Sensors)	-.055	.574
Online Payment Programs (i.e. PayPams)	-.050	.606
TV's, Digital Media for marketing	-.049	.616
Web-based Department Intranet	-.021	.829

Note. $*p < .05$

Labor Cost

Similar to food cost correlations, there was a weak positive correlation between higher labor costs and the number of office applications used (r = .262) and menu and food applications used (r = .259; see Table 10). A weak positive correlation was also shown between higher labor costs and the effectiveness of technology in the area of budget and strategic planning (r = .241; see Table 11). It is difficult to completely understand why these results were found as labor costs can vary a great deal depending on each school district's circumstances. For example, labor costs can be higher due to the district being located in area where it is difficult to hire a qualified labor force. Moreover, most CNDs have to abide by their school district's salary scales which may not be competitive enough with surrounding food service establishments to recruit a sufficient amount of applicants for open positions. As well, contract labor may have to be used if the labor force is non-existent and unavailable for hire. Whatever the reason, and independent of whether the labor costs are high or low within a CNP, technology is likely needed to assist with scheduling, tracking of employee hours, and budgeting and strategic planning for labor needs on a yearly, and often monthly or daily basis. No significant relationships between labor costs and importance of future technology purchases were found (see Table 12).

Table 10

Correlation Coefficients between Labor Cost and the Types of Software/Technology Used in Child Nutrition Programs (N=110)

	r	p
Menu and Food	.262*	.007
Office	.259*	.008
Safety and Security	.086	.387
Training and Education	.079	.426
State Reporting and Meal	-.038	.701
Miscellaneous	-.023	.817
Total	.147	.137

Note. * $p < .05$

Table 11

Correlation Coefficients between Child Nutrition Program Labor Cost and the Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Financial Management		
Budgeting/Strategic Planning	.241*	.014
Controlling Labor Costs	.092	.354
Controlling Food Costs	.062	.532
Monitoring Financial Information (Sales/Expenses, etc.)	.037	.709

(continued)

Table 11, continued

Correlation Coefficients between Child Nutrition Program Labor Cost and the Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Menu and Food Management		
Waste Reduction	.111	.263
Menu Planning and Analysis	.092	.351
Food Production Processes	-.045	.650
Inventory Management	-.022	.828
Safety and Security		
Food Theft	.007	.946
Student Identification Security	-.091	.356
Food Safety	-.016	.875
Regulatory		
Accurate Meal Application Processing and Verification	.012	.905
Coordinated Review Effort (CRE) site visit	-.086	.386
Accurate State Reimbursement Claim Reporting	-.004	.966
Labor		
Employee Productivity	.090	.361
Personnel Management (Time/Attendance, Benefits)	.050	.612
Employee Training	-.022	.827
Communication		
District and Department Communication	-.153	.122
Parent/Student Communication	-.124	.208
Student Nutrition Education	-.079	.425
Miscellaneous		
Innovation and Creativity	.149	.130
Improved Participation Rates	.061	.539
Customer Satisfaction	-.037	.709
Student /Staff Marketing	-.027	.787

Note. $*p < .05$

Table 12

Correlation Coefficients between Child Nutrition Program Labor Cost and the Perceived Importance of Future Computer Technology/Software Purchases (N=110)

	r	p
Reimbursable Meal Vending Machines	.187	.058
Website Manager (Virtual Café's)	.070	.480
Online Training	.068	.494
Online Purchasing	.066	.505
Biometrics (i.e. finger scanning)	.066	.504
Web-based Department Intranet	.065	.511
Security (web-cam viewing)	.062	.532
Personnel Management (i.e. Kronos)	.035	.722
Inventory Management	.018	.854
Meal Application Scanning	-.115	.244
Word Processing (Word, etc.)	-.074	.456
Student Nutrition Education	-.072	.469
Point-of-Sale	-.066	.505
Free/Reduced Application	-.058	.560
Financial Management (Excel, Quicken, Quickbooks)	-.025	.798
Online Payment Programs (i.e. PayPams)	-.010	.918
Online Food Temperature Monitoring (via Sensors)	-.007	.948
TV's, Digital Media for marketing	-.005	.957
Menu Planning and Analysis	-.003	.974

Note. $*p < .05$

Age

The correlation analysis between age and the types of technology used to meet department goals revealed no significant relationships (see Table 13). There was, however, a mild positive relationship, as identified in Table 14, between the effectiveness of technology in helping monitor food theft ($r = .226$) and age, which implies that older CNDs feel that technology is more effective in preventing food theft than younger CNDs. This may be due to the fact that older CNDs have a longer work history in their districts and have technology/software in place, such as strategically placed kitchen web cams, to monitor and prevent food theft. Table 15 also showed a weak positive relationship between age and the barrier of administrative support ($r = .222$). There could be many reasons as to why older CNDs do not feel they have a supportive administration. One reason could be that older CNDs, or their administrative staff, have not expanded their computer skills at the same rate that technology has grown, and therefore, are uncomfortable with using technology or do not find it be necessary. Another reason may be that older CNDs work in smaller, more rural districts, with less money, and limited connectivity due to the location of the district (NCES, 2005). Thus, they do not feel they can justify the funds for technology since they only manage a few schools. Regardless of the reason, these are important factors to consider when trying to discover ways to assist CNDs with obtaining needed funds and technology support.

In comparison, several mild negative relationships were found between age and the importance of future technology purchases (see Table 16). More specifically, 8 out of 19 technology/software programs were not found to be important future purchases.

Reasons for these results could be that older CNDs already use these programs and do not need to purchase them. Further, they do not feel that purchasing these particular technology/software programs would be as useful as purchasing other types of technology/software. Or, older CNDs may not think these types of technology/software would assist them in meeting their department goals at all.

Table 13

Correlation Coefficients between Child Nutrition Directors' Age and the Types of Technology/Software Used in Child Nutrition Programs (N=110)

	r	p
State Reporting and Meal	.022	.823
Training and Education	.007	.946
Menu and Food	-.269	.005
Miscellaneous	-.176	.066
Office	-.141	.141
Safety and Security	-.103	.285
Total	-.161	.092

Note. * $p < .05$

Table 14

Correlation Coefficients between Child Nutrition Directors' Age and Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Financial Management		
Controlling Labor Costs	.133	.165
Controlling Food Costs	.117	.225
Monitoring Financial Information (Sales/Expenses, etc.)	.066	.493
Budgeting/Strategic Planning	.033	.732
Menu and Food Management		
Waste Reduction	.137	.153
Food Production Processes	.101	.292
Inventory Management	.046	.632
Menu Planning and Analysis	.017	.858
Safety and Security		
Food Theft	.226*	.018
Student Identification Security	.070	.466
Food Safety	.022	.821
Regulatory		
Coordinated Review Effort (CRE) site visit	.060	.534
Accurate Meal Application Processing and Verification	.026	.791
Accurate State Reimbursement Claim Reporting	-.096	.319

(continued)

Table 14, continued

Correlation Coefficients between Child Nutrition Directors' Age and Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Labor		
Personnel Management (Time/Attendance, Benefits)	.175	.067
Employee Productivity	.152	.114
Employee Training	.014	.884
Communication		
Student Nutrition Education	-.064	.506
District and Department Communication	-.028	.775
Parent/Student Communication	-.005	.959
Miscellaneous		
Improved Participation Rates	.168	.079
Customer Satisfaction	.101	.294
Innovation and Creativity	.000	.999
Student/Staff Marketing	-.113	.242

Note. $*p < .05$

Table 15

Correlation Coefficients between Child Nutrition Directors' Age and the Perceived Barriers to Purchasing New Technology/Software (N=110)

	r	p
The administration for the district does not support technology in my department.	.222*	.020
There is not enough space in the school kitchens to add computers.	.177	.064
I do not know enough about new technology or software programs to purchase them.	.148	.122
The district does not have a well trained or strong technology department.	.141	.141
The district does not have the wiring capabilities for new technology/computers.	.130	.177
The district does not have a supportive technology department.	.053	.585
The district's computers are too old to run the newer technologies and programs.	.011	.908
I do not have enough money to purchase new technology or software programs.	.003	.978
It will cost too much money to update my old software programs to new programs.	-.114	.238
Training my staff on new technology or software is too time intensive.	-.035	.719

Note. * $p < .05$

Table 16

Correlation Coefficients between Child Nutrition Directors' Age and the Perceived Importance of Future Computer Technology/Software Purchases (N=110)

	r	p
Online Payment (i.e. PayPams)	-.283*	.003
Student Nutrition Education	-.255*	.007
Personnel Management (i.e. Kronos)	-.252*	.008
Website Manager (Virtual Café's)	-.240*	.012
Point-of-Sale	-.239*	.012
Online Training	-.215*	.024
Reimbursable Meal Vending Machines	-.212*	.026
Security (web-cam viewing)	-.200*	.036
Biometrics (i.e. finger scanning)	-.197*	.039
Web-based Department Intranet	-.182	.057
Online Food Temperature Monitoring (via Sensors)	-.181	.058
Online Purchasing	-.165	.084
Inventory Management	-.157	.101
Meal Application Scanning	-.154	.108
TV's, Digital Media for marketing	-.136	.155
Free/Reduced Application	-.133	.167
Menu Planning and Analysis	-.119	.214
Word Processing (Word, etc.)	-.098	.306
Financial Management (Excel, Quicken, Quickbooks)	-.094	.330

Note. $*p < .05$

Years of Work Experience as a Child Nutrition Director

As with age, there were no significant relationships found between years of experience as a CND and the types of technology used to meet department goals (see Table 17). There was, however, a mild positive relationship seen in Table 18, between food theft (r = .219), suggesting that more experienced CNDs feel technology is more effective in preventing food theft than less experienced CNDs. A very mild negative correlation was also found in Table 19 between years of experience as a CND and not having enough money to purchase new technology or software. This finding implies that more experienced CNDs disagree with the idea that inadequate funds are a significant barrier to acquiring needed technology to meet department goals.

Table 17

Correlation Coefficients between Years of Experience as a Child Nutrition Director and the Types of Technology/Software Used in Child Nutrition Programs (N=110)

	r	p
Training and Education	.329	.000
Menu and Food	.154	.154
Total	.182	.182
Miscellaneous	.094	.328
Office	.067	.489
State Reporting and Meal	-.082	.394
Safety and Security	-.007	.945
Total	.182	.182

Note. * $p < .05$

Table 18

Correlation between Years of Experience as a Child Nutrition Director and Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Financial Management		
Controlling Food Costs	.123	.199
Budgeting/Strategic Planning	.109	.255
Controlling Labor Costs	.071	.462
Monitoring Financial Information (Sales/Expenses)	.069	.476
Menu and Food Management		
Waste Reduction	.175	.067
Food Production Processes	.139	.147
Inventory Management	.139	.147
Menu Planning and Analysis	.091	.344
Safety and Security		
Food Theft	.219*	.021
Food Safety	.105	.273
Student Identification Security	.060	.533
Regulatory		
Coordinated Review Effort (CRE) site visit	.041	.672
Accurate State Reimbursement Claim Reporting	-.031	.750
Accurate Meal Application Processing and Verification	-.015	.873

(continued)

Table 18, continued

Correlation between Years of Experience as a Child Nutrition Director and Perceived Effectiveness of Software/Technology in Helping to Meet Department Goals (N=110)

	r	p
Labor		
Personnel Management (Time/Attendance, Benefits)	.161	.094
Employee Productivity	.138	.151
Employee Training	.066	.491
Communication		
Student Nutrition Education	-.064	.506
District and Department Communication	-.028	.775
Parent/Student Communication	-.005	.959
Miscellaneous		
Improved Participation Rates	.168	.079
Customer Satisfaction	.101	.294
Innovation and Creativity	.000	.999
Student/Staff Marketing	-.113	.242

Note. * $p < .05$

Table 19

Correlation Coefficients between Years of Experience as a Child Nutrition Director and the Perceived Barriers to Purchasing New Technology/Software (N=110)

	r	p
I do not have enough money to purchase new technology or software programs.	-.193*	.043
It will cost too much money to update my old software programs to new programs.	-.173	.071
The district does not have the wiring capabilities for new technology/computers.	-.124	.198
The district's computers are too old to run the newer technologies and programs	-.101	.294
There is not enough space in the school kitchens to add computers.	-.082	.397
The district does not have a supportive technology department.	.077	.426
Training my staff on new technology or software is too time intensive.	-.066	.493
I do not know enough about new technology/software programs to purchase them.	-.066	.493
The administration for the district does not support technology in my department.	-.062	.522
The district does not have well trained or strong technology department.	-.044	.650

Note. $*p < .05$

Table 20 shows that more experienced CNDs do not perceive meal application processing software to be as important as those less experienced CNDs. Therefore, it is likely that more experienced CNDs already have this type of software in place and do not need to purchase it, or they have a good system in place to handle meal application processing. As well, experienced CNDs may not work in districts with large numbers of meal applications to process; therefore they may not see the time-saving benefits of having software to handle this responsibility. It is also possible that some of the more experienced CNDs have begun to allow parents to submit meal applications electronically. In contrast, Table 20 reveals that experienced CNDs do believe that financial management software is an important future purchase. Thus, more experienced CNDs either feel they need to upgrade or try another financial management program to manage their financial data or they use a program already, yet still view financial management software to be very important.

Computer Skill Level

Most of the statistically significant correlations concerning perceived computer skill level were mild to moderate in magnitude. Many software/technology applications in Table 21 showed positive correlations between types of applications used and CNDs' perceived computer skill level meaning that CNDs with higher perceived computer skill levels use more software/technology applications. To add to this finding, Table 22 describes several positive relationships between the effectiveness of technology in meeting department goals and perceived computer skill level. More specifically, CNDs with higher perceived computer skills found technology and software to be more

effective in managing financial, menu/food related, regulatory, communication, and innovation goals than those CNDs who had lower perceived computer skill levels.

