

## **Conveyor Belt Sushi Restaurants**

A study of customer knowledge and perceived benefit of technological management systems  
within conveyor belt sushi restaurants

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## **Abstract**

Radio frequency identification management systems are used by conveyor belt sushi restaurants to ensure the freshness of sushi they provide to customers. The workers within these restaurants feel the systems improve business but whether the customers, who are imperative in a restaurant's success, are aware of them and what benefits they perceive is still undefined. The purpose of this study is to determine how and to what extent the knowledge and perceived benefits of RFID systems in conveyor belt restaurants affect customer satisfaction. This qualitative study focuses on the relationship between technological management systems and customer satisfaction as it pertains to freshness. A method of voluntary surveys will be used in this study to measure the knowledge and perceived benefits from frequent sushi consumers dining within a conveyor belt sushi restaurant, as well as online using social media sites. The survey results will be compiled and used to determine the percentage of consumers who are aware of these systems, whether they believe they are beneficial and how satisfied they feel knowing the restaurant uses it. This study will assist sushi restaurant owners in understanding how their customers perceive these systems and potentially furthering their business.

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## **Introduction**

Conveyor belt sushi restaurants are a new addition to the American quick service industry. These restaurants were developed in Japan to serve large populations of people quickly during rush hours (Traphagan & Brown, 2002). These restaurants consist of a self-service belt throughout the dining room that allows customers to view sushi and remove desired pieces as it rotates. With sushi components being of high risk for foodborne illness, it is important that time be monitored in order to ensure that all food upon the belt is safe for consumption (Ngai, Suk & Lo, 2008). In order to guarantee they are serving safe food, conveyor belt restaurants are incorporating information technology management systems within their establishments. These systems, often microchips on plates with readers placed along the belt, are known as Radio Frequency Identification or RFID systems. These tags are embedded with information that is tracked by the readers and analyzed by management to improve operations. These systems have been known to improve efficiency, food safety, food loss, and lower operation costs (Ngai et al., 2008).

Customer service is a driving factor in success for the restaurant industry (Soma Sur, 2008). One way restaurants are attempting to combat their competition is through the implementation of technological systems (Pine & Gilmore, 2011). These RFID systems are an innovative example of these technological systems being implemented into restaurants. The systems are seen as beneficial by chefs, managers and workers in charge of inventory (Ngai et al., 2008). Without research into how customers view these technological systems within conveyor belt sushi restaurants, it is unclear if these systems are improving customer service.

The customer perception of RFID systems within these restaurants has yet to be documented. By investigating the perceived value and how it affects customer satisfaction, this

study was intended to determine whether investing in RFID systems will also benefit restaurants through improving customer service as well as the business advantages. This exploratory study sought to determine knowledge and perceived benefit of these systems by conducting qualitative research through the use of surveys both online and within a conveyor belt sushi restaurant. In order to understand the knowledge and perception, it was necessary to communicate with sushi consumers.

# Literature Review

## Introduction

In the competitive market of the service industry, technology can be an avenue for improving service encounter experiences (Bitner, Brown & Meuter, 2000). Conveyor belt restaurants are one example of combining technology with service. RFID, or radio-frequency identification tags, are electronic microchips used to store and transfer data on a server. These tags allow management to track food. Conveyor belt restaurants utilize these tags by using them to ensure the safety of the items on the track throughout the dining room from which the customers remove food. The information from the chips is accessed by management, employees in charge of inventory and chefs for efficient operations (Ngai, Suk & Lo, 2008).

RFID management systems are successful in creating a more efficient conveyor belt restaurant. RFID tags combined with the management system have been seen as beneficial to the management, chefs and servers (Ngai et al., 2008). The information still unknown is how knowledge of this technology benefits the customer and whether or not it enhances their dining experience. The purpose of this study will be to determine the customer's awareness of RFID technology within the conveyor belt restaurant and their perceived benefits of a technological system such as RFID tags along with the effect it has on their customer satisfaction.

## RFID

RFID or radio frequency identification technology has been around since the Second World War when its creation was originally intended for military aircraft use (Srivastava, 2007). RFID technology combines radar with radio waves to provide the ability to collect data that is updated automatically with any developments through the relationship between a tag (microchip) and a reader. RFID technology was introduced in the 1990s within toll booths and entry access cards (Srivastava, 2007). The technological design behind the process by which these tags and

readers operate is intricate. Each can be programmed to interact with one another how the user desires which allows them to be used in various industries (Wang, Zhang & Wang, 2006).

The information transmitted within these RFID systems can be used for many things within any industry. The tags are placed on the item to be tracked. When these items pass by special readers, the information on the tag is analyzed and updated according to the programmed settings. Readers are programmed with the ability to transfer the data collected from the tags to a separate system, often a computer or server from which people can access the data more easily (Srivastava, 2007). This idea of traceability is particularly beneficial to the food industry due to the rising demand for product safety as well as reducing business risk (Regattieri, Gamberi & Manzini, 2007). According to Karkkainen (2003) RFID is “a technology that can help provide operational efficiencies and improved stock level transparency in short shelf-life products” (p530).

RFID tagging systems are often used in Parmigiano Reggiano production to ensure Italian origin laws are abided to uphold the quality brand name they have developed (Regattieri et al., 2007). Libraries, hospitals and business offices have been testing the use of RFID to track supplies and even people. The agriculture and food production industry has also introduced these RFID tags in order to “monitor and control the quality attributes of food products” (Wang et al., 2006, p9). The literature has strong support in the beneficial qualities of RFID systems to improving business operations. The use of RFID tags specifically within the food industry can improve food safety and quality as well as improving customer service through improving business operations including quicker billing (Ngai et al., 2007, Srivastava, 2007, Regattieri et al., 2007). The literature does however lack the customer’s perceived value of these benefits and whether it will improve their customer satisfaction.

## **Conveyor Belt Restaurants**

The literature pertaining to conveyor belt restaurants is scarce due to its more recent introduction within the United States. The concept of conveyor belt sushi restaurants was first introduced in Japan as the ultimate quick service restaurant to supply the high population (Traphagan & Brown, 2002). The restaurants consist of a continuous countertop placed throughout the dining room on which a belt, often called a train, is built. This belt rotates around the dining room adorned with various plates of sushi that the diners take at will. Although it provides an inexpensive quick way to provide sushi to customers, the conveyor belt restaurants do have challenges. These challenges include pricing and billing issues, food safety concerns, and consistent stock on the conveyor belt (Ngai et al., 2007).

The pricing and billing issues described are caused by human error when itemizing plates. Each plate is color-coded to represent price. These plates are then counted by the server but often times it is done inefficiently causing financial strain for either the restaurant or diner (Ngai et al., 2007). The food safety issues stem from the type of cuisine served at these conveyor belt restaurants. Sushi is a food item often related with foodborne illness due to its main ingredients including fish that is often raw, rice and eggs (Ngai et al., 2007). With these items being of high risk, the plates should not be left on the conveyor belt for more than 4 hours according to the FDA (2005). The issues with the lack of consistent stock stem from the kitchen being unable to view which items are currently on the belt. According to the literature, an RFID system can eliminate these issues within conveyor belt restaurants.

