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HACCP Cost Analysis in Retail Food Establishments

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ABSTRACT

The adoption of Hazard Analysis Critical Control Points (HACCP) in foodservice establishments is voluntary. Investment in HACCP usually requires a diverse set of financial and non-financial resources. Such costs can create constraints for management to adopt HACCP voluntarily, unless the costs versus expected benefits are known and can be evaluated. This study addresses a critical gap in understanding the costs associated with HACCP in foodservice establishments. We propose a costing framework based on a recent study conducted to assess HACCP implementation costs in selected foodservice establishments. This study chose a qualitative research design through an organizational ethnographic approach and case study based assessment of costs. The six establishments surveyed included two of each of the following: restaurants, grocery stores, and convenience stores, serving ready-to-eat foods. The proposed costing framework characterizes costs and their characteristics. Such a framework would be valuable in understanding management biases and preferences in handling food safety. The discussions suggest a gap in management's understanding of perceived versus actual costs. For example, most HACCP implementation costs were ongoing, except for the cost of buying new equipment. Personnel costs (wages) were a significant portion of these ongoing costs. None of the establishments surveyed incurred costs for public communication/consumer awareness regarding HACCP or food safety. Lack of effective communication of HACCP and food safety principles could create an information asymmetry and have negative implications for consumers' perception of food safety. The development of a costing framework could systematically address research regarding management decision-making by making foodservice HACCP costs more transparent.

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INTRODUCTION

Hazard analysis critical control point

Since its introduction to the public in 1971, HACCP has been widely adopted and used in the food industry to ensure that safe foods are served to the public *(22)*. Prior to the introduction of HACCP, traditional food safety methods were inappropriate to detect food contamination during production because the food production processes in use were examined as a snapshot for a short period of time *(29)*. However, HACCP is more effective than traditional methods because it focuses resources on identifying measurable CCPs and allows manufacturers and operators to apply timely corrective actions when they are needed, thus preventing potential food contamination in the production process *(43)*.

HACCP has been adopted as a regulatory standard both domestically and internationally because of its cost efficiency and flexibility. It provides easily monitored control measures at identified points during production, which is more cost-efficient than extensive post-production testing *(3)*.

Although there are general HACCP principles to be followed, firms can determine specific elements of process and performance standards *(32)*. Because of its advantages, HACCP has been accepted and used extensively by all sectors in the food chain, such as raw products processors, food manufacturing plants, restaurants, and food control authorities *(18)*. However, studies have acknowledged that specific characteristics inherent to each sector need to be thoroughly examined when the HACCP program is applied *(6, 18, 39)*.

HACCP in foodservice

Although food safety has recently created a great amount of public concern, its importance in the foodservice industry has been emphasized less *(26)*. Foodservice operations involve a variety of complex procedures that might contaminate food *(37)*. Food contamination can occur at every step during food preparation such as ingredient handling, reheating, storage, refrigeration, and serving *(39)*. Thus, it is of great importance to monitor and control the safety of food from preparation to service. King *(23)* maintained that HACCP could offer a food safety system in foodservice that would minimize and/or eliminate the risk of food contamination.

The HACCP approach seems suitable to foodservice because it can provide operations with an efficient food safety management system by monitoring and controlling the hazards during preparing and serving the food. Walker and Jones *(44)* argue that HACCP is preventive and proactive rather than corrective and reactive, HACCP programs help to alleviate the hazardous conditions by identifying and correcting hazards during food production, before they lead to an outbreak.

Studies have found that it is challenging to adopt HACCP in the foodservice industry. Barriers that have been identified in the literature include the diversity of foods and culinary procedures utilized *(45)*; lack of proper equipment and control instruments *(5)*; human resource issues, such as educational levels and high turnover *(6, 36)*; employee and manager time *(35, 36, 45)*; employee and manager food safety knowledge *(19, 35, 36, 45)*, and lack of training materials *(35)*.