Table 20

Correlation Coefficients between Years of Experience as a Child Nutrition Director and the Perceived Importance of Future Computer Technology/Software Purchases (N=110)

	r	p
Financial Management (Excel, Quicken, Quickbooks)	.241*	.011
Word Processing (Word, etc.)	.146	.127
Online Training Programs	.066	.493
Menu Planning and Analysis Software	.053	.581
TV's, Digital Media for marketing	.021	.824
Free/Reduced Application Software	.010	.919
Point-of-Sale Software	.004	.964
Personnel Management (i.e. Kronos)	-.122	.206
Online Payment Programs (i.e. PayPams)	-.077	.426
Student Nutrition Education Software	-.076	.430
Web-based Department Intranet Programs	-.052	.593
Online Purchasing	-.042	.666
Inventory Management Software	-.035	.717
Biometrics (i.e. finger scanning)	-.031	.751
Reimbursable Meal Vending Machines	-.022	.821
Online Food Temperature Monitoring (via Sensors)	-.012	.904
Website Manager (Virtual Café's)	-.007	.944
Security (web-cam viewing)	-.006	.954
Meal Application Scanning Software	-.234*	.014

Note. $*p < .05$

Table 21

Correlation Coefficients between Child Nutrition Directors' Computer Skill Levels and the Types of Technology/Software Used in Child Nutrition Programs (N=110)

	r	p
Office	.513*	.000
Menu and Food	.433*	.000
Training and Education	.393*	.000
Miscellaneous	.381*	.000
State Reporting and Meal	.215*	.000
Safety and Security	.074	.443
Total	.487*	.000

Note. * $p < .05$

Table 22

Correlation Coefficients between Child Nutrition Directors' Computer Skill Levels and Perceived Effectiveness of Software/Technology to Help Meet Department Goals (N=110)

	r	p
Financial Management		
Budgeting/Strategic Planning	.288*	.002
Monitoring Financial Information (Sales/Expenses)	.245*	.010
Controlling Food Costs	.238*	.012
Controlling Labor Costs	.199*	.038

(continued)

Table 22, continued

Correlation Coefficients between Child Nutrition Directors' Computer Skill Levels and Perceived Effectiveness of Software/Technology to Help Meet Department Goals (N=110)

	r	p
Menu and Food Management		
Menu Planning and Analysis	.206*	.031
Inventory Management	.193*	.044
Waste Reduction	.160	.095
Food Production Processes	.141	.141
Safety and Security		
Food Safety	.179	.061
Student Identification Security	.154	.108
Food Theft	-.003	.971
Regulatory		
Accurate State Reimbursement Claim Reporting	.266*	.005
Accurate Meal Application Processing and Verification	.217*	.023
Coordinated Review Effort (CRE) site visit	.116	.227
Labor		
Employee Training	.106	.272
Employee Productivity	.071	.460
Personnel Management (Time/Attendance, Benefits)	-.177	.064
Communication		
District and Department Communication	.334*	.000
Parent/Student Communication	.212*	.025
Student Nutrition Education	.149	.119
Miscellaneous		
Innovation and Creativity	.261*	.006
Student and Staff Marketing	.212*	.026
Customer Satisfaction	.163	.088
Improved Participation Rates	.079	.414

Note. $*p < .05$

Correlation analysis between barriers to purchasing technology and perceived computer skill level also revealed that CNDs with higher perceived skill levels did not agree with many barriers to purchasing software (see Table 23). In fact, 7 out of 10 barriers were negatively associated with CNDs having higher perceived computer skill levels. Moreover, Table 24 shows that CNDs with higher perceived computer skill levels found more than half of technology/software programs important as future purchases. As discussed earlier, this might also indicate that many of the CNDs with higher perceived computer skill levels already have these programs in place, yet still feel they are important.

Table 23

Correlation Coefficients between Child Nutrition Directors' Computer Skill Levels and the Perceived Barriers to Purchasing New Technology/Software (N=110)

	r	p
The district's computers are too old to run the newer technologies and programs	-.467*	.000
I do not know enough about new technology/software programs to purchase them.	-.295*	.002
I do not have enough money to purchase new technology or software programs.	-.274*	.004

(continued)

Table 23, continued

Correlation Coefficients between Child Nutrition Directors' Computer Skill Levels and the Perceived Barriers to Purchasing New Technology/Software (N=110)

	r	p
It will cost too much money to update my old software programs to new programs.	-.273*	.004
The district does not have well trained or strong technology department.	-.254*	.008
The administration for the district does not support technology in my department.	-.223*	.019
Training my staff on new technology or software is too time intensive.	-.218*	.022
The district does not have a supportive technology department.	-.181	.059
There is not enough space in the school kitchens to add computers.	-.162	.090
The district does not have a supportive technology department.	-.056	.564

Note. $*p < .05$

Table 24

Correlation Coefficients between Child Nutrition Directors' Computer Skill Levels and the Perceived Importance of Future Computer Technology/Software Purchases (N=110)

	r	p
Security (web-cam viewing)	.329*	.000
Personnel Management (i.e. Kronos)	.307*	.001
Online Payment (i.e. PayPams)	.283*	.003
TV's, Digital Media for marketing	.281*	.003
Point-of-Sale	.280*	.003
Web-based Department Intranet	.265*	.005
Website Manager (Virtual Café's)	.249*	.009
Online Purchasing	.225*	.018
Free/Reduced Application	.214*	.024
Financial Management (Excel, Quicken, Quickbooks)	.210*	.028
Menu Planning and Analysis	.208*	.029
Online Training	.199*	.037
Inventory Management	.167	.081
Student Nutrition Education	.155	.107
Biometrics (i.e. finger scanning)	.152	.114
Online Food Temperature Monitoring (via Sensors)	.151	.115
Word Processing (Word, etc.)	.141	.141
Reimbursable Meal Vending Machines	.081	.398
Meal Application Scanning	.056	.561

Note. $*p < .05$

Education Level

There were four relatively weak positive correlations seen between education level and types of technology used (see Table 25). In general, CNDs with higher education levels used more office applications (r = .353), total software applications (r = .296), menu and food applications (r = .259), and safety and security applications (r = .193) than CNDs with less education. One very weak negative relationship appeared between education level and the effectiveness and technology in relation to food safety (r = -.198), indicating that CNDs with higher education levels were less likely to find food safety to be as effective than less educated CNDs (see Table 26). This could be because CNDs with higher education levels already had an efficient system in place or they were not using technology to monitor food safety at all. Similar to CNDs with more computer skills, CNDs with higher education levels did not agree that adequate funds, outdated computers, or technology support were barriers to future technology purchases. Due to lack of variation on the data, no statistical significance was found in the correlation between education level and importance of future technology/software purchases (see Table 28).

Table 25

Correlation Coefficients between Child Nutrition Directors' Education Level and Types of Technology/Software Used in Child Nutrition Programs (N=110)

	r	p
Office	.353*	.000
Menu and Food	.259*	.006
Safety and Security	.193*	.043
Miscellaneous	.184	.055
Training and Education	.169	.078
State Reporting and Meal	.109	.257
Total	.296*	.002

Note. * $p < .05$

Table 26

Correlation Coefficients between Child Nutrition Directors' Education Level and the Perceived Effectiveness of Technology/Software Help Meet Department Goals (N=110)

Department Goal Areas:	r	p
Financial Management		
Monitoring Financial Information (Sales/Expenses)	.087	.368
Controlling Food Costs	-.039	.687
Budgeting/Strategic Planning	-.021	.829
Controlling Labor Costs	-.005	.959

(continued)

Table 26, continued

Correlation Coefficients between Child Nutrition Directors' Education Level and the Perceived Effectiveness of Technology/Software Help Meet Department Goals (N=110)

Department Goal Areas:	r	p
Menu and Food Management		
Inventory Management	-.059	.540
Food Production Processes	-.040	.681
Menu Planning and Analysis	-.022	.817
Waste Reduction	-.019	.540
Safety and Security		
Food Safety	-.198*	.038
Student Identification Security	-.162	.091
Food Theft	-.102	.288
Regulatory		
Coordinated Review Effort (CRE) site visit	.016	.866
Accurate State Reimbursement Claim Reporting	-.031	.748
Accurate Meal Application Processing and Verification	-.013	.889
Labor		
Employee Productivity	-.046	.633
Employee Training	-.035	.716
Personnel Management (Time/Attendance, Benefits)	-.032	.737
Communication		
District and Department Communication	.010	.919
Student Nutrition Education	-.154	.107
Parent/Student Communication	-.150	.184
Miscellaneous		
Customer Satisfaction	-.155	.106
Improved Participation Rates	-.150	.117
Student/Staff Marketing	-.142	.138
Innovation and Creativity	-.076	.430

Note. $*p < .05$

Table 27

Correlation Coefficients between Child Nutrition Directors' Education Level and the Perceived Barriers to Purchasing New Technology/Software (N=110)

Barriers to Purchasing New Software or Technology:	r	p
I do not have enough money to purchase new technology or software programs.	-.235*	.013
The district's computers are too old to run the newer technologies and programs	-.214*	.025
The district does not have a supportive technology department.	-.198*	.038
It will cost too much money to update my old software programs to new programs.	-.189*	.048
The district does not have well trained or strong technology department.	-.141	.141
There is not enough space in the school kitchens to add computers.	-.117	.222
The district does not have the wiring capabilities for new technology or computers.	-.105	.275
I do not know enough about new technology/software programs to purchase them.	-.102	.288
The administration for the district does not support technology in my department.	-.091	.347
Training my staff on new technology or software is too time intensive.	-.029	.760

Note. * $p < .05$

Table 28

Correlation Coefficients between Child Nutrition Directors' Education Level and the Perceived Importance of Future Computer Technology/Software Purchases (N=110)

Computer Technology/Software Programs:	r	p
Online Payment (i.e. PayPams)	.080	.404
Point-of-Sale	.069	.475
Inventory Management	.065	.498
Personnel Management (i.e. Kronos)	.062	.518
TV's, Digital Media for marketing	.057	.555
Online Purchasing	.043	.654
Menu Planning and Analysis	.020	.833
Biometrics (i.e. finger scanning)	.010	.919
Meal Application Scanning	-.072	.056
Word Processing (Word, etc.)	-.058	.545
Student Nutrition Education	-.039	.685
Financial Management (Excel, Quicken, Quickbooks)	-.039	.685
Free/Reduced Application	-.038	.693
Web-based Department Intranet	-.037	.701
Security (web-cam viewing)	-.033	.735
Online Food Temperature Monitoring (via Sensors)	-.032	.739
Online Training	-.016	.872
Website Manager (Virtual Café's)	-.016	.871
Reimbursable Meal Vending Machines	-.006	.950

Note. $*p < .05$

Comparison of Data among Different Groups

Multivariate analysis of variance (MANOVA) calculation results revealed some differences between and among groups of respondents with diverse demographic characteristics. To quantify this, the researchers decided to group respondents into different categories within the areas of menu planning, number of meal equivalents served, education level, and computer knowledge level. For menu planning, traditional food based menu planning and enhanced food based menu planning were grouped together and nutrient standard menu planning (NSMP) and assisted nutrient standard menu planning were grouped together. This was done because food based and nutrient standard menu planning techniques are markedly different. Because there was such a wide range for numbers of meals served, groups were broken into four sizes: small (<1,800), medium (1,800-5,000), large (5,001-10,000) and very large (>10,000).

Education level varied as well, therefore the researchers grouped education levels as: high school and Associate's degree, Bachelor's degree and Bachelor's degree plus some graduate work, and Master's degree with some graduate work towards doctorate/ doctoral degree. Lastly, because the skill sets for perceived computer skills were quite different, they were grouped as basic/average users or advanced/expert users. Once the groupings were determined the means of these four independent categorical variables were compared on the following dependent variables: 1) types of technology or software applications used in CNPs, 2) effectiveness of existing computer technology and software on meeting department goals, 3) barriers to purchasing new technology or software, and 4) importance of future technology/software program purchases.

When looking at the MANOVA tables involving types of technology used, the Mean results will vary depending on the number of applications in each category. Office and menu/food categories had five applications; state reporting/meal application; training/education; and miscellaneous categories had four applications; and the safety and security category had three applications. Means in the MANOVA tables showing the perceived effectiveness of existing technology represent the level of effectiveness. "1" was considered to be "not effective at all" and "5" was considered to be "very effective." In addition, MANOVA table Means for barriers to purchasing new technology/software represent the level of agreement. "1" was considered to be "strongly agree" and "5" was considered to be "strongly disagree." Lastly, Means in the MANOVA tables regarding perceived importance of future technology/software purchases represent the indicated importance. "1" was considered to be "not important at all" and "5" was considered to be "very important." Assuming equal variances, significant differences were seen at ($p < 0.05$). The following sections will discuss each MANOVA separately.

Type of Menu Planning

A one-way MANOVA comparing types of technology used between CNDs using food based menu planning and NSMP revealed that CNDs using NSMP were more likely to use menu and food related technology/software (Mean=3.30) than CNDs who used traditional food based menu planning (Mean=2.78) (Table 29). NSMP analyzes the specific nutrient content of menu items over a week's time (3 to 7 days) using weighted or unweighted averages to ensure that meals meet required standards for key nutrients. Therefore, NSMP can be more complicated and time consuming to implement and use

than food based menu planning which uses basic meal patterns (Fox & Endahl, 1998). Due to these factors, CNDs who use NSMP may be more likely to employ software specifically designed to help analyze weekly menus in this manner. There were no significant differences seen between type of menu planning and any other dependent variables (see Tables 30 and Table 31).