The RFID system within a conveyor belt restaurant consists of tags on each plate with specific information about the dish which can include price, ingredients and nutritional value (Srivastava, 2007). These tags can also help the staff track how long the sushi has been traveling around the belt. As the plates pass the readers, the readers transmit the time to the computer

within the kitchen that alerts chefs if an item needs to be removed. The RFID system proposed by Ngai et al. (2007) would eliminate the remaining issues with the integration of screens depicting an overall image of the belt with images of each plate traveling for chefs to monitor as well as handheld devices for the servers to scan the tags of each plate for a more accurate and efficient billing process. According to Ngai et al. (2007), the RFID system can “improve their food safety, inventory control, service quality, operational efficiency, and data visibility” (p641). Improvement of the billing process, availability of consistent amounts of menu item, and quality of food can all have a direct effect on the quality of service the consumer receives.

### **Customer Satisfaction**

Within the food industry, customer service remains the determining factor in success. Customer service revolves around providing the customer with an enjoyable and memorable experience. When the optimal experience is achieved it is known as customer satisfaction (Soma Sur, 2008). According to Soma Sur (2007), satisfaction includes the feeling of fulfillment and is the core of business. The measurement of customer satisfaction used to be calculated by customer loyalty, but now it has been found that customer satisfaction can be measured by perceived value (Heung & Ngai, 2008). According to Heung & Ngai (2008), perceived value is the customer’s overall assessment based on benefits versus cost. If the customer feels they are receiving high quality food and service compared to the price they are paying, they will have high perceived value. Perceived value leads to customer loyalty and in turn repeat business (Heung & Ngai, 2008). Perceived value is dependent on the expectations of the customers.

As technology advances, restaurants often include new expansions within their restaurants to keep up with customer demands. The service industry has recently taken a turn from high touch to high tech in its service delivery (Pine & Gilmore, 2011). One way business owners can differentiate themselves from competitors is through the implementation of

technology (Bitner et al., 2000). According to Morosan (2011), technology can offer convenience, fast service and ease of use to restaurant customers. Technology would fall into the category of intangible services that a restaurant would offer. These intangible services include friendliness, knowledge and competence as well as the sense of security given by technological systems (Heung & Ngai, 2008).

### **Customer Expectations**

Given that customer satisfaction is dependent on perceived value and perceived value is dependent on customer expectations, it is imperative to understand exactly what customers expect when dining out. There have been various surveys previously conducted that can aid in this subject. The literature suggests that people expect safe, fresh, high quality food when dining at a restaurant.

The Center for Food Safety and Applied Nutrition of the FDA conducted a survey in 2010 that focused on food safety. The researchers administered a telephone survey for adults throughout the United States. The report by Lando and Carlton report a total of 4,500 participants (2011). Of these people, 57% felt that it is more common for people to get food poisoning from restaurant food compared to food prepared at home (Lando & Carlton, 2011). When asked which foods they feel are likely to harbor harmful pathogens and germs, 55% felt that foods containing raw fish, like sushi, are likely to make people sick (Lando & Carlton, 2011). Lando and Carlton (2011) also report that 54% of participants are “confident that the food I eat at restaurants is safe” (p4). The FDA reported in Potential Hazardous Food: The evolving definition of temperature control for safety that sushi rolls prepared with cooked rice and raw fish can be displayed at room temperature for up to 4 hours before they become hazardous (2005).

The National Restaurant Association conducted a survey administered to food service providers touching on customer expectations. Food Technology Magazine highlighted the findings within one of its articles. According to the survey, 75% of foodservice operators said that their customers' "expectations regarding the quality of food provided" has heightened (Nachay, 2011, p. 34). The survey also found that 79% of foodservice operators estimate that the number of people concerned with the quality of food provided has increased (Nachay, 2011).

Romeo reports in Nation's Restaurant News that "freshness equals quality" (2005, p. 57). Romeo goes on to say that customers view fresh foods as valuable (2005) which means freshness can affect customer perceived benefit. According to Petrak (2007) "health, food safety and quality" have all emerged simultaneously as high demands among customers (p. 9). Kruse also touches on freshness. According to Kruse, "consumers place a high value on freshly prepared food" (2003, p. 28). Kruse goes on to note that customers have come to expect freshness when they dine at a restaurant (2003).

According to the literature, customers feel satisfied with their experiences when they believe they are obtaining a high value based on their pre-set expectations. The literature shows that these expectations include freshness, safety and quality of the food they receive. Consumers trust that the restaurants are providing them with safe, fresh food and it is a growing trend among customers to expect nothing less.

### **Knowledge & Perceived Benefit**

The literature offers little insight into knowledge and perceived benefit as it relates to RFID systems within conveyor belt sushi restaurants. The literature does however define perceived value, benefit and knowledge independently based on vast research into each concept. According to Sanchez-Fernandez and Iniesta-Bonillo (2007) perceived value can be defined as the difference found between what is given and what is received. Ultimately, the customer's

perceived value is their feeling of what they have received based on the amount they feel they have given in exchange for it. Value is defined as a higher-level of evaluation into customer satisfaction given that it is individualist and personal dependent on the customer's frame of reference (Sanchez-Fernandez & Iniesta-Bonillo, 2007). Sanchez-Fernandez and Iniesta Bonillo (2007) found in their research that value has been defined as a ratio in many studies with "benefit as the numerator and sacrifice as the denominator" (p 434).

Merriam Webster (2012) defines benefit as something that promotes well-being; a useful aid; useful or profitable. To combine the idea of perceived value with benefit would define perceived benefit as how useful something is based on the customers feeling of the value of that well-being versus what they have put into the experience. For the purpose of this study, perceived benefit was the customer's sense of what they gain from the RFID systems being in place.

Knowledge is defined as the fact or condition of being aware of something based on familiarity gained through experience according to Merriam Webster (2012). For the purpose of this study, knowledge was the awareness of these RFID systems to the customers from their visits to conveyor belt sushi restaurants or being up to date in the food industry.

## **Methodology**

The purpose of this study is to determine the customer's knowledge and perceived benefit of RFID systems. In order to find this information, contact must be made with the customer. One way to obtain customer opinions is to administer a survey in which respondents answer questions by choosing from a list of available answers. According to Schleifer (2001), research surveys allow the providers to obtain feedback from customers on the services they provide. The literature indicates that when surveys are short, clearly worded and disregard personal or sensitive items that people will be more willing to answer honestly (Schleifer, 2001).

## **Conclusion**

The literature provides adequate information on each variable within the study. Conveyor belt sushi restaurants are quick service establishments in which customers choose plates of desired sushi off of a rotating track located throughout the dining area (Traphagan & Brown, 2002). The plates are colored coordinated by price and each contains two to three pieces of sushi. Conveyor belt restaurants are incorporating advancing technology into their management systems in a hope to provide fast, safe and inexpensive food to their customers (Ngai et al., 2007).