Moreover, Roberts and Sneed *(36),* in their study of the readiness of Iowa restaurants to implement HACCP, found that financial resources were a foremost issue of managers. Other researchers have also found that the cost of implementing and maintaining a HACCP system is a major issue for foodservice operations *(38)*. Taylor *(41)* discovered that small foodservice businesses were unable to implement HACCP because of financial constraints, which is of particular concern because most foodservice businesses are individually owned small businesses *(2)*. Martin and Anderson *(27)* argued that small foodservice businesses are limited in use of their financial resources to invest in HACCP because this would increase the price of their products, thus reducing profits. Roberts and Sneed *(36)* posited that because restaurants operate on relatively small profit margins, programs and training must be cost effective. The industry needs to evaluate carefully the costs of implementing HACCP versus the expected benefits; this evaluation would provide management the tools to make an informed decision regarding HACCP programs *(43)*.

HACCP costs and implementation

Studies have found that the cost of HACCP implementation is a great challenge to businesses *(6, 45)*. Although HACCP has been recognized as the most efficient method to ensure food safety, implementing HACCP in a specific foodservice operation incurs various costs such as staff training, purchasing new equipment, and maintaining the system *(21)*. Typically, HACCP implementation costs also include the cost of operational changes to comply with HACCP requirements *(43)*.

Drosinos et al. *(13)* found that investment costs in equipment to meet HACCP requirements were the largest expenditure. Maintenance costs related to training and monitoring in foodservice were also found to be high *(9)*. It has also been suggested that a thorough examination of the operation must be undertaken to avoid unnecessary costs and time *(32)*. Almanza and Ghiselli *(2)* maintained that priorities of HACCP implementation should be based on the characteristics of individual businesses, such as types of products, employees, and service style. For example, HACCP priorities may differ between convenience stores and restaurants; the latter clearly involves more complex food handling and serving techniques.

The cost of HACCP implementation also relies on present food safety practices within the operation *(13)*. HACCP implementation costs can be greatly reduced if foodservice operations are already equipped with sound food safety practices and HACCP prerequisite programs *(15, 41)*. Other studies have shown that strong motivation and commitment of management to HACCP could contribute to reducing implementation costs *(1, 32, 46)*. Cost efficiencies can also be realized when managers correctly understand the concepts of HACCP and effectively apply them in practice *(21)*. Reductions can also be found in the costs of motivating and training of employees, which are often recognized as the most significant costs during HAC-

CP implementation and maintenance *(4, 32)*. Motivated managers could help employees better understand food safety through efficient communication, which would decrease the time and costs associated with training *(49)*. However, while the foodservice industry seems to recognize the costs of HACCP implementation, it apparently fails to perceive the benefits of HACCP *(14)*. Thus, there is a great need for a cost-benefit analysis to encourage foodservice operations to adopt HACCP as their food safety management systems.

Cost-benefit analysis and decision-making

The HACCP system is only a tool that facilitates processes *(28)*. Given the flexible nature of HACCP *(17, 43)*, management should carefully analyze the benefits and costs of such a program in their unique circumstances and decide how it can best be applied.

Although HACCP is associated with various costs, management in the foodservice industry needs to ensure the safety of their food products *(2)*. Research has attempted to show the effectiveness of HACCP by analyzing the cost and benefits of HACCP. According to Antle *(3)*, firms can benefit from minimizing and/or eliminating the risk of foodborne illness while reducing the costs of producing higher quality and safer foods. Taylor *(41)* emphasized the importance of HACCP implementation in small businesses and identified time, money, documentation, and verification as costs while finding confidence, expertise, teambuilding, reduced costs, trading opportunities, and legal protection as benefits. Findings of a study on HACCP implementation in the Mexican meat industry *(25)* revealed that although both implementation and operational costs increased, benefits of the HACCP system exceeded expectations. Some of the benefits identified included reduced product waste, increased motivation among employees, and reduced production costs.