Table 29

One-Way MANOVA on Types of Technology/Software Used between Type of Menu Planning Used in Child Nutrition Programs (N=107)

	n	Mean	*SD*	*F*	*p*
Office				2.85	.094
Food Based Menu Planning[a]	77	4.05	.92		
Nutrient Standard Meal Planning	30	4.37	.72		
Menu and Food Related				4.67	.033
Food Based Menu Planning	77	2.78	1.18		
Nutrient Standard Meal Planning	30	3.30	.95		
State Reporting & Meal				2.26	.136
Food Based Menu Planning	77	2.32	1.14		
Nutrient Standard Meal Planning	30	2.67	.80		
Training and Education				.75	.387
Food Based Menu Planning	77	1.13	.89		
Nutrient Standard Meal Planning	30	1.30	.95		
Safety and Security				.00	.949
Food Based Menu Planning	77	.62	.69		
Nutrient Standard Meal Planning	30	.63	.81		

(continued)

Table 29, continued

One-Way MANOVA on Types of Technology/Software Used between Type of Menu Planning Used in Child Nutrition Programs (N=107)

	n	Mean	*SD*	*F*	*p*
Miscellaneous				1.52	.221
Food Based Menu Planning	77	1.03	1.04		
Nutrient Standard Meal Planning	30	1.30	1.02		

Note. Multivariate F (6, 100) = 1.23, p = .296, partial η^2 = .069.
[a] Includes both traditional food based (n=68) and enhanced food based (n=9)

Table 30

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Type of Menu Planning (N=107)

	n	Mean	*SD*	*F*	*p*
Budgeting/Strategic Planning				.20	.652
Food Based Menu Planning[a]	77	4.01	1.27		
Nutrient Standard Menu Planning	30	4.13	1.14		
Monitoring Financial Information				.01	.943
Food Based Menu Planning	77	4.35	1.04		
Nutrient Standard Menu Planning	30	4.37	1.03		
Controlling Food Costs				.12	.727
Food Based Menu Planning	77	3.92	1.20		
Nutrient Standard Menu Planning	30	3.83	1.12		

(continued)

Table 30, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Type of Menu Planning (N=107)

	n	Mean	*SD*	*F*	*p*
Controlling Labor Costs				.01	.922
Food Based Menu Planning	77	3.79	1.23		
Nutrient Standard Menu Planning	30	3.77	1.17		
Menu Planning and Analysis				1.89	.173
Food Based Menu Planning	77	4.23	1.18		
Nutrient Standard Menu Planning	30	4.57	.97		
Food Production Processes				.76	.385
Food Based Menu Planning	77	3.91	1.21		
Nutrient Standard Menu Planning	30	4.13	1.17		
Inventory Management				1.55	.216
Food Based Menu Planning	77	3.90	1.34		
Nutrient Standard Menu Planning	30	3.53	1.38		
Waste Reduction				3.43	.067
Food Based Menu Planning	77	3.44	1.36		
Nutrient Standard Menu Planning	30	2.93	1.01		
Food Safety				.34	.559
Food Based Menu Planning	77	3.52	1.26		
Nutrient Standard Menu Planning	30	3.37	1.07		
Student Identification Security				.85	.357
Food Based Menu Planning	77	4.22	1.15		
Nutrient Standard Menu Planning	30	4.00	.98		
Food Theft				2.12	.149
Food Based Menu Planning	77	3.18	1.42		
Nutrient Standard Menu Planning	30	2.73	1.46		

(continued)

Table 30, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Type of Menu Planning (N=107)

	n	Mean	*SD*	*F*	*p*
Accurate State Reimbursement Claim Reporting				.04	.841
Food Based Menu Planning	77	4.73	.55		
Nutrient Standard Menu Planning	30	4.70	.79		
Coordinated Review Effort Site Visit				1.30	.258
Food Based Menu Planning	77	4.69	.73		
Nutrient Standard Menu Planning	30	4.50	.86		
Accurate Meal Application Processing and Verification				.24	.628
Food Based Menu Planning	77	4.40	.85		
Nutrient Standard Menu Planning	30	4.30	1.26		
Employee Productivity				.03	.867
Food Based Menu Planning	77	3.61	1.26		
Nutrient Standard Menu Planning	30	3.57	1.07		
Personnel Management				.22	.638
Food Based Menu Planning	77	4.49	7.22		
Nutrient Standard Menu Planning	30	3.87	1.14		
Employee Training				.02	.902
Food Based Menu Planning	77	3.53	1.29		
Nutrient Standard Menu Planning	30	3.57	1.28		
District and Department Communication				.00	.978
Food Based Menu Planning	77	4.27	.98		
Nutrient Standard Menu Planning	30	4.27	1.08		

(continued)

Table 30, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Type of Menu Planning (N=107)

	n	Mean	*SD*	*F*	*p*
Parent/Student Communication				.42	.518
Food Based Menu Planning	77	3.90	1.15		
Nutrient Standard Menu Planning	30	3.73	1.20		
Student Nutrition Education				.33	.570
Food Based Menu Planning	77	3.57	1.33		
Nutrient Standard Menu Planning	30	3.73	1.28		
Student/Staff Marketing				.25	.621
Food Based Menu Planning	77	3.52	1.37		
Nutrient Standard Menu Planning	30	3.67	1.40		
Improved Participation Rates				1.66	.201
Food Based Menu Planning	77	3.44	1.27		
Nutrient Standard Menu Planning	30	3.10	1.12		
Customer Satisfaction				2.58	.111
Food Based Menu Planning	77	3.62	1.17		
Nutrient Standard Menu Planning	30	3.23	1.01		
Innovation and Creativity				.00	.990
Food Based Menu Planning	77	3.66	1.62		
Nutrient Standard Menu Planning	30	3.67	1.32		

Note. Multivariate F (24, 82) = 1.20, p = .272, partial η^2 = .259

[a] Includes both traditional food based (n=68) and enhanced food based (n=9)

Table 31

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Type of Menu Planning used in Child Nutrition Programs (N=107)

	n	Mean	*SD*	*F*	*p*
Financial Management				.81	.370
Food Based Menu Planning[a]	77	3.52	1.46		
Nutrient Standard Menu Planning	30	3.23	1.52		
Word Processing				.21	.645
Food Based Menu Planning	77	3.55	1.42		
Nutrient Standard Menu Planning	30	3.40	1.57		
Menu Planning Software				.18	.676
Food Based Menu Planning	77	3.78	1.31		
Nutrient Standard Menu Planning	30	3.90	1.40		
Inventory Management Software				1.57	.214
Food Based Menu Planning	77	3.87	1.21		
Nutrient Standard Menu Planning	30	3.53	1.36		
On-Line Purchasing				.00	.962
Food Based Menu Planning	77	3.52	1.35		
Nutrient Standard Menu Planning	30	3.53	1.36		
Point of Sale				.06	.809
Food Based Menu Planning	77	3.84	1.50		
Nutrient Standard Menu Planning	30	3.77	1.43		
Reimbursable Meal Vending Machines				1.68	.198
Food Based Menu Planning	77	2.06	1.12		
Nutrient Standard Menu Planning	30	2.40	1.40		
Free/Reduced Meal Application Program				.11	.736
Food Based Menu Planning	77	3.58	1.63		
Nutrient Standard Menu Planning	30	3.70	1.49		

(continued)

Table 31, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Type of Menu Planning used in Child Nutrition Programs (N=107)

	n	Mean	*SD*	*F*	*p*
Meal Application Scanning				.42	.517
Food Based Menu Planning	77	2.99	1.52		
Nutrient Standard Menu Planning	30	3.20	1.54		
Student Nutrition Education Software				.68	.411
Food Based Menu Planning	77	3.00	1.03		
Nutrient Standard Menu Planning	30	2.80	1.35		
On-Line Training				.15	.699
Food Based Menu Planning	77	3.30	1.18		
Nutrient Standard Menu Planning	30	3.20	1.19		
Website Manager				.44	.509
Food Based Menu Planning	77	2.70	1.18		
Nutrient Standard Menu Planning	30	2.53	1.17		
Web-Based Department Intranet				.08	.777
Food Based Menu Planning	77	3.01	1.33		
Nutrient Standard Menu Planning	30	2.93	1.23		
On-Line Food Temperature Monitoring				.33	.566
Food Based Menu Planning	77	3.16	1.25		
Nutrient Standard Menu Planning	30	3.00	1.29		
Biometrics				.00	.982
Food Based Menu Planning	77	2.73	1.28		
Nutrient Standard Menu Planning	30	2.73	1.26		
Security				.08	.774
Food Based Menu Planning	77	3.05	1.29		
Nutrient Standard Menu Planning	30	3.13	1.38		

(continued)

Table 31, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Type of Menu Planning used in Child Nutrition Programs (N=107)

	n	Mean	*SD*	*F*	*p*
On-Line Payment Systems				.07	.795
Food Based Menu Planning	77	3.58	1.48		
Nutrient Standard Menu Planning	30	3.50	1.57		
Personnel Management				.01	.920
Food Based Menu Planning	77	3.13	1.36		
Nutrient Standard Menu Planning	30	3.10	1.45		
TV's/Digital Media for Marketing				.05	.817
Food Based Menu Planning	77	2.83	1.31		
Nutrient Standard Menu Planning	30	2.77	1.25		
Other				1.02	.316
Food Based Menu Planning	77	1.42	.92		
Nutrient Standard Menu Planning	30	1.63	1.19		

Note. Multivariate F (20, 86) = .66, p = .856, partial η^2 = .133

[a] Includes both traditional food based (n=68) and enhanced food based (n=9)

Number of Meal Equivalents Served

The second one-way MANOVA comparing types of technology used between <1,500, 1,501-5,000, 5,001-10,000, and >10,000 meal equivalents served per day revealed that CNPs serving a larger number of meal equivalents per day (>10,000 meals) used more types of technology in all application areas than the CNPs serving a smaller number of meal equivalents per day (<1,500 meals; see Table 32). These results indicate

that CNPs who serve a larger number of students and staff employ more technology/software to handle the increase in volume of business. It may also indicate that larger districts have more technology and IT support, and more money to spend on technology due to a larger volume of revenues.

Table 32

One-Way MANOVA on Types of Technology/Software Used between Numbers of Meal Equivalents Served in Child Nutrition Programs (N=110)

	N	Mean		*SD*	*F*	*p*
Office					13.59	.000
< 1,500	27	3.41	a	1.08		
1,501 – 5,000	30	4.07	b	.69		
5,001-10,000	22	4.41	bc	.67		
>10,000	31	4.65	c	.55		
Menu and Food Related					11.93	.000
< 1,500	27	2.00	a	1.11		
1,501 – 5,000	30	2.83	b	.99		
5,001-10,000	22	3.45	b	.80		
>10,000	31	3.39	b	1.05		
State Reporting & Meal App					15.08	.000
< 1,500	27	1.93	a	.92		
1,501 – 5,000	30	2.27	a	.74		
5,001-10,000	22	1.95	a	1.17		
>10,000	31	3.32	b	.83		

(continued)

Table 32, continued

One-Way MANOVA on Types of Technology/Software Used between Numbers of Meal Equivalents Served in Child Nutrition Programs (N=110)

	N	Mean		*SD*	*F*	*p*
Training and Education					3.83	.012
< 1,500	27	.85	a	1.10		
1,501 – 5,000	30	1.07	ab	.64		
5,001-10,000	22	1.18	ab	.91		
>10,000	31	1.61	b	.88		
Safety and Security					9.08	.000
< 1,500	27	.22	a	.42		
1,501 – 5,000	30	.40	ab	.50		
5,001-10,000	22	.77	bc	.75		
>10,000	31	1.03	c	.84		
Miscellaneous					8.71	.000
< 1,500	27	.56	a	.93		
1,501 – 5,000	30	1.03	a	.93		
5,001-10,000	22	.95	a	1.00		
>10,000	31	1.77	b	.88		

Note. Multivariate F (18, 286) = 5.47, p = .000, partial η^2 = .243. Means with different superscripts differed significantly, Tukey post hoc test, $p < .05$.

When comparing barriers to purchasing technology and software and total number of meal equivalents served per day (see Table 33), CNPs serving a smaller number of meals equivalents per day [<1,500, (Mean=3.85)] were more likely to strongly agree with the barriers of inadequate funds to purchase technology/software and computers being too old to run newer technologies than CNPs serving a larger number of meals

equivalents per day[1,501-5,000 (Mean=2.67), 5,000-10,000 (Mean=2.86), >10,000 (Mean=2.84)]. As discussed earlier in the literature review, very small districts may have less money overall, thus it is more of a challenge to purchase new technology/software and replace older computers (NCES, 2005). These results confirm previous research and are a reminder that this problem continues to be an issue in smaller communities.

Table 33

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean		*SD*	*F*	*p*
Not Enough Money					3.73	.014
< 1,500	27	3.85	[a]	1.29		
1,501 – 5,000	30	2.93	[b]	1.20		
5,001-10,000	22	2.86	[b]	1.28		
>10,000	31	2.84	[b]	1.46		
Not Enough Knowledge					1.81	.150
< 1,500	27	2.67		1.24		
1,501 – 5,000	30	2.10		.88		
5,001-10,000	22	2.23		.87		
>10,000	31	2.19		.91		
Training Staff Too Time Intensive					.69	.557
< 1,500	27	3.00		.83		
1,501 – 5,000	30	2.60		1.22		
5,001-10,000	22	2.68		1.17		
>10,000	31	2.84		1.19		

(continued)

Table 33, continued

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Not Enough Space to Add Computers				2.67	.051
< 1,500	27	2.63	1.33		
1,501 – 5,000	30	1.93	1.17		
5,001-10,000	22	2.00	1.02		
>10,000	31	1.87	.96		
District Lacks Wiring Capabilities				.40	.757
< 1,500	27	2.22	1.25		
1,501 – 5,000	30	2.17	1.18		
5,001-10,000	22	1.91	.92		
>10,000	31	2.03	1.05		
Technology Dept not Well Trained				.72	.541
< 1,500	27	2.37	1.21		
1,501 – 5,000	30	2.23	1.36		
5,001-10,000	22	1.95	.95		
>10,000	31	2.42	1.23		
Administration does not Support				.72	.540
< 1,500	27	2.63	1.33		
1,501 – 5,000	30	2.17	1.23		
5,001-10,000	22	2.32	1.13		
>10,000	31	2.35	1.08		
Technology not Supported in my Department				2.16	.098
< 1,500	27	2.37	1.18		
1,501 – 5,000	30	1.73	.94		
5,001-10,000	22	1.91	.92		
>10,000	31	2.16	.97		

(continued)

Table 33, continued

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean		*SD*	*F*	*p*
Cost too High to Update Software					1.53	.212
< 1,500	27	3.04		1.32		
1,501 – 5,000	30	2.73		1.26		
5,001-10,000	22	2.41		1.05		
>10,000	31	2.45		1.18		
Computers too Old to Run Newer Programs					4.20	.008
< 1,500	27	2.67	a	1.18		
1,501 – 5,000	30	2.00	b	1.08		
5,001-10,000	22	1.95	ab	.65		
>10,000	31	1.84	b	.78		

Note. Multivariate F (30, 285) = 1.36, p = .104, partial η^2 = .123. Means with different superscripts differed significantly, Tukey post hoc test, $p < .05$.

A significant difference was also discovered between total meal equivalents served per day and the importance of purchasing online food temperature monitoring systems, personnel software, and TV's/digital media for marketing (see Table 34). In general, the CNPs serving >10,000 meal equivalents/day felt these types of technology were more important for future purchase than CNPs serving <1500 meal equivalents/day. No significant differences were seen when comparing number of meal equivalents with effectiveness of current technology use (see Table 35).