The RFID systems used in these restaurants is a leading technology through which items can be tracked. The tags hold pertinent information about the item and communicate with a reader to analyze and compile data (Regattieri et al., 2007). This data can then be used to speed up efficiency as well as track sushi so it remains safe on the conveyor belt. Since sushi is made of high risk ingredients it is imperative that the sushi remain on the belt no longer than is allowed by safety regulations (Ngai et al., 2007). In order to ensure quality sushi be given to customers, the restaurants are using these RFID systems to track the time each plate has been on the belt.

By taking the necessary steps to improve efficiency as well as provide safe food, conveyor belt sushi restaurants are attempting to provide the highest customer service possible. In the competitive market of the food industry, customer service can be a major factor in deciding whether a profit is made (Pine & Gilmore, 2011). It has been shown that safe, fresh, high quality food is being demanding more often and by more consumers than before (Kruse, 2003, Petrak, 2007, Nachay, 2011). These RFID systems are an added benefit to the customer, but it was still unknown how and to what extent the knowledge and perceived benefit of these systems affects customer satisfaction.

This qualitative study focused on the gap in the literature about the RFID technology systems through the eyes of the customer with the use of customer surveys. This study gives insight into the customer's view of RFID systems and whether it improves customer satisfaction. This will benefit conveyor belt sushi restaurant owners in determining whether their customers are influenced by their investment in providing them with safe efficient food.

## **Methodology**

The purpose of this study was to determine how and to what extent the knowledge and perceived benefit of radio frequency identification (RFID) technological management systems in conveyor belt sushi restaurants affect customer satisfaction. For the purpose of this study, customer satisfaction was defined as the perceived quality and freshness of the sushi. The systems consist of tags placed onto plates, readers along the belt and an intricate computer system that can be personalized for the specific needs of the restaurant. These RFID systems benefit the restaurant by allowing the operations to be run more efficiently through attributes such as automatic inventory deductions, daily cost calculations, and identifying the most popular products. These systems also provide the service of ensuring the sushi does not exceed the time limit for safe consumption while on the belt, which according to the FDA is four hours (2005). This benefit of the RFID systems was the main focus for this study. This study gives insight into the customer's view of RFID systems. Given that customers want to feel that they are receiving safe food when eating at a restaurant (Henson & Hooker, 2001) this study is significant to the food service industry because of its correlation with the RFID system's purpose of providing safe food.

### **Methods**

The methodology used for this study consisted of qualitative research. Through the utilization of web-based surveys, and surveys distributed within conveyor belt sushi restaurants this study sought to determine customer satisfaction as it relates to the knowledge and perceived benefits of the RFID systems. Surveys consist of a pre-determined agenda, structured by specific questions that seek to answer desired inquiries (Suchman & Jordan, 1990). The self-administered surveys (See Appendix A) were given to participants and the responses were compiled and analyzed to find information pertinent to the study (Schonlau, Fricker & Elliott, 2002). Since the

customer's opinions and views were crucial to this study, contact needed to be made with potential sushi consumers. The literature indicated that when surveys are short, clearly worded and disregard personal or sensitive items that people would be more willing to answer honestly (Schleifer, 2001) thus this model was followed in designing the surveys used. The surveys were left anonymous, and no identifying questions were asked to ensure that the participants felt comfortable answering honestly. A consent form listing the researcher's information, the nature of the study and the confidentiality of the surveys was also given (See Appendix B).

The survey consisted of structured questions with pre-determined answers as well as a few open ended questions (See Appendix A). Pre-determined answers allow for a greater uniformity in responses and make processing and coding easier (Babbie, 2011). A comment section was included to avoid the limitation of surveys not allowing participants to voice opinions or explain their answers (Walonick, 2004). A letter of support was made and sent to Wasabi, a conveyor belt sushi restaurant, which has various locations throughout the United States to ask for their assistance with this project (See Appendix C). A representative from Wasabi agreed to distribute the surveys within one of the restaurants to assist in gathering data. The surveys were also uploaded on the internet, and the respondents "self-selected" into the survey in order to attract a larger number of respondents (Schonlau, Fricker & Elliott, 2002). The surveys were distributed two ways to ensure a large volume of responses.

This method was chosen because of the focus of the study. The study was intended to determine the customer's knowledge and perception of RFID systems. In order to obtain this information, potential sushi consumers, and avid sushi consumers needed to be contacted and surveyed. Due to the remote location of the researcher, internet surveys were chosen to reach a larger audience more conveniently, as well as more affordably. According to Schonlau, Fricker

& Elliott, internet surveys are more preferable when the study is using a convenience sample (2002). The surveys distributed within the conveyor belt sushi restaurants were chosen to gather the feelings of those consumers directly within an establishment.

### **Population**

The population included in this study consisted of a convenience sample of respondents, as well as a random sampling of sushi consumers. In this type of convenience sample used for the internet surveys, respondents “self-select” into the survey via social media sites and email (Schonlau, Fricker & Elliott, 2002). Convenience sampling was best for this study because a large number of people were needed and this sampling allows for the most affordable and least time consuming option (Walonick, 2004). In order to ensure that the population reached online was pertinent to the study, a video was comprised and administered along with the survey. The video outlined what a conveyor belt sushi restaurant is and what the RFID systems are capable of. This video was intended to inform the participants of the topic to guarantee they understood the questions within the survey. The random sample used for the hard copy surveys was chosen to obtain the opinions of customers within a conveyor belt sushi restaurant. A stratum is a subset of the population that shares at least one common characteristic (Walonick, 2004). For this random sampling, a stratum of dining within a conveyor belt sushi restaurant was defined. From within this stratum, voluntary random participants completed a survey.

Since the population of people within the United States that consume sushi is a large demographic, the best way to obtain an accurate sample size was through the convenience sampling paired with the informative video in addition to the random sample of sushi diners. The online participants were contacted using Facebook and email, linking them to the survey. The customers within the restaurant were asked to participate in the study at the completion of their meal. The researcher had an initial goal of receiving at least 100 completed surveys.

## **Information**

The surveys consisted of questions that were intended to record the opinions and beliefs of the participants as it relates to sushi and these RFID management systems. The survey asked: how important freshness is when dining at sushi restaurants, how important food safety is when dining out, whether the participant associates sushi with a high risk of foodborne illness, how often they dine at sushi restaurants, how important freshness is to them when eating sushi, how many times they have ever dined at a conveyor belt sushi restaurant, whether they have ever felt the quality of sushi was poor, whether the participant is aware of management systems used by conveyor belt sushi restaurants, would the fact that these systems are used make them more willing to dine there, whether they would choose a particular restaurant strictly based on the use of it, and to what degree would they trust these systems to ensure the quality of the sushi (See Appendix A). The questions regarding the frequency of sushi consumption and whether they have dined at a conveyor belt sushi restaurant were included for general demographic data in order to later disaggregate the population.

## **Data Analysis**

This study utilized the Grounded Theory Method by examining data to reach a theory (Babbie, 2011). The surveys were reviewed, analyzed and disaggregated. From the surveys, the answers were counted based on similar responses and coded based on the questions. This type of coding is called univariate analysis. Univariate analysis consists of using a single variable and showing the distribution of its attributes (Babbie, 2011). For example, the survey asked whether the participants had heard of RFID systems, these responses were broken into yes and no answers. Much of the data taken from the surveys was put into charts and graphs using frequency distribution, which is a description of the number of times an attribute is observed (Babbie, 2011). All data was calculated and displayed using graphs on Microsoft Excel in order to better

represent the findings. This is known as concept mapping. Concept mapping consists of putting data into graph forms to better understand the relationship occurring within a study (Babbie, 2011). These coded results indicate whether these management systems truly mattered to customers and how affected their restaurant choices would be by their presence.