Activity based costing

Activity Based Costing (ABC) has recently attracted much attention as a way of compensating for the defects of conventional cost analysis methods. In conventional costing methods, costs are allocated to a product based on attributes of a unit such as direct labor hours, energy, overheads, and materials costs. However, reported costs in such unit-based systems might not be accurate, because some products are charged for resources that are not used to produce them. In contrast, in ABC systems costs are allocated based on activities consumed per product *(11)*. Thus ABC systems can provide a more accurate costing method because costs are traced based on the resources used by activities to make each product. Activities (such as acquiring, inspecting, storing, and moving) and cost drivers (that cause activities to happen) are the two key factors in the ABC system *(30)*. An example of a cost driver would be labor that makes the monitoring activity happen. Thus, it is critical to identify, measure, and control the cost drivers in order to, first, trace costs to associated activities, and second, trace costs from those activities to products. In summary, ABC systems use various cost drivers to assign costs of the associated activities to each individual product.

Research has found that ABC provides manufacturing firms with a more accurate unit costing method *(10, 12, 42)*. Similiary, the foodservice industry has found advantages to allocating overhead costs to individual products. Raab and Mayer *(33)* showed that applying ABC to menu pricing in restaurants could achieve more detailed insights about the operating profit margin. The ABC model with regard to menu engineering was further tested in a buffet restaurant in Hong Kong *(34)*. The results suggested that ABC could facilitate the effective analysis of menu engineering by using cost drivers that are associated with each activity. Analyzing costs in relation to associated activities can be an efficient approach to establishing an accurate cost structure for HACCP in several ways.

First, the HACCP approach involves various CCPs (activities) in the production process, which need to be taken into account when evaluating costs *(43)*. Cooper and Kaplan *(12)* maintained that ABC could provide accurate costs when products and production processes are diverse.

Second, HACCP requires extensive understanding of the production processes, since food contamination can occur at any step during food preparation, such as ingredient handling, reheating, storage, refrigeration, and serving *(39)*. Understanding the process enables management to realize that the activities in the production process are interrelated, so that potential dangers, should be eliminated as a group rather than individually *(30)*. Therefore, this study attempts to develop a costing structure for the implementation of HACCP in selected foodservice organizations by adapting ABC. The use of ABC will help management increase awareness of all the activities during food preparation and accurately identify cost incurring activities. Accurately identifying cost incurring activities will assist management not only in decreasing the cost of HACCP implementation, but also in improving productivity and profitability.

Research purpose

The purpose of this research was to develop a costing framework for the implementation of HACCP in select foodservice establishments. Questions regarding specific characteristics of this framework that were the foci of this investigation were the following:

1. What are the distinct categories of costs associated with implementing HACCP in select foodservice establishments (such as materials, labor, and other overheads)?
2. What are the "cost drivers" associated with the respective cost categories?
3. Can the costs be characterized as fixed versus variable?
4. How are the costs allocated, in terms of corporate versus unit expenditures?
5. In view of these cost characteristics, what can be concluded regarding management's ability to monitor and control HACCP implementation costs?

MATERIALS AND METHODS

Research design

This investigation used a multiple case study approach. The cases were defined in the context of the six partici-

pating organizations. The multiple case study approach was used to generically characterize costs across cases and compare cost characteristics between cases *(50)*. Ethnographic methods are an important element of qualitative research. Research using such methods is not new; rather, such methods have been the source of most groundbreaking management research of the twentieth century *(16)*. Ethnographic research has been defined as "sustained, explicit, methodical observation and paraphrasing of social situations in relation to their naturally occurring contexts" *(47)*.

Although we do not use the "ideal" approach of an ethnographic investigation, our research design attempts to capture the important elements. Our approach to methodologically capturing costs associated with food safety practices used a combination of the questionnaire approach and a semi-structured interview with each participant. Use of such an approach in financial contexts unfortunately remains scarce. Nevertheless, we believe that in the present context, such an approach is ideal, given that little is known about how management perceives or observes HACCP-related costs.