Table 34

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Financial Management				.57	.636
< 1,500	27	3.15	1.54		
1,501 – 5,000	30	3.67	1.49		
5,001-10,000	22	3.41	1.33		
>10,000	31	3.42	1.57		
Word Processing				.97	.410
< 1,500	27	3.33	1.49		
1,501 – 5,000	30	3.87	1.41		
5,001-10,000	22	3.41	1.26		
>10,000	31	3.29	1.64		
Menu Planning				.34	.800
< 1,500	27	3.63	1.28		
1,501 – 5,000	30	3.97	1.22		
5,001-10,000	22	3.91	1.19		
>10,000	31	3.87	1.59		
Inventory Management				2.29	.083
< 1,500	27	3.30	.87		
1,501 – 5,000	30	3.87	1.28		
5,001-10,000	22	4.18	1.01		
>10,000	31	3.87	1.54		
On-Line Purchasing				.88	.454
< 1,500	27	3.19	1.47		
1,501 – 5,000	30	3.70	1.26		
5,001-10,000	22	3.55	1.14		
>10,000	31	3.68	1.42		

(continued)

Table 34, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Point of Sale				2.10	.105
< 1,500	27	3.41	1.45		
1,501 – 5,000	30	4.27	1.14		
5,001-10,000	22	4.00	1.35		
>10,000	31	3.55	1.80		
Reimbursable Meal Vending Machines				.74	.531
< 1,500	27	2.00	1.30		
1,501 – 5,000	30	1.97	1.03		
5,001-10,000	22	2.36	1.14		
>10,000	31	2.29	1.32		
Free/Reduced Meal Application				.83	.479
< 1,500	27	3.52	1.48		
1,501 – 5,000	30	3.97	1.52		
5,001-10,000	22	3.32	1.59		
>10,000	31	3.48	1.77		
Meal Application Scanning				2.02	.116
< 1,500	27	3.15	1.41		
1,501 – 5,000	30	2.67	1.21		
5,001-10,000	22	2.82	1.65		
>10,000	31	3.55	1.69		
Student Nutrition Education				.58	.626
< 1,500	27	2.93	1.21		
1,501 – 5,000	30	2.83	.95		
5,001-10,000	22	3.23	.81		
>10,000	31	2.87	1.43		

(continued)

Table 34, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean		*SD*	*F*	*p*
On-Line Training					1.09	.357
< 1,500	27	3.11		1.28		
1,501 – 5,000	30	3.50		.97		
5,001-10,000	22	3.36		.95		
>10,000	31	3.00		1.41		
Website Manager					.89	.447
< 1,500	27	2.41		1.08		
1,501 – 5,000	30	2.60		1.00		
5,001-10,000	22	2.68		1.09		
>10,000	31	2.90		1.42		
Web-Based Department Intranet					.24	.871
< 1,500	27	2.85		1.32		
1,501 – 5,000	30	2.93		1.20		
5,001-10,000	22	3.00		1.20		
>10,000	31	3.13		1.45		
On-Line Food Temperature Monitoring					3.78	.013
< 1,500	27	2.67	a	1.14		
1,501 – 5,000	30	2.87	ab	1.25		
5,001-10,000	22	3.50	ab	.96		
>10,000	31	3.55	b	1.34		
Biometrics					1.35	.263
< 1,500	27	2.52		1.28		
1,501 – 5,000	30	2.53		1.22		
5,001-10,000	22	3.00		1.20		
>10,000	31	3.03		1.40		

(continued)

Table 34, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases Between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean		*SD*	*F*	*p*
Security					2.25	.087
< 1,500	27	2.56		1.34		
1,501 – 5,000	30	3.03		1.13		
5,001-10,000	22	3.18		1.18		
>10,000	31	3.42		1.46		
On-Line Payment Systems					.66	.581
< 1,500	27	3.37		1.42		
1,501 – 5,000	30	3.77		1.41		
5,001-10,000	22	3.36		1.53		
>10,000	31	3.77		1.63		
Personnel Management					2.91	.038
< 1,500	27	2.48	a	1.19		
1,501 – 5,000	30	3.00	b	1.34		
5,001-10,000	22	3.50	ab	1.26		
>10,000	31	3.35	b	1.56		
TV's/Digital Media for Marketing					3.31	.023
< 1,500	27	2.22	a	1.15		
1,501 – 5,000	30	2.83	ab	1.32		
5,001-10,000	22	2.82	ab	1.05		
>10,000	31	3.26	b	1.39		
Other					1.97	.123
< 1,500	27	1.30		.67		
1,501 – 5,000	30	1.57		1.07		
5,001-10,000	22	1.18		.59		
>10,000	31	1.77		1.31		

Note. Multivariate F (60, 260) = 1.61, p = .006, partial η^2 = .269. Means with different superscripts differed significantly, Tukey post hoc test, $p < .05$.

Table 35

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Budgeting/Strategic Planning				2.15	.098
< 1,500	27	3.67	1.59		
1,501 – 5,000	30	3.90	1.24		
5,001-10,000	22	4.41	.80		
>10,000	31	4.29	.97		
Monitoring Financial Information				2.24	.088
< 1,500	27	4.00	1.36		
1,501 – 5,000	30	4.23	1.04		
5,001-10,000	22	4.64	.58		
>10,000	31	4.55	.81		
Controlling Food Costs				1.93	.128
< 1,500	27	3.52	1.55		
1,501 – 5,000	30	3.80	1.06		
5,001-10,000	22	4.14	.71		
>10,000	31	4.16	1.04		
Controlling Labor Costs				2.38	.074
< 1,500	27	3.44	1.58		
1,501 – 5,000	30	3.57	1.10		
5,001-10,000	22	4.05	.79		
>10,000	31	4.13	1.02		
Menu Planning and Analysis				1.27	.288
< 1,500	27	4.07	1.54		
1,501 – 5,000	30	4.33	1.03		
5,001-10,000	22	4.68	.78		
>10,000	31	4.23	.96		

(continued)

Table 35, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Food Production Processes				.43	.735
< 1,500	27	4.07	1.54		
1,501 – 5,000	30	3.93	1.01		
5,001-10,000	22	4.09	1.02		
>10,000	31	3.77	1.12		
Inventory Management				1.77	.158
< 1,500	27	3.30	1.75		
1,501 – 5,000	30	3.80	1.16		
5,001-10,000	22	4.00	1.11		
>10,000	31	4.03	1.20		
Waste Reduction				2.65	.053
< 1,500	27	2.89	1.65		
1,501 – 5,000	30	3.13	1.01		
5,001-10,000	22	3.86	1.17		
>10,000	31	3.35	1.11		
Food Safety				.67	.575
< 1,500	27	3.63	1.47		
1,501 – 5,000	30	3.20	1.10		
5,001-10,000	22	3.55	1.18		
>10,000	31	3.45	1.09		
Student Identification Security				.64	.592
< 1,500	27	4.30	1.07		
1,501 – 5,000	30	3.93	1.26		
5,001-10,000	22	4.14	1.13		
>10,000	31	4.26	.96		

(continued)

Table 35, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Food Theft				.42	.738
< 1,500	27	3.04	1.63		
1,501 – 5,000	30	2.87	1.33		
5,001-10,000	22	3.32	1.52		
>10,000	31	3.03	1.28		
Accurate State Reimbursement Claim Reporting				1.32	.272
< 1,500	27	4.70	.54		
1,501 – 5,000	30	4.60	.81		
5,001-10,000	22	4.68	.57		
>10,000	31	4.90	.47		
Coordinated Review Effort Site Visit				.57	.639
< 1,500	27	4.59	.80		
1,501 – 5,000	30	4.53	.86		
5,001-10,000	22	4.68	.89		
>10,000	31	4.77	.50		
Accurate Meal Application Processing and Verification				.94	.425
< 1,500	27	4.44	.93		
1,501 – 5,000	30	4.17	1.12		
5,001-10,000	22	4.41	1.05		
>10,000	31	4.58	.81		

(continued)

Table 35, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Employee Productivity				.03	.992
< 1,500	27	3.56	1.63		
1,501 – 5,000	30	3.57	1.07		
5,001-10,000	22	3.59	1.14		
>10,000	31	3.65	.91		
Personnel Management				.85	.472
< 1,500	27	5.93	12.12		
1,501 – 5,000	30	3.67	1.24		
5,001-10,000	22	4.00	1.31		
>10,000	31	3.77	.92		
Employee Training				.38	.766
< 1,500	27	3.74	1.70		
1,501 – 5,000	30	3.50	1.17		
5,001-10,000	22	3.36	1.18		
>10,000	31	3.48	1.03		
District and Department Communication				1.03	.384
< 1,500	27	4.07	1.21		
1,501 – 5,000	30	4.13	1.07		
5,001-10,000	22	4.45	.74		
>10,000	31	4.42	.85		
Parent/Student Communication				.55	.648
< 1,500	27	4.00	1.49		
1,501 – 5,000	30	3.67	1.21		
5,001-10,000	22	3.82	1.05		
>10,000	31	4.00	.86		

(continued)

Table 35, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology on Helping to Meet Department Goals between Number of Meal Equivalents Served in Child Nutrition Programs (N=110)

	n	Mean	*SD*	*F*	*p*
Student Nutrition Education				1.50	.218
< 1,500	27	4.04	1.60		
1,501 – 5,000	30	3.37	1.50		
5,001-10,000	22	3.73	1.12		
>10,000	31	3.45	.89		
Student/Staff Marketing				.26	.851
< 1,500	27	3.74	1.75		
1,501 – 5,000	30	3.43	1.61		
5,001-10,000	22	3.64	1.00		
>10,000	31	3.52	1.00		
Improved Participation Rates				.58	.632
< 1,500	27	3.41	1.47		
1,501 – 5,000	30	3.27	1.26		
5,001-10,000	22	3.09	1.31		
>10,000	31	3.52	.85		
Customer Satisfaction				.43	.729
< 1,500	27	3.37	1.42		
1,501 – 5,000	30	3.67	1.12		
5,001-10,000	22	3.36	1.18		
>10,000	31	3.52	.81		
Innovation and Creativity				.51	.677
< 1,500	27	3.44	1.83		
1,501 – 5,000	30	3.83	1.64		
5,001-10,000	22	3.41	1.53		
>10,000	31	3.74	1.12		

Note. Multivariate F (72, 249) = 1.27, p = .094, partial η^2 = .268

Perceived Computer Skill Level

The one-way MANOVA related to computer skill level comparing types of technology used between advanced/expert and basic/average computer skill levels found a significant difference in all technology areas aside from safety and security. In particular, mean comparisons showed that CNDs with higher perceived computer skill levels used more types of technology/software applications than CNDs with lower perceived computer skill levels (see Table 36). Similar results were seen in Table 37 when looking at the perceived effectiveness of technology in helping to meet department goals. Except for labor related technology/software, CNDs with higher perceived computer skill levels found most technology/software to be more effective in helping to meet department goals than CNDs with lower perceived computer skill levels.

Table 36

One-Way MANOVA on Types of Technology/Software Used in Child Nutrition Programs between Perceived Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*p*
Office				19.43	.000
Basic/Average	33	3.61	1.12		
Advanced/Expert	77	4.36	.67		

(continued)

Table 36, continued

One-Way MANOVA on Types of Technology/Software Used in Child Nutrition Programs between Perceived Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*p*
Menu and Food Related				11.74	.001
Basic/Average	33	2.36	1.37		
Advanced/Expert	77	3.14	.96		
State Reporting & Meal Appl.				3.72	.056
Basic/Average	33	2.12	1.14		
Advanced/Expert	77	2.55	1.02		
Training and Education				11.36	.001
Basic/Average	33	.76	.83		
Advanced/Expert	77	1.38	.90		
Safety and Security				.00	.977
Basic/Average	33	.61	.79		
Advanced/Expert	77	.61	.69		
Miscellaneous				10.92	.001
Basic/Average	33	.64	.78		
Advanced/Expert	77	1.31	1.05		

Note. Multivariate F (6, 103) = 4.75, p = .000, partial η^2 = .217

Table 37

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
Budgeting/Strategic Planning				10.01	.002
Basic/Average	33	3.52	1.48		
Advanced/Expert	77	4.29	1.01		
Monitoring Financial Information				7.99	.006
Basic/Average	33	3.94	1.20		
Advanced/Expert	77	4.52	.88		
Controlling Food Costs				7.40	.008
Basic/Average	33	3.45	1.35		
Advanced/Expert	77	4.09	1.02		
Controlling Labor Costs				7.39	.008
Basic/Average	33	3.33	1.36		
Advanced/Expert	77	3.99	1.06		
Menu Planning and Analysis				6.27	.014
Basic/Average	33	3.91	1.44		
Advanced/Expert	77	4.48	.91		
Food Production Processes				2.83	.095
Basic/Average	33	3.67	1.31		
Advanced/Expert	77	4.08	1.11		
Inventory Management				4.04	.047
Basic/Average	33	3.39	1.50		
Advanced/Expert	77	3.95	1.24		

(continued)

Table 37, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
Waste Reduction				3.46	.066
Basic/Average	33	2.94	1.46		
Advanced/Expert	77	3.43	1.17		
Food Safety				7.76	.006
Basic/Average	33	2.97	1.38		
Advanced/Expert	77	3.65	1.07		
Student Identification Security				4.53	.035
Basic/Average	33	3.82	1.36		
Advanced/Expert	77	4.30	.95		
Food Theft				.64	.424
Basic/Average	33	2.88	1.69		
Advanced/Expert	77	3.12	1.30		
Accurate State Reimbursement Claim Reporting				5.77	.018
Basic/Average	33	4.52	.67		
Advanced/Expert	77	4.82	.58		
Coordinated Review Effort Site Visit				6.80	.010
Basic/Average	33	4.36	.82		
Advanced/Expert	77	4.77	.71		
Accurate Meal Application Processing and Verification				3.93	.050
Basic/Average	33	4.12	1.08		
Advanced/Expert	77	4.52	.91		

(continued)

Table 37, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
Employee Productivity				1.29	.258
Basic/Average	33	3.39	1.37		
Advanced/Expert	77	3.68	1.11		
Personnel Management				.76	.385
Basic/Average	33	5.09	11.02		
Advanced/Expert	77	3.99	1.18		
Employee Training				1.89	.172
Basic/Average	33	3.27	1.53		
Advanced/Expert	77	3.64	1.15		
District and Department Communication				13.68	.000
Basic/Average	33	3.76	1.12		
Advanced/Expert	77	4.48	.85		
Parent/Student Communication				8.49	.004
Basic/Average	33	3.39	1.30		
Advanced/Expert	77	4.08	1.05		
Student Nutrition Education				4.83	.030
Basic/Average	33	3.21	1.47		
Advanced/Expert	77	3.81	1.21		
Student/Staff Marketing				6.86	.010
Basic/Average	33	3.06	1.50		
Advanced/Expert	77	3.79	1.27		

(continued)

Table 37, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
Improved Participation Rates				1.92	.169
Basic/Average	33	3.09	1.49		
Advanced/Expert	77	3.44	1.08		
Customer Satisfaction				2.91	.091
Basic/Average	33	3.21	1.43		
Advanced/Expert	77	3.61	.96		
Innovation and Creativity				8.45	.004
Basic/Average	33	3.00	1.62		
Advanced/Expert	77	3.90	1.42		

Note. Multivariate $F(24, 85) = 2.00, p = .011$, partial $\eta^2 = .361$

Furthermore, in regards to barriers to purchasing technology/software and perceived computer skill levels (see Table 38), the advanced/expert group more commonly disagreed with a majority of the barriers to purchasing technology/software than the basic/average group. A significant difference was also seen between these two groups in regards to importance of future technology purchases (see Table 39). Essentially, the advanced/expert group felt that POS, free/reduced meal application processing, virtual café's, biometrics, and all miscellaneous applications were more

important as future purchases than the basic/average group. In brief, it is apparent from the data in this category that CNDs with higher perceived computer skills are those who use more technology, find it more effective in meeting department goals, have little concern for barriers to purchasing new technology and find most technology to be important for the future.