## **Conclusion**

This study was intended to determine whether the customer knowledge and perceived benefits of RFID systems would affect customer satisfaction. This qualitative study utilized surveys within a conveyor belt sushi restaurant, and web-based surveys in order to obtain data with a goal of at least 100 responses. The surveys were designed to be short, clear and concise to ensure optimal response rates. The web-based surveys were given to a convenience sampling of people who first viewed an informative video explaining conveyor belt sushi restaurants and RFID systems and then completed the survey. The surveys within the restaurant were given to a random sampling that was identified as sushi consumers. The surveys consisted of some demographic questions that were used to group the participants, and the remaining questions were related specifically to sushi and the RFID systems. This data was then compiled using various coding methods to create graphs and charts, also known as concept mapping, in which the findings could be easily displayed and understood. This methodology was chosen because in order to find out consumer opinions, the potential consumers needed to be directly questioned. The findings are meant to assist the food industry with customer insight into technological management systems as it pertains to their knowledge and perceived benefit.

## Results

The purpose of this study was to determine how and to what extent the knowledge and perceived benefit of radio frequency identification (RFID) technological management systems in conveyor belt sushi restaurants affect customer satisfaction. For the purpose of this study, customer satisfaction was defined as the perceived freshness of the sushi. These RFID systems ensure the sushi does not exceed the time limit for safe consumption while on the belt, which according to the FDA is four hours (2005). This study gives insight into the customer's view of RFID systems. Given that customers want to feel that they are receiving safe food when eating at a restaurant (Henson & Hooker, 2001) this study is significant to the food service industry because of its correlation with the RFID system's purpose of providing safe food. The following are the results from the completed surveys. The online survey was distributed using Facebook as well as Paul Smith's College email. The online survey was accompanied by an informative video that explained the variables of the study. The survey was also distributed within a conveyor belt sushi restaurant, Wasabi, in Orlando, Florida. The online surveys resulted in 163 complete responses, and the hard copy surveys resulted in 34 complete responses

Question one was designed for disaggregation purposes. For this study, only sushi consumers were desired as respondents. Question one asked: How frequently do you dine at sushi restaurants? The answer choices provided were: Never, Weekly, Monthly or Yearly. Out of 163 total online surveys, 61% dine at sushi restaurants at least once a year. Within these 101 responses, 54% dine at sushi restaurants on a yearly basis, 44% dine at sushi restaurants on a monthly basis, and 2% dine at sushi restaurants on a weekly basis. For the purpose of the study, only the responses from these 101 participants were used combined with the 34 responses from the surveys completed within the conveyor belt sushi restaurant, for a total of 135.

Question two asked: How important is freshness to you when eating at a sushi restaurant? The answer choices provided were: Unimportant, Important, or Very important. Of the sushi consuming participants, 89% felt freshness was very important, 9% felt it was important, 1% felt it was somewhat important, and 1% felt it was unimportant (see Figure 1).

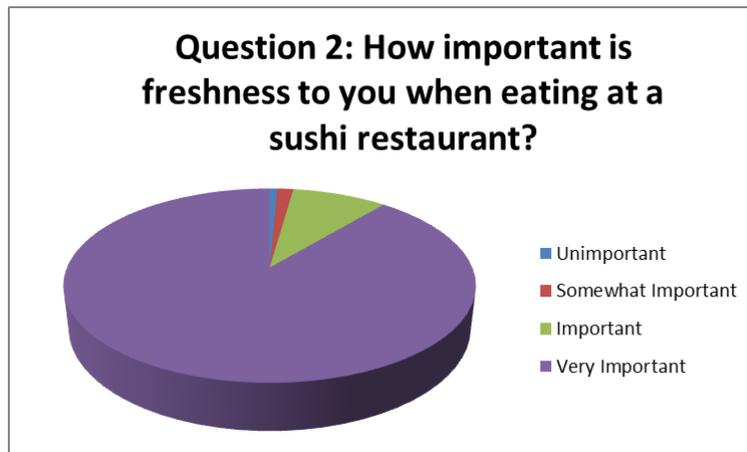


Figure 1: Question 2

Question three asked: How important is food safety to you when dining out? The answer choices provided were: Unimportant, Somewhat important, Important, or Very important. Of the sushi consuming participants, 84% said food safety was very important, 15% said food safety was important, and 1% said food safety was somewhat important (see Figure 2).

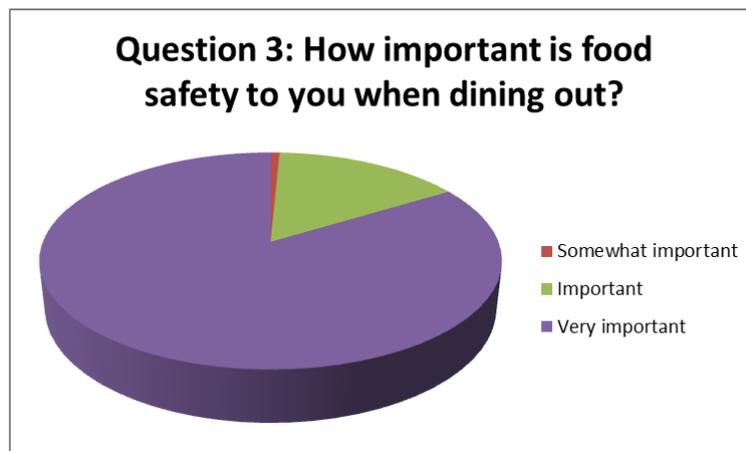


Figure 2: Question 3

Question four asked: Do you associate sushi with a high risk of foodborne illness? The answers choices provided were: Never thought of it, Unsure, No, or Yes. Of the sushi consuming participants, 8% had never thought of it, 14% were unsure, 24% did not associate sushi with a high risk of foodborne illness, and 54% did (see Figure 3).

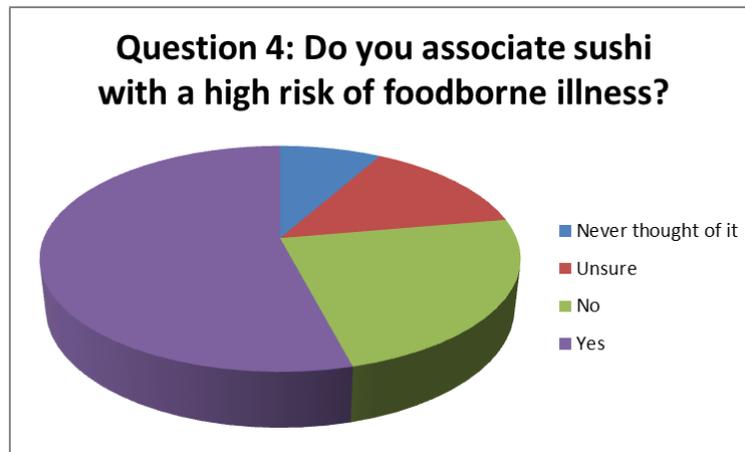


Figure 3: Question 4

Question five asked: Has the quality of sushi within a restaurant ever caused you to dine elsewhere? The answer choices provided were: Unsure, No, or Yes. Of participants, 3% were unsure, 50% replied they never changed dining habits based on this, which could be attributed to never encountering poor sushi or high customer loyalty among other reasons. Lastly, 47% had been inclined to choose another restaurant based on the quality of the sushi (see Figure 4).