Sample

The goal was for this sample to be representative of selected foodservice operations: restaurants, grocery stores, and convenience stores. Accordingly, two of each of the following types of establishment were selected: casual dining restaurants, grocery stores with a deli and/or prepared food outlet, and a convenience store that serves prepared foods. Grocery stores and convenience stores were included to represent the recent trend toward eating in non-traditional food outlets.

Of the six establishments, five were regional multi-chain operations, and one of the convenience stores was a national chain. Initial contact was established with either the Director of Operations or the person responsible for food safety. After an initial open-ended discussion regarding their food safety practices, a mutually convenient time was set up for a phone interview. Multiple researchers were involved in the initial discussion (two researchers) and the phone interview (three researchers).

Data collection

Data were collected via phone to ensure consistency across the six companies. Two of the companies were located at a significant distance from the researchers, so that it would not have been feasible to visit them physically. To ensure consistency, phone discussions were conducted with all of them. After the initial contact, the participants were sent a copy of the survey instrument via email a few days before the scheduled phone interview, along with an informed consent form. The participants were requested to complete the survey instrument by hand. These surveys were then scanned by the respondents and sent to the Principal Investigator via email.

Instrument

The survey instrument was designed based on prior literature on HACCP and activity based costing. The focus was on investigating the various cost centers and activity types to develop a costing framework. Cost centers are usually defined as functional and operational areas of a unit or an organization where costs are accumulated or computed, such as planning and development, monitoring, and corrective action. Activity is essentially a measurable task that converts inputs into outputs, such as identification of CCPs and conducting a hazard analysis. Therefore, the survey instrument was developed to gather data about each establishment's HACCP plan, whether the plan was process- or menu-based. Process-based systems look at the specific preparation process and classify the food item based on the number of times the food goes through the temperature danger zone. Similar food items are grouped together as the CCPs would be, to control potential food safety issues that would likely be similar. Menu-based systems group items on the menu that are similar based on ingredients, again because the CCPs would likely be similar *(40)*. The survey instrument also gathered data about each of those two components of an activity-based costing framework for HACCP implementation.

The seven HACCP principles were used to identify the activity types. Each of these seven principles was then subdivided into appropriate tasks *(40)*.

The cost centers were identified based on fixed and variable cost categories: labor, materials, equipment, maintenance, facilities, and training. Labor cost was further divided into time spent on specific tasks and cost of additional wages. Training cost was sub-divided into internal and outsourced training. Equipment cost was subdivided into initial cost of equipment and ongoing maintenance costs.

Questions were also designed to investigate the drivers of these costs, such as which employees (management, supervisory or front line) spent time on the various sub-tasks? Similarly, we investigated whether each of those costs was one-time or ongoing, and whether they were accounted for at the corporate or the unit levels. The respondents were also requested to elaborate on how they thought each of the activity costs were influenced by various cost drivers and sub-tasks.

Data analysis

Data were analyzed qualitatively with the purpose of observing underlying and emerging patterns and themes in the responses among the six organizations. The interview discussion notes and responses to the questionnaires were transcribed and tabulated. Responses were then collated and categorized by the type of organization: restaurants, grocery stores, and convenience stores. The researchers individually studied the tabulated responses, compared them within the cases, and assessed the emerging themes and patterns, and then discussed them to ensure completeness. The discussions also ensured that researcher-specific biases were minimized.

Once the resulting patterns were identified, the researchers then reevaluated these patterns to characterize the various costs. The descriptive assessment of data and interview notes are presented in the results section. These assessments further describe individual cases. The discussion section presents a comparative assessment and overall characterization of the costs.

RESULTS

The results of this study are presented in Tables 1, 2, and 3.