Table 38

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Computer Skill Levels of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*p*
Not Enough Money				10.16	.002
Basic/Average	33	3.73	1.31		
Advanced/Expert	77	2.86	1.32		
Not Enough Knowledge				21.46	.000
Basic/Average	33	2.91	1.07		
Advanced/Expert	77	2.03	.84		
Training Staff too Time Intensive				3.73	.056
Basic/Average	33	3.09	1.13		
Advanced/Expert	77	2.65	1.09		
Not Enough Space to Add Computers				8.52	.004
Basic/Average	33	2.58	1.35		
Advanced/Expert	77	1.90	1.01		

(continued)

Table 38, continued

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Computer Skill Levels of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*p*
District Lacks Wiring Capabilities				7.35	.008
Basic/Average	33	2.52	1.20		
Advanced/Expert	77	1.91	1.02		
Technology Dept not Well Trained				5.45	.021
Basic/Average	33	2.67	1.29		
Advanced/Expert	77	2.09	1.14		
Technology Dept not Supportive				3.09	.081
Basic/Average	33	2.67	1.27		
Advanced/Expert	77	2.23	1.15		
Administration does not Support				9.30	.003
Basic/Average	33	2.48	1.18		
Advanced/Expert	77	1.86	.90		
Cost too High to Update Software				6.98	.009
Basic/Average	33	3.12	1.24		
Advanced/Expert	77	2.47	1.17		
Computers too Old to Run Newer Programs				3.94	.050
Basic/Average	33	2.39	1.00		
Advanced/Expert	77	1.99	.98		

Note. Multivariate F (10, 99) = 2.92, p = .003, partial η^2 = .228

Table 39

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
Financial Management				2.31	.131
Basic/Average	33	3.09	1.51		
Advanced/Expert	77	3.56	1.46		
Word Processing				2.41	.123
Basic/Average	33	3.15	1.50		
Advanced/Expert	77	3.62	1.44		
Menu Planning Software				1.17	.282
Basic/Average	33	3.64	1.39		
Advanced/Expert	77	3.94	1.30		
Inventory Management Software				.72	.398
Basic/Average	33	3.64	1.14		
Advanced/Expert	77	3.86	1.29		
On-Line Purchasing				1.84	.178
Basic/Average	33	3.27	1.46		
Advanced/Expert	77	3.65	1.27		
Point of Sale				6.19	.014
Basic/Average	33	3.27	1.61		
Advanced/Expert	77	4.03	1.39		
Reimbursable Meal Vending Machines				1.01	.318
Basic/Average	33	1.97	1.19		
Advanced/Expert	77	2.22	1.21		
Free/Reduced Meal Application Program				6.11	.015
Basic/Average	33	3.03	1.65		
Advanced/Expert	77	3.83	1.52		

(continued)

Table 39, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
Meal Application Scanning				.70	.405
Basic/Average	33	2.88	1.60		
Advanced/Expert	77	3.14	1.48		
Student Nutrition Education Software				1.74	.190
Basic/Average	33	2.73	1.15		
Advanced/Expert	77	3.04	1.13		
On-Line Training				1.03	.312
Basic/Average	33	3.06	1.22		
Advanced/Expert	77	3.31	1.17		
Website Manager				6.14	.015
Basic/Average	33	2.24	1.06		
Advanced/Expert	77	2.83	1.17		
Web-Based Department Intranet				2.32	.131
Basic/Average	33	2.70	1.33		
Advanced/Expert	77	3.10	1.26		
On-Line Food Temperature Monitoring				.84	.360
Basic/Average	33	2.97	1.38		
Advanced/Expert	77	3.21	1.18		
Biometrics				3.97	.049
Basic/Average	33	2.39	1.50		
Advanced/Expert	77	2.92	1.17		
Security				8.52	.004
Basic/Average	33	2.52	1.54		
Advanced/Expert	77	3.29	1.13		

(continued)

Table 39, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Computer Skill Level of Child Nutrition Directors (N=110)

	n	Mean	*SD*	*F*	*P*
On-Line Payment Systems				4.21	.043
Basic/Average	33	3.15	1.52		
Advanced/Expert	77	3.78	1.45		
Personnel Management				4.79	.031
Basic/Average	33	2.64	1.37		
Advanced/Expert	77	3.26	1.37		
TV's/Digital Media for Marketing				2.86	.094
Basic/Average	33	2.48	1.39		
Advanced/Expert	77	2.94	1.23		
Other				2.07	.153
Basic/Average	33	1.27	.67		
Advanced/Expert	77	1.57	1.11		

Note. Multivariate F (20, 89) = .93, p = .551, partial η^2 = .173

Education Level

The one-way MANOVA comparing types of technology to high school/Associate's, Bachelor's degree and above, and Master's degree and above education levels revealed that CNDs with a Bachelor's degree and above or a Master's degree and above used more office related applications (Bachelor's Mean=4.33 and Master's Mean=4.31) and menu/ food related applications (Bachelor's Mean=3.18, Master's Mean=3.00) than CNDs with a high school/Associate's degree (office

applications Mean=3.54, menu application Mean=2.27; see Table 40). In terms of barriers, CNDs with a high school/Associate's degree were in higher agreement with the purchasing barriers of not having enough money to purchase new technology/software (HS/Associate's: Mean=3.62, Master's: Mean=2.71) and an unsupportive IT department (HS/Associate's: Mean=2.77, Master's: Mean=2.00) than CNDs with a Master's degree or higher (see Table 41). Essentially, CNDs with more education rely more often on technology to meet department goals and are not as concerned with the barriers to purchasing technology as less educated CNDs.

Table 40

One-Way MANOVA on Types of Technology/Software Used in Child Nutrition Programs between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
Office				8.71	.000
High School/Associate's	26	3.54 [a]	1.17		
BA/Some Graduate Work	49	4.33 [b]	.72		
Master's or Greater	35	4.31 [b]	.68		
Menu and Food Related				6.09	.003
High School/Associate's	26	2.27 [a]	1.25		
BA/Some Graduate Work	49	3.18 [b]	.88		
Master's or Greater	35	3.00 [b]	1.24		

(continued)

Table 40, continued

One-Way MANOVA on Types of Technology/Software Used in Child Nutrition Programs between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
State Reporting & Meal				.21	.813
High School/Associate's	26	2.31	1.26		
BA/Some Graduate Work	49	2.43	1.04		
Master's or Greater	35	2.49	.98		
Training and Education				1.07	.346
High School/Associate's	26	.96	.77		
BA/Some Graduate Work	49	1.24	1.03		
Master's or Greater	35	1.29	.86		
Safety and Security				2.46	.090
High School/Associate's	26	.50	.65		
BA/Some Graduate Work	49	.51	.65		
Master's or Greater	35	.83	.82		
Miscellaneous				1.19	.310
High School/Associate's	26	.92	1.13		
BA/Some Graduate Work	49	1.06	.99		
Master's or Greater	35	1.31	.99		

Note. Multivariate F (12, 204) = 2.60, p = .003, partial η^2 = .133. Means with different superscripts differed significantly, Tukey post hoc test, $p < .05$.

Table 41

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Child Nutrition Director Education Levels (N=110)

	n	Mean		*SD*	*F*	*p*
Not Enough Money					3.40	.037
High School/Associate's	26	3.62	a	1.42		
BA/Some Graduate Work	49	3.14	ab	1.22		
Master's or Greater	35	2.71	b	1.43		
Not Enough Knowledge					1.13	.328
High School/Associate's	26	2.50		1.17		
BA/Some Graduate Work	49	2.31		.82		
Master's or Greater	35	2.11		1.08		
Training Staff too Time Intensive					1.00	.370
High School/Associate's	26	2.81		1.17		
BA/Some Graduate Work	49	2.92		1.00		
Master's or Greater	35	2.57		1.22		
Not Enough Space to Add Computers					1.41	.248
High School/Associate's	26	2.42		1.27		
BA/Some Graduate Work	49	2.04		1.14		
Master's or Greater	35	1.94		1.08		
District Lacks Wiring Capabilities					.95	.390
High School/Associate's	26	2.31		1.32		
BA/Some Graduate Work	49	2.10		1.10		
Master's or Greater	35	1.91		.92		

(continued)

Table 41, continued

One-Way MANOVA on Perceived Barriers to Purchasing New Software/Technology Between Child Nutrition Director Education Levels (N=110)

	n	Mean		*SD*	*F*	*p*
Technology Dept not Well Trained					2.27	.109
High School/Associate's	26	2.50		1.33		
BA/Some Graduate Work	49	2.39		1.20		
Master's or Greater	35	1.91		1.07		
Technology Dept not Supportive					3.29	.041
High School/Associate's	26	2.77	a	1.39		
BA/Some Graduate Work	49	2.41	ab	1.21		
Master's or Greater	35	2.00	b	.91		
Administration does not Support					.92	.403
High School/Associate's	26	2.27		1.19		
BA/Some Graduate Work	49	2.02		.92		
Master's or Greater	35	1.91		1.04		
Cost too High to Update Software					1.97	.145
High School/Associate's	26	2.92		1.41		
BA/Some Graduate Work	49	2.76		1.07		
Master's or Greater	35	2.34		1.24		
Computers are too Old to Run Newer Programs					2.30	.105
High School/Associate's	26	2.35		1.20		
BA/Some Graduate Work	49	2.18		.95		
Master's or Greater	35	1.83		.86		

Note. Multivariate F (20, 196) = .86, p = .642, partial η^2 = .080. Means with different superscripts differed significantly, Tukey post hoc test, $p < .05$.

Moreover, a weak significant difference was found between the importance of online training as a future purchase and the BA/some graduate work group (Mean=3.51) and the Master's degree and above group (Mean 2.91; see Table 42). In general, the more highly educated group found this type of technology to be a more important future purchase. The reason for this might be that the more educated respondents value education more and believe that training is essential to a competent and knowledgeable work force. Or, these respondents may feel that their staff is interested and capable of completing online training which could eventually save time and meet ongoing department training goals such as food safety. Either way, this finding gives credence to the idea that some CNDs find training of their staff to be an important responsibility. These results reinforce research by Yoon, Huss, and Brown (1998) and Sullivan, Harper, and West (2001) who discovered that child nutrition program managers and workers were highly interested in having computer training courses as part of their continuing education program. In addition, this finding supports research by Zoellner and Carr (2008) which found CNDs to be highly interested in web-based training to improve their knowledge and skills. In relation to effectiveness of technology utilization and education level, no significant differences were seen between any of the groups (see Table 44).

Table 42

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*p*
Financial Management				.58	.563
High School/Associate's	26	3.58	1.53		
BA/Some Graduate Work	49	3.49	1.45		
Master's or Greater	35	3.20	1.53		
Word Processing				1.00	.371
High School/Associate's	26	3.69	1.44		
BA/Some Graduate Work	49	3.57	1.40		
Master's or Greater	35	3.20	1.59		
Menu Planning				.18	.839
High School/Associate's	26	3.85	1.29		
BA/Some Graduate Work	49	3.92	1.20		
Master's or Greater	35	3.74	1.54		
Inventory Management				.66	.518
High School/Associate's	26	3.62	1.13		
BA/Some Graduate Work	49	3.94	1.13		
Master's or Greater	35	3.71	1.49		
On-Line Purchasing				.07	.934
High School/Associate's	26	3.54	1.45		
BA/Some Graduate Work	49	3.49	1.19		
Master's or Greater	35	3.60	1.48		
Point of Sale				.14	.871
High School/Associate's	26	3.69	1.52		
BA/Some Graduate Work	49	3.88	1.38		
Master's or Greater	35	3.77	1.65		

(continued)

Table 42, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*p*
Reimbursable Meal Vending Machines				1.86	.161
High School/Associate's	26	2.00	1.26		
BA/Some Graduate Work	49	2.39	1.30		
Master's or Greater	35	1.91	.95		
Free/Reduced Meal Application				.58	.564
High School/Associate's	26	3.88	1.56		
BA/Some Graduate Work	49	3.51	1.54		
Master's or Greater	35	3.49	1.70		
Meal Application Scanning				.64	.531
High School/Associate's	26	3.35	1.41		
BA/Some Graduate Work	49	3.02	1.57		
Master's or Greater	35	2.91	1.52		
Student Nutrition Education				2.12	.125
High School/Associate's	26	2.85	1.19		
BA/Some Graduate Work	49	3.18	1.03		
Master's or Greater	35	2.69	1.21		
On-Line Training				3.78	.026
High School/Associate's	26	3.04 [ab]	1.22		
BA/Some Graduate Work	49	3.57 [a]	1.02		
Master's or Greater	35	2.91 [b]	1.29		

(continued)

Table 42, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*p*
Website Manager				.85	.431
High School/Associate's	26	2.54	1.17		
BA/Some Graduate Work	49	2.82	1.13		
Master's or Greater	35	2.51	1.22		
Web-Based Department Intranet				.70	.501
High School/Associate's	26	2.88	1.31		
BA/Some Graduate Work	49	3.14	1.26		
Master's or Greater	35	2.83	1.34		
On-Line Food Temperature Monitoring				.69	.506
High School/Associate's	26	3.08	1.13		
BA/Some Graduate Work	49	3.29	1.19		
Master's or Greater	35	2.97	1.40		
Biometrics				.82	.442
High School/Associate's	26	2.65	1.23		
BA/Some Graduate Work	49	2.94	1.27		
Master's or Greater	35	2.60	1.38		
Security				.98	.380
High School/Associate's	26	2.96	1.31		
BA/Some Graduate Work	49	3.24	1.30		
Master's or Greater	35	2.86	1.33		

(continued)

Table 42, continued

One-Way MANOVA on Perceived Importance of Future Technology/Software Purchases between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*p*
On-Line Payment				.06	.939
High School/Associate's	26	3.50	1.39		
BA/Some Graduate Work	49	3.61	1.50		
Master's or Greater	35	3.63	1.59		
Personnel Management				1.86	.161
High School/Associate's	26	2.69	1.29		
BA/Some Graduate Work	49	3.33	1.30		
Master's or Greater	35	3.00	1.55		
TV's/Digital Media for Marketing				1.71	.185
High School/Associate's	26	2.50	1.30		
BA/Some Graduate Work	49	3.04	1.17		
Master's or Greater	35	2.69	1.41		
Other				1.56	.215
High School/Associate's	26	1.23	.71		
BA/Some Graduate Work	49	1.47	.92		
Master's or Greater	35	1.69	1.25		

Note. Multivariate F (40, 176) = .81, p = .787, partial η^2 = .155. Means with different superscripts differed significantly, Tukey post hoc test, $p < .05$.