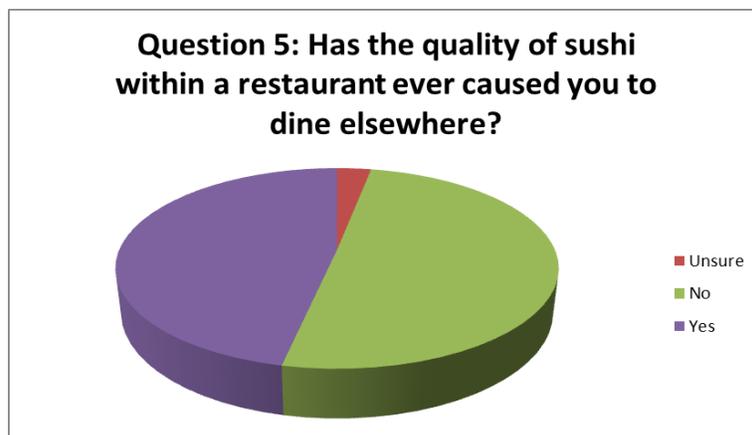


Figure 4: Question 5

Question six asked: How many times have you dined at a conveyor belt sushi restaurant?

The question was open ended and asked participants to provide a numerical answer. From the 135 respondents, 50%, had never been to a conveyor belt sushi restaurant, 40% had been between one and five times, 5% had been between six and ten times, 1% had been eleven to nineteen times, and 4% had been twenty plus times (see Figure 5).

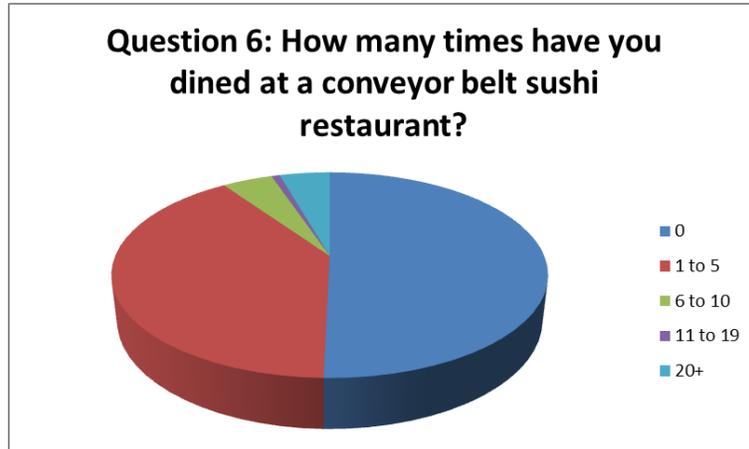


Figure 5: Question 6

Question seven posed whether the participant had been aware of the management systems used to monitor the quality of the sushi before it being brought to their attention for this study. The answer choices provided were: Unsure, No, or Yes. Of the participants, 4% were unsure, 16% were aware of the systems, and 80% were not aware of the systems (see Figure 6).

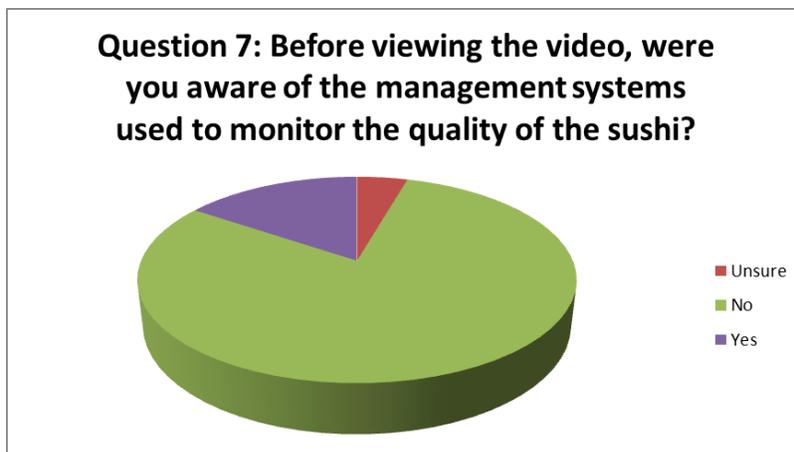


Figure 6: Question 7

Question eight asked: Would you be inclined to dine at a conveyor belt sushi restaurant based on the use of a system such as this? The answer choices provided were: Undecided, No, or Yes. Of the sushi consuming participants, 27% were undecided, 6% said no, and 67% said yes (see Figure 7).

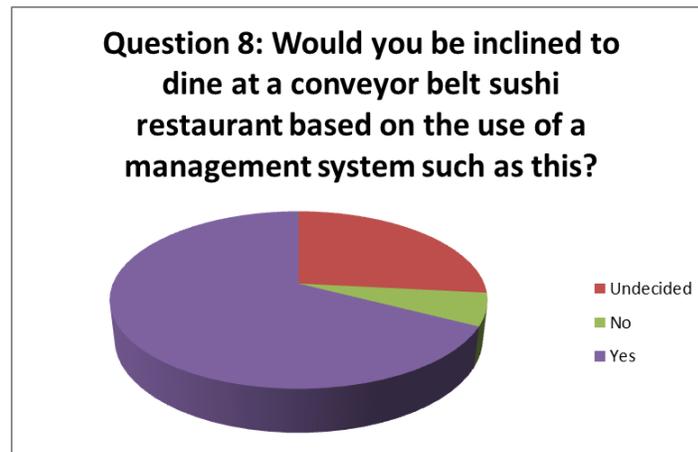


Figure 7: Question 8

Question nine asked: Would the use of this management system lead you to choose one conveyor belt sushi restaurant over one that doesn't? The answer choices provided were: Undecided, No, or Yes. Of the sushi consuming participants, 31% were undecided, 23% said no, and 46% said they would rather choose a restaurant that utilizes this system (see Figure 8).