TABLE 1. Costs of HACCP

Has your operation incurred or is likely to incur the following costs for HACCP planning and implementation?	Restaurant 1		Restaurant 2		Grocery Store 1		Grocery Store 2		Convenience Store 1		Convenience Store 2	
	Ongoing	No	Ongoing	No	Ongoing	No	Ongoing	No	Ongoing	No	Ongoing	No
Planning and Development												
Management's time costs for developing HACCP plan?	X		X		X		X		X			
Management's time costs for HACCP team activities?	X		X		X		X					
Management's time cost for conducting hazard analysis?	X		X		X		X		X			
Management's time cost for menu grouping into processes?	X			X	X		X		X		X	
Management's time cost for identifying critical control points?	X		X		X		X		X			
Management's time cost for establishing critical control points?	X		X		X		X		X			
Monitoring and Planning												
Do you incur employee time costs for monitoring procedures?	X		X								X	
Documentation and Recordkeeping												
Management's time cost for developing procedures to document items that are monitored?	X		X		X		X		X			
Management/employee's time cost for implementing procedures for keeping and storing monitoring records?	X			X	X		X		X			
Verification and Corrective Action												
Management/employee's time for taking corrective actions if critical limits are not met?	X		X		X		X		X			
Costs for plan in place to verify the effectiveness of your HACCP program, including internal inspections?	X			X	X		X		X			
Costs for conducting third party inspections to verify the effectiveness of you HACCP program?	X					X		X	X			
Training												
Cost of training employees on critical limits?	X		X		X		X		X			
Costs for training employees on corrective actions?	X		X				X		X			
Costs of outsourcing employee training?	X			X	X				X			
Higher Wages												
Cost of higher wages for employees who are trained to monitor these critical limits?	X			X	X		X		X		X	
Equipment												
Costs of buying new equipment	X						X		X			
Costs for maintaining existing equipment for HACCP compliance?	X						X		X			
Costs for upgrading existing equipment for HACCP compliance?	X		X		X		X		X			
Other Costs												
Costs for public communication/consumer awareness regarding HACCP?	X			X		X	X			X		
Any other costs not mentioned above that relate to your organization's HACCP planning and implementation activities?					X				X			

Demographic information

Restaurants. Both restaurant chains are regional, casual-theme family dining restaurants. Restaurant 1 had a more focused menu offering, whereas Restaurant 2's menu was more diverse in its choices. The numbers of establishments for restaurant 1 and 2 were 38 and 150, respectively.

Convenience stores. Convenience store 1 is a regional convenience store located in one of the Mid-Atlantic States, with 575 stores. Convenience store 1 offers beverages and ready-to-eat hot and cold sandwiches, salads, and side dishes. Convenience store 2, a national chain, offers a multitude of ready-to-eat food, including hot and cold sandwiches, soups, side dishes, and chicken wings.

Grocery stores. Both grocery store chains are regional chains with full-service deli operations. The numbers of establishments in each chain were 77 and 150, respectively.

Stage of HACCP prerequisites and implementation

The six foodservice establishments surveyed were at different stages of developing a HACCP program. Overall, most of the participating organizations had policies related to certain HACCP and most prerequisite programs. Restaurant 1 has had a HACCP plan in place since 1995. Its plan is both process- and menu-based. Restaurant 2 has had a plan in place since 2001. Its plan is a

processed-based plan based on end-point cooking temperatures.

Convenience store 1 has had a process based HACCP plan in place since 1999. Convenience store 2 does not have a full HACCP plan currently in place within the organization.

Grocery Store 1 has had a HACCP program in place since 1998. Their plan is a combination of menu-based and process-based. Grocery store 2 has had a HACCP program in place since 2000. Their plan is process based.

HACCP costs

None of the six surveyed foodservice establishments formally traced any costs associated with HACCP implementation (or food safety costs, in cases in which HACCP programs were not in place). Therefore, the respondents were asked to respond, to their best understanding, how they would characterize these costs, such as ongoing versus one time, corporate versus unit level. The respondents were also asked whether the costs were included or accounted elsewhere in one of their financial statements. That is, even though costs may not show up as being related to HACCP (or food safety), they could be linked to a cost category in the financial statements. However, for our purposes those costs were still found be less available for HACCP implementation decision-making. The analysis of the following costs is presented in subsequent sections. These costs are also presented in Tables 1 and 2, and associated with each of the establishments: planning and development; monitoring procedures; documentation and recordkeeping; verification and corrective action; training; higher wages; equipment; and other costs.