Table 43

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
Budgeting/Strategic Planning				.12	.886
High School/Associate's	26	4.08	1.32		
BA/Some Graduate Work	49	4.10	1.07		
Master's or Greater	35	3.97	1.36		
Monitoring Financial Information				.28	.758
High School/Associate's	26	4.23	1.24		
BA/Some Graduate Work	49	4.35	.86		
Master's or Greater	35	4.43	1.07		
Controlling Food Costs				.19	.825
High School/Associate's	26	3.96	1.28		
BA/Some Graduate Work	49	3.94	.97		
Master's or Greater	35	3.80	1.32		
Controlling Labor Costs				.27	.766
High School/Associate's	26	3.77	1.37		
BA/Some Graduate Work	49	3.88	1.01		
Master's or Greater	35	3.69	1.30		
Menu Planning and Analysis				.70	.498
High School/Associate's	26	4.23	1.31		
BA/Some Graduate Work	49	4.45	.94		
Master's or Greater	35	4.17	1.22		

(continued)

Table 43, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
Food Production Processes				.29	.749
High School/Associate's	26	4.00	1.26		
BA/Some Graduate Work	49	4.02	1.13		
Master's or Greater	35	3.83	1.22		
Inventory Management				.31	.738
High School/Associate's	26	3.96	1.40		
BA/Some Graduate Work	49	3.71	1.26		
Master's or Greater	35	3.74	1.44		
Waste Reduction				.09	.912
High School/Associate's	26	3.35	1.41		
BA/Some Graduate Work	49	3.22	1.14		
Master's or Greater	35	3.31	1.39		
Food Safety				2.21	.115
High School/Associate's	26	3.73	1.22		
BA/Some Graduate Work	49	3.53	1.12		
Master's or Greater	35	3.11	1.28		
Student Identification Security				2.11	.126
High School/Associate's	26	4.54	.65		
BA/Some Graduate Work	49	4.04	1.15		
Master's or Greater	35	4.03	1.25		

(continued)

Table 43, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
Food Theft				.98	.378
High School/Associate's	26	3.38	1.36		
BA/Some Graduate Work	49	2.92	1.41		
Master's or Greater	35	2.97	1.48		
Accurate State Reimbursement Claim Reporting				.56	.574
High School/Associate's	26	4.65	.56		
BA/Some Graduate Work	49	4.80	.46		
Master's or Greater	35	4.69	.83		
Coordinated Review Effort Site Visit				.18	.836
High School/Associate's	26	4.62	.75		
BA/Some Graduate Work	49	4.69	.71		
Master's or Greater	35	4.60	.85		
Accurate Meal Application Processing and Verification				2.25	.110
High School/Associate's	26	4.62	.75		
BA/Some Graduate Work	49	4.18	1.03		
Master's or Greater	35	4.54	1.01		
Employee Productivity				.12	.883
High School/Associate's	26	3.69	1.38		
BA/Some Graduate Work	49	3.55	1.16		
Master's or Greater	35	3.57	1.12		

(continued)

Table 43, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
Personnel Management				.35	.704
High School/Associate's	26	4.00	1.52		
BA/Some Graduate Work	49	4.86	9.00		
Master's or Greater	35	3.80	1.18		
Employee Training				.18	.838
High School/Associate's	26	3.65	1.38		
BA/Some Graduate Work	49	3.47	1.31		
Master's or Greater	35	3.51	1.17		
District and Department Communication				.07	.935
High School/Associate's	26	4.23	.91		
BA/Some Graduate Work	49	4.24	1.01		
Master's or Greater	35	4.31	1.05		
Parent/Student Communication				1.01	.366
High School/Associate's	26	4.12	1.21		
BA/Some Graduate Work	49	3.88	1.09		
Master's or Greater	35	3.69	1.23		
Student Nutrition Education				1.37	.259
High School/Associate's	26	3.96	1.37		
BA/Some Graduate Work	49	3.61	1.26		
Master's or Greater	35	3.40	1.35		

(continued)

Table 43, continued

One-Way MANOVA on Perceived Effectiveness of Computer Software and Technology in Helping to Meet Department Goals between Child Nutrition Director Education Levels (N=110)

	n	Mean	*SD*	*F*	*P*
Student/Staff Marketing				1.65	.197
High School/Associate's	26	3.88	1.42		
BA/Some Graduate Work	49	3.63	1.32		
Master's or Greater	35	3.26	1.40		
Improved Participation Rates				1.84	.164
High School/Associate's	26	3.73	1.31		
BA/Some Graduate Work	49	3.24	1.25		
Master's or Greater	35	3.17	1.07		
Customer Satisfaction				1.23	.297
High School/Associate's	26	3.77	1.18		
BA/Some Graduate Work	49	3.47	1.10		
Master's or Greater	35	3.31	1.13		
Innovation and Creativity				.74	.479
High School/Associate's	26	3.92	1.67		
BA/Some Graduate Work	49	3.47	1.49		
Master's or Greater	35	3.63	1.50		

Note. Multivariate F (48, 168) = 1.07, p = .367, partial η^2 = .234

CHAPTER V

SUMMARY AND CONCLUSIONS

In the face of tighter profit margins, labor force diversity, outside competition, and increasing regulation, it is critical that CNDs use every resource they can to assist them in managing organized and productive child nutrition programs. New advances in software and technologies are occurring at a rapid pace. The internet, too, is now playing a significant role in assisting CNPs with data collection and management while offering an effective interface for communication with outside vendors, students, staff, and the community. It is essential, therefore, for CNPs to employ technology to keep pace with current trends and maintain a competitive edge. With this in mind, it is important to evaluate and summarize what this research study found regarding technology use in child nutrition programs and the impact it may have on the future of school nutrition. The following section restates each hypothesis with a short summary of findings.

Summary

Types of Technology and Software Used in Child Nutrition Programs

$H0^1$ - There will be no significant differences in types of technology and software used in child nutrition programs based on type of menu planning, number of meal equivalents served, child nutrition director (CND) education level, and CND computer knowledge level. *The null hypotheses were rejected for all variables in this hypothesis.*

Overall, CNDs were using a wide variety of technology and software programs. Significant differences were seen between types of technology and menu planning, number of meals equivalents served, CND education level and perceived computer knowledge level. Child nutrition programs serving a larger number of meal equivalents per day and CNDs with more education and higher perceived computer skills incorporated the most technology/software in their operations. In addition, CNDs using NSMP found menu/food related software to be extremely useful for managing menu development and analysis, which can be a time and labor intensive responsibility.

$H0^2$ - There will be no significant relationships between types of technology and software used in child nutrition programs and the following variables: food cost per meal, labor cost per meal, CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level. *The null hypotheses were rejected for food cost per meal, labor cost per meal, CND computer knowledge/skill level, and CND education level variables. For age and years of experience as a CND, however, the researchers failed to reject the null hypotheses as they did not show any significant relationships.*

As mentioned above, there were some mild significant relationships that occurred between types of technology and food cost, labor cost, education level, and perceived computer skill level. The findings regarding education level and perceived computer skills were positive in nature and revealed that CNDs who were more educated and perceived themselves as computer savvy used the most technology/software programs. Food and labor cost findings, however, were difficult to interpret as these variables are

often subject to factors outside of a CND's control such as rising food costs, district location, and availability of labor.

Child Nutrition Director's Perceived Effectiveness of Current Technology and Software Utilization in Meeting Department Goals

$H0^3$ - There will be no significant differences in CNDs' perceptions of the effectiveness of computer software and technology in assisting to meet department goals based on menu planning, number of meal equivalents served, CND education level, and CND computer knowledge/skill level. *The null hypothesis was rejected for the variable of CND computer knowledge/skill level. However, for menu planning, number of meal equivalents served, and education level, the researchers failed to reject the null hypotheses as there were no significant differences found.*

CNDs with higher perceived computer skills found technology/software to be more effective in meeting department goals than less advanced users. Obviously, the operation of technology and software programs requires computer knowledge and skills. Therefore, this finding is logical and reinforces the observation that the more at ease a person is with an activity or responsibility, the more likely he/she is to accept it or find it useful.

$H0^4$ - There will be no significant relationships between CNDs' perceptions of the effectiveness of computer software and technology in assisting to meet department goals and the following variables: food cost per meal, labor cost per meal, CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level. *The null hypotheses for all variables in this hypothesis were rejected aside from*

food cost. Food cost failed to be rejected as it did not show a significant relationship to effectiveness of computer software and technology.

With respect to the effectiveness of technology meeting department goals, there were a few weak relationships between labor costs, age, education level, and years of experience as a CND. In general, older and more experienced CNDs thought technology was more effective in preventing food theft. This finding suggests that older and more experienced CNDs may have invested more time and resources into theft prevention and seen the benefits. CNPs with higher labor costs also found budgeting and strategic planning programs to be effective which, as mentioned earlier, was difficult to interpret as labor is frequently subject to factors outside of a CNDs control.

Child Nutrition Directors' Perceived Agreement/Disagreement with Barriers to Purchasing New Technology/Software

$H0^5$ - There will be no significant differences in CNDs' perceptions of the challenges or barriers to purchasing new technology and software programs for their departments based on number of meal equivalents served, CND education level, and computer knowledge/skill level. *The null hypotheses were rejected for all variables in this hypothesis.*

Overall, CNDs with higher computer skills disagreed with the barriers to purchasing new technology/software. In contrast to this disagreement, CNDs with less education and CNPs who were serving a smaller number of meals per day agreed more with the barriers, especially in the areas of inadequate funds, outdated computers, and lack of IT support. These findings suggest that not all school districts are keeping up

with the advances in technology, and some may still be using outdated systems with limited IT and financial support.

$H0^6$ - There will be no significant relationships between CNDs' perceptions of the challenges or barriers to purchasing new technology and software programs for their departments and the following variables: CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level. *The null hypotheses were rejected for every variable in this hypothesis except for labor costs. No significant relationships were found for labor costs so this variable failed to be rejected.*

Similar to the outcomes above, CNDs with higher perceived computer skills disagreed with many of the barriers associated with purchasing technology/software. Both higher educated and experienced CNDs disagreed with inadequate funds as a barrier and more educated CNDs also disagreed with the barriers of outdated computers and inadequate IT support. CNPs with higher food costs, however, agreed with inadequate wiring as a barrier and older CNDs agreed that lack of administrative support was a barrier. As previously discussed, these results may be important to consider when searching for ways to encourage funding and IT support from district administrators.

Child Nutrition Directors' Perceived Importance of Technology/Software Programs for Future Purchase

$H0^7$ - There will be no significant differences between CNDs' perceptions of the importance of future technology/software acquisitions based on type of meal planning, number of meal equivalents served, CND education level or computer knowledge/skill level. *The null hypotheses were rejected for CND education level, number of meal*

equivalents served, and CND computer knowledge/skill level. However, the researchers failed to reject the null hypotheses for the variables of menu planning as there were no significant differences found.

Again, CNDs with higher perceived computer skills were the respondents most likely to find the majority of technology/software programs to be important for future purchase. This is probably due to the fact that these respondents were more comfortable with technology/software and saw its effectiveness; therefore, they wanted to purchase more of it. Or, this finding suggests that CNDs with higher perceived computer skills already use a lot of technology/software and marked it as important on the questionnaire because they felt it was essential to own. Other findings in regard to the importance of future purchases showed that CNDs with more education found online training programs to be an important future purchase, and CNDs in districts serving a larger number of meals equivalents were interested in personnel programs, digital media, TV's and online food temperature monitoring systems.

$H0^8$ - There will be no significant relationships between CNDs perceptions of the importance of future technology and software acquisitions and the following variables: food cost per meal, labor cost per meal, CND age, years of work experience as a CND, CND computer knowledge/skill level, and CND education level. *The null hypotheses were rejected for age, years of experience as a CND, and CND computer knowledge/skill level variables. For food cost per meal, labor cost per meal, and education level, however, the researchers failed to reject the null hypotheses as they did not find any significant relationships.*

Results were the same as in HO^7 for CNDs with more advanced computer skills. Interestingly, older CNDs felt that almost half of the technology and software programs listed in this section of the questionnaire were unimportant future purchases. It is difficult to know why they felt this way. Reasons could be that they already owned many of the software applications listed or they truly did not feel they needed them to effectively operate their CNP. More experienced CNDs found financial management to be an important future purchase, but not menu planning software. This may be due to the reasons just mentioned above or to the fact that most respondents were using food based menu planning and did not see the need for menu planning software. As for financial planning software, respondents may have either wanted to try a new financial management system or they may already use one, yet marked it as important because they felt it was essential to own.

Limitations

There were three known limitations of this study. First, the data for this study was only collected in the Southwest Region of the United States (U.S.) and through the listserv of American Dietetic Association School Nutrition Services Dietetic Practice Group. Therefore, results cannot be generalized beyond this region or other school nutrition groups. Second, the database used for participants in the Southwest Region was from the SNA and ADA listserv. Thus, results cannot be generalized to CNDs who are not members of these two organizations. Third, data was only collected in school districts participating in the SBP or NSLP. Thus, results cannot be generalized to other school districts operating CNPs that do not participate in the SBP or NSLP.