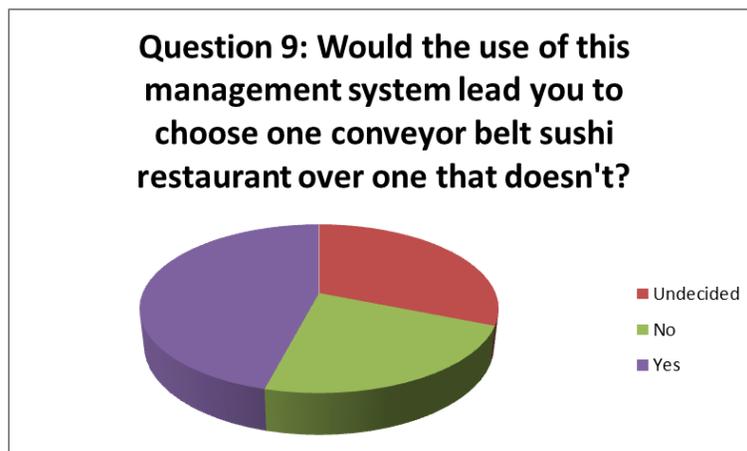


Figure 8: Question 9

Question ten asked online participants: To what degree do you trust that these systems ensure the quality of the sushi? The answer choices provided were: Unsure, Not at all, Somewhat, or Trust entirely. Of the participants, 12% were unsure, 5% did not trust the systems at all, 69% somewhat trust the systems, and 14% trust the systems entirely (see Figure 9).

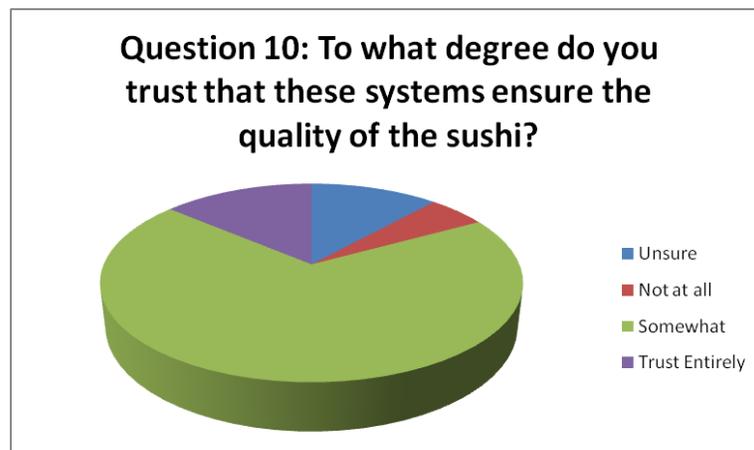


Figure 9: Question 10

The participants were then asked their age. It was an open ended voluntary question in which they were asked to answer numerically. Of the sushi consuming participants, 1% was under eighteen, 10% were between the ages of eighteen and twenty, 51% were between the ages of twenty-one and twenty-nine, 28% were between the ages of thirty and forty-nine, and 10% were fifty and over. The participants were then provided with a space to add comments. This was optional. Out of the 197 respondents, only 16% left comments. Most comments were explaining why the participants were against these types of restaurants. One participant wrote, “There is no need for microchips. Nor really a conveyor belt. Completely ridiculous and kind of disgusting that we need such technology just to serve food! (sic)”. Another participant wrote, “This conveyor belt weirds me out because lots of people could sneeze on it, touch it, etc as it passes by them on its way to you (sic)”. The remaining comments were based on the RFID systems itself and the participants being unaware that it was utilized for this purpose.

## Discussion

The purpose of this study was to determine whether the knowledge and perceived benefit of RFID systems within conveyor belt sushi restaurants affects customer satisfaction. The opinions of sushi consumers were gathered through the use of a survey (See Appendix A). These surveys were distributed online accompanied by an informative video using social media and email as well as being distributed within a conveyor belt sushi restaurant. The surveys revealed that sushi consumers expect to receive fresh, safe food when dining at restaurants and that they would be more likely to dine at conveyor belt sushi restaurants because of the use of an RFID system.

The survey results suggested that these sushi consumers feel food safety and freshness are important when dining out. The majority of participants recognize that sushi is at a high risk for foodborne illness with 54% responding “yes”. Most participants had been driven to choose a new sushi restaurant based on the issue of quality, with 47% responding “yes” when asked question five. Of participants, 50% had never dined within a conveyor belt sushi restaurant. Of the participants, 80% had not known about these management systems. Participants generally felt they would be inclined to dine at a conveyor belt sushi restaurant with 67% responding yes to question eight, but the numbers for question nine suggest that participants felt unsure about this system making one restaurant more desirable than another. The majority of the online participants to some degree did trust these systems to ensure the quality of the sushi.

For the purpose of this study, customer satisfaction was defined as perceived value, which is the difference between what customers receive and what they expected to receive. The literature gave ample evidence that customer expectations have recently become focused on receiving safe, fresh, high quality food. The survey results indicate that 98% of participants felt

freshness is at least important to them when dining at sushi restaurants, with 89% of them feeling it was very important. This correlates to Kruse (2003) who mentions in an article of *Nation's Restaurant News* that customers have come to expect freshness when they dine at restaurants. The participants of the survey also reported that 47% have had to change which sushi restaurants they dine in because of the quality of the sushi. Romeo reports in *Nation's Restaurant News* that "freshness equals quality" (2005, p. 57) which greater strengthens the idea that customers desire freshness.

The survey results also showed that 99% feel food safety is at least important, with 84% of that number feeling it is very important. This correlates to the survey conducted by the FDA in 2010 that surveyed households via telephone. Lando and Carlton (2011) found from this survey that 54% of people trust the restaurants they dine in to provide them with safe food. Lando and Carlton (2011) also found that people recognize food at restaurants to be of a higher risk for foodborne illness than food prepared at home. The public recognizes that food safety is an issue, and has come to trust restaurants in ensuring the safety of the food they provide. Over half of the population surveyed, 54%, also recognized sushi as being a high risk item for foodborne illness. This also directly correlates to the FDA survey. Lando and Carlton (2011) found that 55% of participants in the telephone survey believed foods containing raw fish, like sushi, are likely to make people sick. The survey participants proved the literature accurate in customer expectations in that they find food safety and freshness to be important aspects of dining out, and expect the food in restaurants to be safe. Given that the RFID systems ensure the freshness and safety of the sushi, the survey results suggest that this system would positively affect customer satisfaction, as it directly relates to perceived value.

The participants were asked whether they would be inclined to dine within a conveyor belt sushi restaurant based on the use of these management systems. Of the 135 surveyed participants, 67% said they would be inclined. The final question given to online participants was to what degree they trusted that these management systems ensured the quality of the sushi. A total of 69% somewhat trust the system, and 14% trust the system entirely. When asked whether the use of these management systems would lead them to choose one conveyor belt sushi restaurant over another, 46% agreed that they would rather visit one that utilizes this system. The responses from these questions suggest that the survey participants saw benefit from these management systems and recognized that it could encourage customer loyalty.

Half of participants had never dined within a conveyor belt sushi restaurant prior to the study, which is due to the majority of the surveys coming from the convenience sampling online rather than within the conveyor belt restaurant. For the purpose of understanding whether conveyor belt sushi restaurant patrons know and understand the potential benefit of the management systems, this number was not the desired finding.

A finding that opposed expected outcome was the answer responses to question nine. Question nine asked whether the use of these management systems would lead participants to choose one conveyor belt sushi restaurant over one that does not. While 46% reported that they would, another 31% were undecided. Given the results from question eight that strongly suggested the participants would be inclined to dine at a conveyor belt sushi restaurant based on these use of management systems, the response of “yes” for question nine was expected to be higher. These findings could be attributed to the wording of question nine. One online participant left a comment noting that the wording was difficult to understand. After reviewing the question, it became clear that the question could be taken two ways. Participants may have been confused

whether they were choosing between two conveyor belt sushi restaurants, of which only one used the RFID system; or between a conveyor belt sushi restaurant and a traditional sushi restaurant.