Restaurant 1. Planning and development costs, to quote the respondent, were "… considered part of doing business — no formal accounting." All development costs were categorized as ongoing. Monitoring procedure costs were ongoing, and so were the costs for documentation and record keeping. Verification and corrective action costs, as well as training costs, were ongoing. Similarly, other costs such as higher wages and equipment costs were identified as ongoing. This restaurant identified no other costs related to the HACCP program, particularly those for communicating food safety consumers.

Restaurant 2. Planning and development costs were identified as ongoing and accounted at the corporate level. However, costs associated with hazard analysis were unit level. Unit costs also included monitoring activities. Critical control points were identified at the corporate level but established in units, and therefore costs were accounted appropriately. Monitoring procedure costs were accounted at the unit level. Key personnel were usually responsible for all monitoring activities. Documentation and record costs were identified as employee time costs and incorporated into the employees' job description; therefore, the restaurant thought, these costs were minimal. Verification and corrective action costs were ongoing and accounted at the unit level. The manager or a key personnel performed verification and corrective action. Training costs were internal and accounted at corporate and unit levels. This restaurant did not think that higher wages were a cost of implementing HACCP. Initial equipment costs were accounted at the corporate level; then costs of maintaining equipment were ongoing, though it was not clear whether such costs were accounted at the corporate or unit level. Others costs identified by this restaurant included equipment maintenance parts and tools (readily available in stock), training materials, engaging new employees, and payroll and training. There were few communication and advertising costs, and those that existed were mostly focused on the menu. A third-party inspector was usually hired to conduct audits. The respondent emphasized that managers ensured effectiveness of HACCP plans. Therefore, employees were critical to this process. Still, Restaurant 2 did not trace any costs specifically for HACCP.

Convenience store 1. Planning and development costs were accounted at the corporate level. The corporate office had three individuals on the food safety team, plus a food safety manager at the unit level. All these costs are ongoing. Similarly, identification and establishment of hazard analysis and critical control point were treated as corporate costs. The monitoring procedure was ongoing and centered on the food safety manager. These costs were incorporated in the scheduled hours of each unit's food safety manager and were identified as a significant portion, about 8–10 hours a week.

Documentation and record costs for developing monitoring procedures were at the corporate level; therefore, costs were accounted appropriately. Actual implementation was at the unit level, and therefore the costs were associated with the food safety manager's and general managers' time. All verification and corrective action costs were in-house, not outsourced. The food safety manager was responsible, and costs accounted at both corporate and unit levels. Training costs included the cost for critical limits and corrective action at the unit level. No training costs were outsourced; all training was conducted in-house. However, while training was mandated by the corporate level, it was accounted at unit levels. Equipment costs included the cost of replacement and maintenance, accounted at the unit level. The actual decision to replace or maintain could have been either made at the corporate or unit level, but the costs were still accounted at the unit level. Higher wages costs were ongoing and included the food safety manager. Other costs included costs for third party inspections (ongoing and accounted at unit level), and electronic documentation for HACCP (though this is still not accepted by the authorities). None of these costs of Convenience Store 1 were traced as HACCP costs.

Convenience store 2. This company did not have a HACCP plan in place and therefore did not incur any costs for planning and development. Still, if these costs were accounted, they would be at the corporate level. The company did group menu items by processes. The employee costs for these activities were accounted at the corporate level, and these costs were ongoing. Corporate management's time was also identified as a cost for conducting hazard analysis in units, and with suppliers. The corporate office also developed procedures as part of their quality assurance process, and associated costs were accounted at the corporate level. Monitoring procedure costs were identified as employee time costs, but these were part of the employees' job de-