Conclusions

In conclusion, it was evident from the demographic information that most respondents were working in larger communities and had a relatively long history of employment in child nutrition. In addition, a majority were older, highly educated with additional credentialing, and were operating within appropriate food and labor cost markers for child nutrition operations. It was also evident that the independent variables of type of menu planning (a categorical variable) and food costs and labor costs (continuous variables) had very little effect on the dependent variables in this study. If there was an effect it was often relatively weak in nature.

Furthermore, there were no significant differences between the menu planning, number of meal equivalents served and education level and perceived technology effectiveness. When comparing means, however, the lack of significance in this comparison was probably a result of most respondents finding technology to be effective, yet not as effective as CNDs with higher perceived computer skills. This finding is encouraging because it implies that the technology/software being designed for child nutrition programs is being successfully used by CNDs and is serving its intended purpose of meeting the needs of the child nutrition industry. The only downside to this finding is that there are still smaller districts that are likely not seeing the benefits of this technology. This thought leads the researchers to wonder if technology/software in being effectively marketed to smaller communities. Because sales commissions are often related to the size of the purchase, are technology/software companies as motivated to approach smaller districts in more rural communities to sell their product? Maybe this is

one of the reasons that smaller more rural districts are not as informed about the benefits of new technology/software.

Besides effectiveness of technology, results also verified that CNDs with higher perceived computer skills were undeterred by the challenges and barriers to purchasing technology/software, and thought most types of technology/software were important as a future purchase. Similarly, CNDs who had more education and CNPs serving a larger number of meals per day used a greater number of technology/software programs and disagreed more often with the barriers to acquiring new technology. The researchers also noted that a majority of respondents operating CNPs in larger communities held a bachelor's degree or higher and answered the questionnaire online. In view of these findings, by using the SNA database and the listserv for recruiting participants, this research likely missed a certain cross-section of the CND population. This population being the CNDs who are working in smaller districts with less IT support and less education. As well, a fairly large number of respondents who started the questionnaire online did not finish it; therefore, the researchers were left to wonder if insufficient time or an inability to answer the questions due to inadequate knowledge/information were the reasons the questionnaires were not completed.

Also of note, was the finding that many CNDs were planning to purchase at least two new types of technology/software within the next two years. These new purchases should improve current foodservice systems and increase student communication and participation. Although the purchase of new technology/software programs by some CNDs is encouraging, there are still CNDs who face challenges and barriers to acquiring

new technology/software. Therefore, it is important that states, cities, and school districts work together to find better ways to serve CNDs and their staff through access to more computer education, increased IT support, and adequate funding. Furthermore, school districts, technology/software vendors, and the child nutrition community need to begin or continue to provide services such as mentorship programs, local computer skill-building classes, and online training. Offering more affordable hardware and technology/software would also be beneficial.

Changes continue to happen on a national, state, and local level which will eventually impact how CNPs operate. Many of these changes will take time and cost money, therefore further research should be conducted that exclusively measures the effectiveness of technology in finite terms. For instance, measuring whether the use of inventory management software actually saves money and staff time would be of great benefit for those seeking to purchase it in the future. Positive outcomes speak volumes to administrators, and when they can see that technology saves money, they are more likely to support the idea and allocate the funds. In addition, as this research missed a cross-section of CNDs who are working in smaller and more rural districts, new research specifically targeting this group of child nutrition professionals could benefit their future growth and direction. The key in implementing this type of research is to finding ways to reach this audience without using government databases. These databases often only list the school district name without listing the CNDs operating the CNPs.

In conclusion, this research confirmed that there is already a group of CNDs who are confident in their computer skills and actively using many technology and software

applications to meet their department goals. The fact that such a large group of CNDs have solid technology foundations is a positive and encouraging sign for the child nutrition profession. But this study has also revealed that there is a sub-section of CNDs who may have limited exposure to technology and thus limited knowledge of what impact technology can have on their programs. Therefore, there is a need to bridge the gap between CNDs with less confidence in their computer skills and those CNDs who have advanced/expert knowledge and skills. The child nutrition industry needs leaders who can support and mentor those CNDs who are less confident with technology/software and have had less exposure to its benefits. The likely result of such leadership will be a continued investment of both mental and financial resources into child nutrition programs, thus insuring that programs will meet the future demands of the industry.

REFERENCES

Alexander, M. (2005). Making technology work for you. *Healthcare Food & Nutrition Focus, 22(3), 1-5.*

American School Food Service Association. (1989). *Needs Assessment Manual for the Computerization of School Food Service.* Denver, Colorado.

At school test sites: Internet ordering streamlines lunch. (2000, March 15) *Foodservice Director,* 12(3).

Begalle, M., (2002). Technology solutions for school foodservice. *School Planning and Management,* 41(2), 43-45.

Bender J.R., & Matthews M.E. (1989). Computer systems in food services: A review of applications and potential benefits. *School Food Service Research Review*, 13(2), 150-155.

Big brother? Nope, big mother. (2006, April). *Prepared Foods.* 35.

Bouwman, L.I., Hiddink, G.J., Koelen, M.A., Korthals, M., van't Veer, P., & vanWoerkum, C. (2005). Personalized nutrition communication through ICT application: How to overcome the gap between potential effectiveness and reality. *European Journal of Clinical Nutrition,* 59(S1), 108-116.

Brewer, K.P., DeMicco, F.J., & Conn R.E. (1993). Computer hardware and software use in school food service operations. *School Food Service Research Review*, 17(2), 120-124.

Brown, D. (2005). Prevalence of food production systems in school foodservice. *Journal of the American Dietetic Association,* 105(8), 1261-1265.

Callahan T., & Sharma V.K. (2002). Technology in school foodservice operations. *School Business Affairs,* 11-14.

Capehart, T., & Richardson, J. (2008). *Food Price Inflation: Causes and Impacts*. Report for Congress. Congressional Research Service. RS22859. Retrieved March 25, 2010. http://www.bread.org/learn/rising-food-prices/congressional-research-service-on-food-price-inflation.pdf

Carr, D. (2000). *Reshaping the National Food Service Management Institute's Research Agenda. Executive Summary*. University, MS: National Food Service Management Institute. R-42-00.

Carr, D., (1998). Software S.O.S. *School Foodservice & Nutrition,* 52(1), 42-45.

Certo, S.C. (2000). *Modern Management.* 8th ed. Upper Saddle River, NJ:Prentice Hall Publishing.

Christensen, L. (1991). Computerizing? Start with menu planning. *School Food Service Journal,* 45(1), 46-50.

Cline T.J., & Lusk M.A. (1999). Marketing healthful school meals: The basics of marketing, case examples, and standards of practice. *Topics in Clinical Nutrition,* 15(1), 30-36.

Computer software. (n.d.) Retrieved May 5, 2010 from Wikipedia: http://en.wikipedia.org/wiki/Software

Deluzuriaga, T. (2006, October 17). Mouse click soon will buy lunch in Dade schools: parents around Miami Dade County will soon be able to pay for school lunch via the internet. *Miami Herald.*

Elan, E. (2005, June 6). Mealpay lets parents monitor kids' school lunches. *Nation's Restaurant News.* 18.

Fox M.K., & Endahl J. (1998). Nutrient Standard Menu Planning: Challenges and successes. *Journal of the American Dietetic Association,* 98(9) Suppl 1, A12.

Friedland, A. (2000). Conquering computer fear together. *School Foodservice and Nutrition,* 36-40.

Gilmore S.A., Brown N.E., & Hutchinson J.C. (1998). High school student perceptions associated with their participation in the National School Lunch Program. *Journal of the American Dietetic Association*, 98(9) Suppl 1, A67.

Gould, R., & Barrett, B., (1998). Post-then pre-evaluation of computer classes for school foodservice personnel. *Journal of Child Nutrition and Management,* 22(1), 40-45.

Graves, K., (2004). The need for speed. *School Foodservice & Nutrition,* 59(1), 30-32.

Gross, S.M., & Cinelli B. (2004). Coordinated school health program and dietetics professionals: Partners in promoting healthful eating. *Journal of the American Dietetic Association,* 104(5), 793-798.

Grossbauer, S. (1998). For operations, trend analysis, marketing: The intranet as a tool. *Foodservice Director,* 11(6), 172.

Gryder, S.D. (2005). Point, click, commodities. *School Foodservice & Nutrition,* 59(1).

HACCP. (n.d.) Retrieved, May 29, 2010 from Wikipedia: http://en.wikipedia.org/wiki/HACCP

Haerens, L., Deforche, B., Maes, L., Cardon, G., Stevens, V., & DeBourdeaudhuij, I. (2006). Evaluation of a 2-year physical activity and healthy eating intervention in middle school children. *Health Education Research.* 21(6), 911-921.

Henroid, D., & Sneed, J. (2004). Readiness to implement Hazard Analysis and Critical Control Point (HACCP) systems in Iowa schools. *Journal of the American Dietetic Association,* 104(2), 180-185.

Johns, R.D. & Bain, K.R. (2006, October 15). Embracing POS technology. *Foodservice Director, 18(8), 50.*

Kronos. (n.d.) Retrieved May 27, 2010 from Wikipedia: http://en.wikipedia.org/wiki/Kronos

Levin, A. (2008). Training day. *Foodservice Equipment and Supplies.* Retrieved April 8, 2008, from http://www.fesmag.com/archives/2008/02/training.htm.

Linston H.A., & Turoff M. (1975). *The delphi method: techniques and applications.* Addison Wesley Publishing, Reading, Mass.

Long, J.D., & Stevens, K.R., (2004). Using technology to promote self-efficacy for healthy eating in adolescents. *Journal of Nursing Scholarship,* 36(2), 134-139.

Lowe, B.M. (2005). Technology innovations put school food service on the cutting edge. *Dietary Manager,* Nov/Dec 2005, 20-21.

Luepker R.V., Pery C. L., McKinlay S. M., Nader P.R., Parcel G.S., Stone E. J., Webber L.S., Elder J.Pl, Feldman H.A., Johnson C.C. (1996). Outcomes of a field trial to improve children's dietary patterns andphysical activity. The Child and Adolescent

Trail for Cardiovascular Health. CATCH collaborative group. *Journal of the American Medical Association,* 275, 768-776.

Maize, R.S., & Conklin, M.T. (1995). *NFSMI needs assessment of school foodservice directors,* NFSMI-R20-95. University, MS: National Food Service Management Institute.

McLaren, P. (2004) Reducing the pounds of paper. *School Foodservice & Nutrition,* 58(1).

McLaren, P. (2007). More than a machine. *School Food Service Journal,* 61(1), 26-35.

National Center for Education Statistics. (2005). *Internet Access in U.S.Public Schools and Classrooms: 1994–2003.* Retrieved February 15, 2008, from http://nces.ed.gov/pubs2005/2005015.pdf

Nutri-Scan Free and Reduced Application Scanning, Retrieved May 27, 2010 from http://www.n-ltech.com/productsNutriScan.shtml

Nutri-Café Interactive Cafeteria, Retrieved May 27, 2010 from http://www.nl-tech.com/productsNutriScan.shtml

PayPams Company Info. (n.d.) Retrieved May 27, 2010, from https://paypams.com/CompanyInfo.aspx

PCS Revenue Control Systems Info. (n.d.) Retrieved May 27, 2010 from http://www.pcsrcs.com/about/index.html

Plemmons, K.L. (2004). The National School Lunch Program and USDA dietary guidelines: is there room for reconciliation? *Journal of Law and Education, 33, 180-216.*

Position of the American Dietetic Association, Society for Nutrition Education and American School Food Service Association. (2006). Nutrition services: An essential component

of comprehensive school health programs. *Journal of the American Dietetic Association,* 106(12), 2039-2044.

Public Law 79-396. Stat 281, Sect 2. National School Lunch Act (1946).

Puckett, R.P. (2002). Health care foodservice: keeping pace. *Topics in Clinical Nutrition,* 17(3), 10-22.

Puckett, R. P. (2005). Practice paper of the American Dietetic Association: A systems approach to measuring productivity in health care foodservice operations. *Journal of the American Dietetic Association.* 105, 122-130.

Rainville, A.J., & Carr, D. (2002). *Competencies, knowledge, and skills statements for district school nutrition directors/supervisors*. Executive Summary. University, MS: National Food Service Management Institute. R-50-01.

Ross, J.R. (2006, November 6). Digital menu, marketing "infotainment" yields upbeat results. *Nation's Restaurant News.* 20-21.

Sackin, B. (2007). Disking up success. *School Food Service Journal,* 61(1), 36-44.

Sanchez, N., Gould, R., & Sanchez, A. (2000). What financial tools school foodservice directors use? *The Journal of Child Nutrition & Management,* 24(1), 40-42.

Schilling, B. (2008). Point of service. *Foodservice Director*, 21(1), 42-43.

School Meals Initiative for Healthy Children; Final Rule, (1995, June 13) Federal Register, 60, 31188-31222.

Shanley, E.L., Thompson, C.A., Leuchner, L.A., & Yanyun, Z. (2004). Distance education is an effective as traditional education when teaching food safety. *Food Service Technology,* 4, 1-8.

Student Nutrition Association Press Releases. *"State of School Nutrition 2009" Survey: School foodservice directors cite funding and cost of food as biggest concerns but are weathering tough economy.* Retrieved March 25, 2010, from http://www.schoolnutrition.org/Blog.aspx?id=12832&blogid=564

Sullivan, J., (2006, June 5). Leverage the right technology to enhance learning. *Nation's Restaurant News.* 31-32.

Sullivan, K., Harper, M., & West, C.K. (2001). Professional development needs of school foodservice directors. *Journal of Child Nutrition and Management.* 25(2), 89-95.