The survey inquired whether customers and potential sushi consuming participants had prior knowledge of these RFID management systems. Of the 135 survey participants, 80% were not aware of the system being used within conveyor belt sushi restaurants. Many online participants left comments noting that they were aware of RFID technology itself, but that its use in this specific aspect was new to them. This leads to the assumption that conveyor belt sushi restaurants are not advertising the use of this system to their advantage. Given the findings that the customers see this as a beneficial system, along with the fact that they desire fresh, safe food, the investment into these RFID systems could lead to new and repeat business for conveyor belt sushi restaurants.

The survey ended with an optional comment section. Given the literature on surveys, it was seen as necessary to include this in case the participants wanted to better express their opinions on the topic. Many of the comments were from the participants that responded that they felt these types of systems were not beneficial. For example, one participant wrote, “There is no need for microchips. Nor really a conveyor belt. Completely ridiculous and kind of disgusting that we need such technology just to serve food! (sic)”. Another participant wrote, “This conveyor belt weirds me out because lots of people could sneeze on it, touch it, etc as it passes by them on its way to you (sic)”. The trend in comments among the negative responses seemed to express more of a disdain for conveyor belt sushi restaurants themselves, and not specifically management systems. It was assumed that the participants answer based on their opinions of the

RFID systems. Given the trend in comments, it is possible that the answers were skewed due to preconceived opinions.

There were a few measures that may have affected the outcome of the survey results that are worth mentioning. Question ten that asks the participants, “To what degree do you trust that these systems ensure the quality of the sushi?” was only provided to online participants. The question was formulated as being necessary to study after the survey draft had already been sent to the conveyor belt sushi restaurant for distribution within their brick and mortar location. From the similarities in responses from the online sushi consumers and the participants in the restaurant, there is a slight chance the findings would be similar but can only be assumed.

Another mishap was the wording of question nine. After analyzing the data, the results of the question seemed to stray from the general trend noticed within the answers of the other questions in the survey. Taking into account a participant comment noting the difficulty of understanding question nine, it became apparent that the wording may have been poor. If the wording had affected the way the participants understood the question, the resulting responses could potentially be answering a question different than the one the researcher intended it to answer. All responses were assumed to have answered the question in the context it was intended, which could skew results.

The results of this study will be shared with the Paul Smith’s College campus during the Capstone Celebration on April 27, 2013. The presentation, that is open to the campus, will outline the study and report on the findings. The results will also be given to Wasabi, in thanks for their help and participation in this study. The final report will also be uploaded onto the Paul Smith’s College Library database for future students to potentially access and utilize the findings.

In the future, this study could be used as a starting point for more research. Age was not used as a variable for this study, but could play a significant role in future studies. Based on the age demographics that were reached, research could potentially be done to access people above the age of fifty to more accurately gauge their opinions on this topic. Due to the age of the researcher and the utilization of social media and email on a college campus, the majority of participants for this study were between the ages of twenty-one and twenty-nine. Another aspect that could be explored is the specific perceived benefits potential customers may have. The surveys for this study did not specifically ask participants to explain why they think these systems are beneficial, or what they felt these systems offer. Future research could be conducted to include this aspect. Given that the overall population of Americans that consume sushi is a fairly difficult number to estimate, future studies could be conducted on a larger scale to more accurately portray the sushi consumer opinions of the United States. This study had a goal of 100 surveys due to the remote location of the researcher and short time frame for collecting data. Future research could be conducted to survey a larger population, given available resources. Another future study could include only surveying customers within conveyor belt sushi restaurants. This study attracted a population in which 50% had never dined at a conveyor belt sushi restaurant. Potential future research could collect the opinions of diners within the establishments to better obtain a more concentrated sushi consuming population that frequent these types of restaurants.

## References

- Babbie, E. (2011). *The Basics of Social Research*. Belmont, CA: Wadsworth Cengage Learning.
- Bitner, M. J., Brown, S. W., Meuter, M. L. (2000). Technology infusion in service encounters. *Journal of the Academy of Marketing Science*, 28. doi: 10.1177/0092070300281013
- Bocchetti, S. (2006). Security and Privacy in RFID Protocols. Master Thesis. <http://lasecwww.epfl.ch/abstracts/abstract RFID bocchetti.shtml>
- Creswell, J. W. (1998). *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*. Sage Publications.
- Henson, S., Hooker, N. (2001). Private sector management of food safety: public regulation and the role of private controls. *International Food and Agribusiness Management Review* 4, 7-17. [http://dx.doi.org/10.1016/S1096-7508\(01\)00067-2](http://dx.doi.org/10.1016/S1096-7508(01)00067-2)
- Heung, V.C.S., Ngai, E.W.T. (2008). The mediating effects of perceived value and customer satisfaction on customer loyalty in the Chinese restaurant setting. *Journal of Quality Assurance in Hospitality & Tourism* 9(2), 85-107. doi: 10.1080/15280080802235441
- Kara, A., Kaynak, E., Kucukemiroglu, O. (1996). Positioning of fast-food outlets in two regions of North America: a comparative study using correspondence analysis. *Journal of Professional Services Marketing* 14(2), 99-119. doi:10.1300/J090v14n02\_07
- Karkkainen, M. (2003). Increasing efficiency in the supply chain for short shelf life goods using RFID tagging. *International Journal of Retail & Distribution Management* 31(10), 529-536. doi: 10.1108/09590550310497058
- Kruse, N. (2003, October 6). To achieve restaurant success remember it's the food, stupid. *Nation's Restaurant News* 37(40), 28. Retrieved from <http://search.proquest.com>
- Lando, A., Carlton, E. (2011). 2010 Food Safety Survey: Key Findings and Topline Frequency Report. Center for Food Safety and Applied Nutrition, FDA. Retrieved from <http://www.fda.gov>
- Merriam-Webster. (2012). Benefit. Merriam Webster Dictionary. Retrieved from <http://www.merriam-webster.com/dictionary/benefit>
- Merriam-Webster. (2012). Knowledge. Merriam Webster Dictionary. Retrieved from <http://www.merriam-webster.com/dictionary/knowledge>
- Morosan, C. (2011). Customers' adoption of biometric systems in restaurants: an extension of the technology acceptance model. *Journal of Hospitality Marketing & Management* 20, 661-690. doi: 10.1080/19368623.2011.570615