TABLE 2. Costs of HACCP – accounting levels

	Restaurant 1		Restaurant 2		Grocery Store 1		Grocery Store 2		Convenience Store 1		Convenience Store 2	
	Corporate-C/ Unit-Un	Accounted-A/ Unaccounted-U	Corporate-C/ Unit-Un	Accounted-A/ Unaccounted-U	Corporate-C/ Unit-Un	Accounted-A/ Unaccounted-U	Corporate-C/ Unit-Un	Accounted-A/ Unaccounted-U	Corporate-C/ Unit-Un	Accounted-A/ Unaccounted-U	Corporate-C/ Unit-Un	Accounted-A/ Unaccounted-U
Planning and Development												
Management's time costs for developing HACCP plan		A	C	A	C	A	C	A	C	A		U
Management's time costs for HACCP team activities		A	Un	A	C	A	C	A	C	A		U
Management's time cost for conducting hazard analysis		A	Un	A	C	A	C	A	C	A		U
Management's time cost for menu grouping into processes		A		U	C	A	C	A	C	A	C	A
Management's time cost for identifying critical control points		A	Un	A	C	A	C	A	C	A		U
Management's time cost for establishing critical control points		A	Un	A	C	A	C	A	C	A		U
Monitoring and Planning												
Employee time costs for monitoring procedures		A		A		U	Un	A		U		A
Documentation and Recordkeeping												
Management's time cost for developing procedures to document items that are monitored		A		A	Both	A	C	A	C	A		U
Management/employee's time cost for implementing procedures for keeping and storing monitoring records		A		U	Un	A	Un	A		A		U
Verification and Corrective Action												
Management/employee's time for taking corrective actions if critical limits are not met		A	Un	A	Both	A	Un	A	Un	A		U
Costs for plan in place to verify the effectiveness of your HACCP program, including internal inspections		A	Un	A	C	A	C	A	Both	A		U
Costs for conducting third party inspections to verify effectiveness of HACCP program		A	C	A		U		U	Un	A		U
Training												
Cost of training employees on critical limits		A	C	A	C	A	C	A	Un	A		U
Costs for training employees on corrective actions		A	Both	A	Both	A	Un	A	Un	A		U
Costs of outsourcing employee training		A		U	C	A	C	A	C	A		U
Higher Wages												
Cost of higher wages for employees who are trained to monitor these critical limits		A		U	C	A		A	Un	A		A
Equipment												
Costs of buying new equipment		A	C	A	C	A	Both	A	Un	A		U
Costs for maintaining existing equipment for HACCP compliance		A			Un	A	Un	A	Un	A		U
Costs for upgrading existing equipment for HACCP compliance		A	C	A	Un	A	Both	A	Un	A		U
Other Costs												
Costs for public communication/consumer awareness regarding HACCP		A	C	A		A	C	A		U		U
Any other costs not mentioned above that relate to your organization's HACCP planning and implementation activities						A				A		

scriptions. Documentation and record costs did not exist. Verification and corrective action costs included the cost of training employees for corrective action. Corporate paid for development of procedures, but units paid for employees' hourly wages. Training costs were accounted at the corporate level, but the actual training took place in the stores. In some areas of food safety training there were costs of outsourcing, which were ultimately billed to the unit. This company did not incur costs of higher wages. Equipment costs were treated as general facility costs and were part of the usual capital costs. Other costs included annual costs for a third party inspection, also allocated to the units. Food safety violation fines were also treated as costs to the units, and as per their corporate policy could be billed to the individual units. Convenience store 2 also did not trace any of these costs as HACCP costs.

Grocery store 1. Planning and development costs were ongoing and accounted at the corporate level. Individuals involved included a HACCP manager, coordinator, and representatives from other areas (as appropriate). Unit or store managers were involved as needed for discussions of certain specific matters such as implementation of operational processes. Monitoring procedure costs were ongoing and absorbed as employees' time costs. For instance, purchasing and receiving departments ensured HACCP control procedures in