Technology. (n.d.) Retrieved May 5, 2010 from Wikipedia: http://en.wikipedia.org/wiki/Technology

United States Department of Agriculture, Food and Nutrition Service. (2008). *National School Lunch Program: Participation and lunches served.* Retrieved January 24, 2010, from http://www.fns.usda.gov/pd/slsummar.htm

United States Department of Agriculture, Food and Nutrition Service. (2007). *School Breakfast Program: Participation and breakfasts served.* Retrieved January 24, 2010, from http://www.fns.usda.gov/pd/sbsummar.htm

United States Department of Agriculture, Food and Nutrition Service. (June 30, 2004). Child Nutrition and WIC Reauthorization Act of 2004, 42 USC 1751. Retrieved July 24, 2007, from http://www.fns.usda.gov/cnd/Governance/Legislation/Historical/PL_108-265.pdf

United States Department of Agriculture, Food and Nutrition Service. *Menu Planning in the National School Lunch Program.* Retrieved May 27, 2010, from http://www.fns.usda.gov/cnd/menu/menu.planning.NSLP.htm

United States Department of Agriculture, Food and Nutrition Service. *National School Lunch Program: fact sheet.* Retrieved January 24, 2010, from http://www.fns.usda.gov/cnd/Lunch/AboutLunch/NSLPFactSheet.pdf

United States Department of Agriculture, Food and Nutrition Service. *School Breakfast Program: program history.* Retrieved January 24, 2010, from http://www.fns.usda.gov/cnd/Breakfast/AboutBFast/ProgHistory.htm

United States Department of Agriculture, Food and Nutrition Service. Program Regulations (CFR) Part 210 – National School Lunch Program and Part 220 – School Breakfast Program. Retrieved March 23, 2010 from http://www.fns.usda.gov/cnd/governance/regulations/7cfr210_09.pdf

VanEgmond-Pannell, D. Improving management in school food services with computers. In: Kaud, FA, ed. *Effective Computer Management in Food and Nutrition Services.* Rockville, Md: Aspen Publishers; 1989: 118-130

Vilschick, J. K. (2000). Software at your service. *School Food Service Journal,* 54(1), 32-35.

Ward, M. (2006). Beyond the computer room. *School Foodservice & Nutrition,* 60(1).

Weisberg, K. (2007, January 15). Food safety tops wish list. *Food Service Director.* 58.

White, G., Sneed, J., & Martin, J. (1992). School food service in the Year 2000. *School Food Service Journal*, 46(6), 68-70, 130.

White, P. (2007). Positive identification. *School Foodservice & Nutrition.* 62(1), 18-23.

Williams, M. (2006, November 6). Tracking time and temperature. *Nation's Restaurant News.* 12, 22.

Yoon, B.J.H., Huss, J.J., & Brown, N.E. (1998). Computer use and training preferences of school foodservice managers in Iowa. *Journal of Child Nutrition and Management.* 22(1), 6-12.

APPENDIX A

Human Subjects Review Approval

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378 Fax 940-898-3416
e-mail: IRB@twu.edu

October 10, 2008

Ms. Peggy E. Pratt
516 Hunters Ridge Rd.
Coppell, TX 75019

Dear Ms. Pratt:

Re: Technology Use in Child Nutrition Programs and the Impact on Food and Labor Costs

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. Because a signed consent form is not required for exempt studies, the filing of signatures of participants with the TWU IRB is not necessary.

Another review by the IRB is required if your project changes in any way, and the IRB must be notified immediately regarding any adverse events. If you have any questions, feel free to call the TWU Institutional Review Board.

Sincerely,

Dr. David Nichols, Chair
Institutional Review Board - Denton

cc. Dr. Chandan Prasad, Department of Nutrition & Food Sciences
Dr. Junchee Kwon, Department of Nutrition & Food Sciences
Graduate School

APPENDIX B

Questionnaire Used in this Study

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Department of Nutrition and Food Sciences
P.O. Box 425888, Denton, TX 76204-5888
940-898-2636 Fax 940-898-2634

December 2009

Dear School Food Service Director,

There are many factors associated with purchasing and using computer technology in school nutrition programs; however, little research has been conducted on this topic. As technology continues to transform how the school food service industry operates, we believe there is a need to find out how valuable these changes have been at the district level.

Therefore, we are conducting a research study entitled ***Technology use in child nutrition programs and the impact on food and labor costs.*** The purpose of this study is to investigate:

1) types of technology and software currently being used by child nutrition programs
2) effectiveness of computer software and technology in helping meet department goals
3) challenges and barriers to implementing technology and software, and
4) importance of technology and software for attaining future department goals.

Your participation in this study will involve answering a web-based survey found at www.psychdata.com (survey #131661) or by completing the enclosed written questionnaire. To encourage participation, we will randomly select **three** school foodservice directors from all participants who will receive a $50 gift card to Wal-Mart. If your name is selected, and your completed response has been returned, a $50 gift card will be sent to you. In the event that we do not have a match, we will pull names until a match is found.

By using secure data collection, all efforts will be made to insure responses remain confidential. The code number on the questionnaire will only be used for follow-up and prize drawing purposes. After follow-up postcards are mailed, and the names for the prizes are drawn, the record of code numbers and contact will be destroyed. Only summarized data will be published in a scientific journal, and the name and facility of participants will not be revealed.

If you agree to participate in this study, please fill out the enclosed questionnaire and send it back in the envelope provided or you can answer the questionnaire on line by going to www.psychdata.com (survey #131661). **Please return by Friday, December 18, 2009.** We appreciate your participation in advance. If you have any questions regarding this research study, please do not hesitate to contact us.

Sincerely,

Peggy Pratt, MS, RD, LD
Doctoral Student
Texas Woman's University
peggy@gprattlaw.com
972-745-3552

Dr. Carolyn Bednar, PhD., RD, LD, CFCS
Professor
Texas Woman's University
cbednar@twu.edu
940-898-2658

Think SUCCESS Think TWU

The return of your completed questionnaire constitutes your informed consent to act as a participant in this research.

Technology use in child nutrition programs and the impact on food and labor costs
Department of Nutrition and Food Sciences
TEXAS WOMAN'S UNIVERSITY Winter 2009

SECTION I. DEMOGRAPHIC DATA

Please respond to each question by selecting the statement that best applies to you.

1. Indicate the size of the community where your district is located.
   _____ Large metropolitan (> 1 million)
   _____ Medium metropolitan (500,001 - 1 million)
   _____ Small metropolitan (50,001-500,000)
   _____ Suburban (2,500 - 50,000)
   _____ Rural (<10,000)
   _____ Rural (< 2,500)

2. Indicate the number of the student population in your district. _____

3. Does your child nutrition program participate in the National School Breakfast Program? ____yes ___no

4. If you indicated "yes" to participating in the National School Breakfast Program, please indicate your district's participation rate. Please use **reimbursable meals only** to calculate, not total meals. _____

5. Does your child nutrition program participate in the National School Lunch Program? ____yes ___no

6. If you indicated "yes" to participating in the National School Lunch Program, please indicate your district's participation rate. Please use **reimbursable meals only** to calculate, not total meals. _____

7. What is your average daily food cost? _____ Daily food cost percentage? _____

8. On average, how many meals do you serve each day? Breakfast? _____ Lunch? _____

9. What is your average daily a la carte sales amount? _____

10. What is your average daily labor cost per meal? _____ Daily labor cost percentage? _____

11. Please indicate the number of central office FTEs you have in your department. _____FTEs
    (40 hrs=1 FTE)

12. Please indicate the number of kitchen manager FTEs you have in your department. _____FTEs
    (40 hrs=1 FTE)

13. Please indicate the number of FTEs for the kitchen support staff. _____FTEs
    (40 hrs=1 FTE)

14. What type of menu planning do you use?

    _____ Traditional Food Based Menu Planning
    _____ Enhanced Food Based Menu Planning
    _____ Other (Please Specify)
    _____ Nutrient Standard Meal Planning
    _____ Assisted Nutrient Standard Meal Planning

15. How long have you worked as a child nutrition foodservice director? ____years

16. How long have you been employed in child nutrition programs? ____years

17. How long have you worked in your current child nutrition program? ____years

18. What is your highest level of education?

_____ Less than high school diploma	___ Some graduate school toward master's
_____ High school graduate/diploma	___ Master's degree
_____ Associate's degree	___ Some graduate school toward doctorate
_____ Bachelor's degree	___ Doctoral degree

19. What is your age? _____

20. Please indicate any credentials you have obtained.

_____ Registered Dietitian (RD)	_____ School Nutrition Specialist (SNS)
_____ Licensed Dietitian (LD)	_____ Certified Dietary Manager
_____ SNA certified	Other: _____

21. Please indicate your perceived computer knowledge and skill level by choosing one of the below:

___ I do not use computers for any departmental tasks

___ I have basic computer knowledge, keyboarding and mouse-clicking skills, and am capable of using basic word processing and accounting programs

___ I have average computer knowledge and am able to effectively use word processing programs, work with databases and spreadsheets, send and retrieve electronic mail, search the Internet, and create Power Point presentations

___ I am an advanced user and can easily use all Windows applications as well as operate multiple software programs (POS, Menu Analysis, Inventory) and web-based applications such as online payments, purchasing, web-training, etc.

___ I am a computer expert and am able to teach all advanced user applications in addition to developing my own databases, websites, etc. I use multiple types of technology, web-cams, podcasts, biometrics, digital media and consider myself to be a technology trendsetter.

SECTION II. SOFTWARE APPLICATIONS UTILIZATION AND USER ACTIVITIES

A. Indicate the types of technology or software applications that are used in your nutrition program. Check all that apply.

Office Applications

___ Word Processing (Word, Word Perfect)
___ Spreadsheet/Financial Management (Excel)
___ Presentation (like Power Point, Mac)
___ Email (like Outlook)
___ Database Management (like Access)

Menu and Food Related Applications

___ Menu Planning (Nutrikids, Horizon)
___ Inventory Manager
___ On-line Purchasing (via internet vendor site)
___ Point of Sale (PCS, Nutrikids, Horizon)
___ Reimbursable Meal Vending Machines

State Reporting & Meal Application

___ Free/Reduced Meal Application Program
___ Meal Application Scanning (Nutri-Scan)
___ On-line Reimbursement Claim Reporting
___ On-line Meal Application Reporting

Training and Education Applications

___ Student Nutrition Education Software (KidFit, etc)
___ On-line Training(Webinars, Web-based training modules)
___ Website Manager (Virtual Cafés)
___ Web-based Department Intranet

Safety and Security Applications

___ On-line Food Temperature Monitoring (via Sensors)
___ Biometrics (like finger scanning)
___ Security (Web Cam Viewing)

Miscellaneous Applications

___ On-line Payment Systems
___ Personnel Management
___ TV's, Digital Media for marketing
___ Other, please specify _____

SECTION III. EFFECTIVENESS AND IMPORTANCE OF TECHNOLOGY IN USE

B. How effective is computer software and technology in helping you meet your department goals in the following areas?

Rate each item by circling the appropriate NUMBER in each column using the 5 point scale. "1" being NOT EFFECTIVE AT ALL and "5" being VERY EFFECTIVE.

Effectiveness rating	*Not Effective at All*				*Very Effective*
Financial Management					
Budgeting/Strategic Planning	1	2	3	4	5
Monitoring Financial Information (Sales/Expenses, etc.)	1	2	3	4	5
Controlling Food Costs	1	2	3	4	5
Controlling Labor Costs	1	2	3	4	5
Menu and Food Management					
Menu Planning and Analysis	1	2	3	4	5
Food Production Processes	1	2	3	4	5
Inventory Management	1	2	3	4	5
Waste Reduction	1	2	3	4	5
Safety and Security					
Food Safety	1	2	3	4	5
Student Identification Security	1	2	3	4	5
Food Theft	1	2	3	4	5
Regulatory					
Accurate State Reimbursement Claim Reporting	1	2	3	4	5
Coordinated Review Effort (CRE) site visit	1	2	3	4	5
Accurate Meal Application Processing and Verification	1	2	3	4	5
Labor					
Employee Productivity	1	2	3	4	5
Personnel Management (Time & Attendance,Benefits)	1	2	3	4	5
Employee Training	1	2	3	4	5
Communication					
District and Department Communication	1	2	3	4	5
Parent/Student Communication	1	2	3	4	5
Student Nutrition Education	1	2	3	4	5
Student/Staff Marketing	1	2	3	4	5
Miscellaneous					
Improved Participation Rates	1	2	3	4	5
Customer Satisfaction	1	2	3	4	5
Innovation and Creativity (Menu Boards, Digital Media,TV's, etc)	1	2	3	4	5

Circle how many software programs or new types of technology you plan to purchase in the next two years? 0 1 2 3 4 >4

C. Indicate your level of agreement/disagreement with the following statements that may be a challenge or barrier to purchasing new software or technology.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. I do not have enough money to purchase new technology or software programs.	SA	A	N	D	SD
2. I do not know enough about new technology or software to purchase them.	SA	A	N	D	SD
3. Training my staff on new technology or software is too time intensive.	SA	A	N	D	SD
4. There is not enough space in the school kitchens to add computers.	SA	A	N	D	SD
5. The district does not have the wiring capabilities for new technology/computers.	SA	A	N	D	SD
6. The district does not have a well trained or strong technology department.	SA	A	N	D	SD
7. The district does not have a supportive technology department.	SA	A	N	D	SD
8. The administration for the district does not support technology in my department.	SA	A	N	D	SD
9. It will cost too much money to update my old software programs to new programs.	SA	A	N	D	SD
10. The district's computers are too old to run the newer technologies and programs.	SA	A	N	D	SD

D. What types of technology or software programs do you perceive as most important to purchase in the future in order for you to attain the goals of your department?

Rate each item by circling the appropriate NUMBER in each column using the 5 point scale. "1" being NOT IMPORTANT AT ALL and "5" being VERY IMPORTANT.

Importance rating	*Not Important at All*				*Very Important*
Financial Management (Excel, Quicken, Quickbooks)	1	2	3	4	5
Word Processing (Word, Word Perfect)	1	2	3	4	5
Menu Planning Software	1	2	3	4	5
Inventory Management Software	1	2	3	4	5
On-line Purchasing (via internet vendor site)	1	2	3	4	5
Point of Sale (PCS, Nutrikids, Horizon)	1	2	3	4	5
Reimbursable Meal Vending Machines	1	2	3	4	5
Free/Reduced Meal Application Program	1	2	3	4	5
Meal Application Scanning (Nutri-Scan)	1	2	3	4	5
Student Nutrition Education Software (KidFit, etc)	1	2	3	4	5
On-line Training(Webinars, Web-based training modules)	1	2	3	4	5
Website Manager (Virtual Cafés)	1	2	3	4	5
Web-based Department Intranet	1	2	3	4	5
On-line Food Temperature Monitoring (via Sensors)	1	2	3	4	5
Biometrics (like finger scanning)	1	2	3	4	5
Security (Web Cam Viewing)	1	2	3	4	5
On-line Payment Systems (PayPams, etc.)	1	2	3	4	5
Personnel Management (Kronos, etc)	1	2	3	4	5
TV's, Digital Media for marketing	1	2	3	4	5
Other, please specify _____	1	2	3	4	5

Thank you for your participation

Please return this questionnaire in the enclosed self-addressed envelope and mail.