- Nachay, K. (2011, June). Would you like a salad with that? *Food Technology Magazine* 65(6), 29-7.
- Ngai, E.W.T., Suk, F.F.C., & Lo, S.Y.Y. (2008). Development of an RFID-based sushi management system: The case of a conveyor-belt sushi restaurant. *International Journal of Production Economics*, 112 (2). Hung Hom, Kowloon, Hong Kong. doi:10.1016/j.ijpe.2007.05.011
- Petrak, L. (2007). Freshening Up the Supply Chain. *National Provisioner*, 9-10,12.
- Pine, J., Gilmore, J.H. (2011). *The Experience Economy, Updated Edition*. Boston, Massachusetts: Harvard Business School Publishing.
- Regattieri, A., Gamberi, M., Manzini, R. (2007). Traceability of food products: general framework and experimental evidence. *Journal of Food Engineering* 81, 347-356. doi:10.1016/j.jfoodeng.2006.10.032
- Romeo, P. (2005). Panel discusses chain's efforts to define, deliver freshness. *Nation's Restaurant News* 39 (42), 57.
- Sanchez-Fernandez, R., Iniesta-Bonillo, M.A. (2007). The concept of perceived value: a systematic review of the research. *Marketing Theory* 7(4) 427-451. doi:10.1177/1470593107083165
- Schleifer, S. (2001). Trends in Attitudes Toward and Participation in Survey Research. *Public Opinion Quarterly*, 50(1), 17-26. doi: 0033-362X/86/0050-17
- Schonlau, M., Fricker, R.D., Elliott, M.N. (2002). *Conducting research surveys via E-mail and the Web*. Santa Monica, California: RAND.
- Soma Sur (2008). Technology-based remote service encounters: understanding customer satisfaction and sustainability. *Journal of Foodservice Business Research* 11(3), 315-332. doi: 10.1080/15378020802317040
- Srivastava, L. (2007). Radio frequency identification: ubiquity for humanity. *Info* 9(1), 4-14. doi:10.1108/14636690710725030
- Suchman, L., & Jordan, B. (1990). Interactional Troubles in Face-to-Face Survey Interviews. *Journal of the American Statistical Association* 85 (409), 232-253. doi: 10.1080/01621459.1990.10475331
- Traphagan, J. W., & Brown, L. (2002). Fast food and intergenerational commensality in Japan: new styles and old patterns. *Ethnology*, 41(2), 119. Retrieved from <http://web.ebscohost.com>

U.S. Food and Drug Administration. (2005, June 26). Potentially Hazardous Food: The evolving definition of temperature control for safety. Retail Food Risk Factor Studies. Retrieved from <http://www.fda.gov>

Walonick, D. (2004). *Survival Statistics*. Bloomington, MN: StatPac, Inc.

Wang, N., Zhang, N., Wang, M. (2006). Wireless sensors in agriculture and food industry-recent development and future perspective. *Computer and Electronics in Agriculture* 50, 1-14. doi:10.1016/j.compag.2005.09.003

## Appendix A

### Survey

**How often do you dine at sushi restaurants?**

- Never     Weekly     Monthly     Yearly

**How important is freshness to you when eating at a sushi restaurant?**

- I don't eat sushi     Unimportant     Somewhat important     Important     Very important

**How important is food safety to you when dining out?**

- Unimportant     Somewhat important     Important     Very Important

**Do you associate sushi with a high risk of foodborne illness?**

- Never thought of it     Unsure     No     Yes

**Has the quality of sushi within a restaurant ever caused you to dine elsewhere?**

- N/A     Unsure     No     Yes

**How many times have you dined at a conveyor belt sushi restaurant?** Please answer numerically \_\_\_\_\_

**Are you aware of the management systems used to monitor the quality of the sushi?**

- Unsure     No     Yes

**Would you be more willing to dine at conveyor belt sushi restaurants knowing they use a management system such as this?**

- N/A     Undecided     No     Yes

**Would the use of these management systems lead you to choose a conveyor belt sushi restaurant over one that doesn't?**

- N/A     Undecided     No     Yes

**To what degree do you trust that these systems to ensure the quality of sushi?**

- Unsure     Not at all     Somewhat     Trust Entirely

**Age** \_\_\_\_\_

Thank you for completing the survey! Please feel free to leave any comments you may have.

**Comments:**

## Appendix B

### Survey Consent Form

March 2013

#### **Conveyor Belt Sushi Restaurants:**

A study of customer knowledge and perceived benefit of technological management systems within conveyor belt sushi restaurants

You are being invited to participate in a research study about the information management systems known as radio frequency identification or RFID within conveyor belt sushi restaurants. These systems are used to monitor the sushi as it travels along the belt. There are various business advantages to these systems as well as ensuring the sushi on the belt is of the best quality.

This study is being conducted by **Heather Miller**, from the Integrative Studies program at **Paul Smith's College** in Paul Smiths, New York. This study is being conducted for a senior level capstone project for a Bachelor's of Science.

You were selected as a possible participant in this study because you were dining within the conveyor belt sushi restaurant and identified as a sushi eater.

There are no known risks if you decide to participate in this research study. There are no costs to you for participating in the study. The information you provide will be used to analyze whether these management systems affect customer satisfaction when dining at a conveyor belt sushi restaurant. The questionnaire will take about **five minutes** to complete. The information collected may not benefit you directly, but the information learned in this study should provide more general benefits to the food industry.

**This survey is anonymous.** Do not write your name on the survey. No one will be able to identify you or your answers, and no one will know whether or not you participated in the study. Should the data be published, no individual information will be disclosed.

Your participation in this study is voluntary. By completing and answering the questions on the survey, you are voluntarily agreeing to participate. You are free to leave any question unanswered that you do not wish to answer for any reason.

If you have any questions about the study, please contact Heather Miller, 51 Helen St. Apt 6 Saranac Lake, NY 12983. (773)571-8623. HMiller@s.paulsmiths.edu

Paul Smith's College has reviewed my request to conduct this project. If you have any concerns about your rights in this study, please contact Joe Conto, jconto@paulsmiths.edu

## Appendix C

### Letter of Support

To whom it may concern,

My name is Heather Miller. I am in my final year at Paul Smith's College in Paul Smith's, New York working towards finishing my Bachelors of Science in Integrative Studies. The topics I am studying within my degree are Food and Beverage Management along with Culinary Arts and Service Management with a minor in business. During our final year in Bachelor level programs here at Paul Smith's College we are required to complete a capstone project. This capstone project consists of researching and implementing a study in a topic that interests us.

Throughout the last semester, I have been researching the information management systems used within conveyor belt sushi restaurants. The incorporation of the radio frequency identification tags in the conveyor belt to ensure food safety is a new and fascinating innovation. Most of the research on these types of management systems revolves around the logistics of the system itself or how it can be useful to the company. I want to find out how the customer feels about these systems and whether or not it affects their satisfaction when dining at a conveyor belt sushi restaurant.

In order to evaluate whether customers are aware of these systems and how they feel it affects their experience, I will need to somehow interact with sushi diners. The surveys will be asking how often they consume sushi, if they feel freshness is an important factor when choosing a restaurant, if they are aware of management systems to ensure quality and if the knowledge of the system will make them want to return. I would like to obtain this information using a survey.

My goal is to receive at least 100 responses. I am planning to distribute surveys using an online program, but I was hoping to have some surveys distributed within a conveyor belt sushi restaurant to ensure some respondents have in fact been to a conveyor belt sushi restaurant. The survey is completely anonymous and is not specifically affiliated with any one restaurant. Your feedback and cooperation are very much appreciated. Thank you for your time in reviewing my request and allowing my survey to be distributed.

Sincerely,

Heather Miller