those functional areas as part of their day-to-day responsibilities. Employees monitored temperatures of refrigerators and freezers; however, because these were mostly automated, such costs were small. Verification and corrective action costs were also ongoing and accounted at corporate and unit levels. Documentation and record costs were ongoing and accounted at both corporate and unit levels. The organization had begun recently to go through such processes to ensure ease of use and minimize HACCP teams' time costs, also at the unit level. Training costs were both corporate and unit level and were mostly ongoing. Corporate costs included the trainer's time and materials. Unit costs included employee time for the initial web-based training followed by in-class sessions. Supervisors and managers took 2-day classes and employees took shorter sessions. Higher wages did account for the costs of hiring HACCP-trained employees at this grocery store; it did pay higher wages to employees trained in HACCP procedures, and these costs were ongoing. However, most of these higher wages were at the corporate or managerial levels. The employees involved in HACCP processes and other food safety procedures did so as part of their day-to-day job responsibilities. Equipment costs were one-time costs and accounted at the corporate level, whereas equipment maintenance and upgrades were ongoing and at unit levels. Among other costs, the company did not incur any costs for public communication/consumer awareness regarding HACCP. The company also incurred costs for specification software to develop product flow procedures. This resulted in license subscription costs of the software, ongoing training costs, and new as well as other related costs, such as for periodic upgrades. None of the costs discussed for Grocery store 1 were traced to HACCP.

Grocery store 2. Planning and development costs were ongoing and accounted at the corporate level, such as field employees. Some costs were also accounted at the unit level (such as employee time for critical limits). Monitoring procedure costs were ongoing costs, mostly at the unit level. Documentation and record costs included development of documentation costs (corporate level), and monitoring documentation costs (unit level). Verification and corrective action costs to ensure HACCP effectiveness included verification costs at the corporate level. Corrective action costs were mostly unit level and included such items as training for corrective action and completion of procedures (employee time). Training costs were corporate level, and most of the training was outsourced. The organization incurred costs of higher wages for employees trained in HACCP; however, these were mostly corporate-level costs. Costs of buying new equipment were at the corporate level, but the cost of maintaining equipment was at the unit level. The responsibility for updating equipment was at both the corporate and unit level. Corporate costs included inspection tools and digital thermometer, and unit costs included monitoring devices. Grocery store 2 also did not trace any of these costs of HACCP.

DISCUSSION

As noted earlier, none of the establishments surveyed formally identified any of their costs as HACCP-related costs. Therefore, even though a number of costs are being "accounted" in financial statements, these are not easily accessible to the management for evaluating the HACCP programs (Table 2 and 3). Those reported "unaccounted" were excluded in even the traditional accounting framework. Costs that were accounted were probably easier for the management to draw upon than those that are currently not identified or "unaccounted."

Labor costs were associated with planning and development (except for convenience store 2, which did not have a HACCP program in place), monitoring procedures, documentation and records, verification and corrective action, and training. Some of the key non-labor costs included investment in equipment, parts for maintenance of such equipment, software, and, in a limited way, consumer communication and awareness costs. Therefore, significant portions of the costs were associated with labor. Given that labor was an important element of most costs, a large portion of these costs were ongoing, in contrast to the smaller number of one-time costs.

An interesting aspect of these costs was that most of the labor (and therefore ongoing) costs were located at the unit level. While corporate offices also incurred labor costs, most of these were duplicated at the unit level. On the other hand, many of the non-labor costs were located at the corporate level. Another pattern that emerged from the responses was that most of the labor costs (both at corporate and unit level) were "unaccounted."

Research related to behavioral aspects of costing suggests that when decision-makers are faced with uncertain input costs (time, money) *(7, 8)*, agents become optimistic. Odean *(31)* argued that optimistic biases could induce individuals to believe that their estimations are more accurate than they really are. Miscalibration due to optimistic biases could partly explain excessive failure in HACCP cost assessment. In a similar vein, optimistic biases allow individuals to underestimate the probability that a negative outcome will occur *(48)*. This implies that managers might choose to neglect cost assessment for HACCP while underestimating their relative chances to experience undesirable incidents involving food safety. Among other reasons for inaccurate assessment of costs, Kujawski et al. *(24)* identify "use of inadequate data elicitation methods" and "use of improper cost distributions." The authors state that these are not necessarily due to lack of technical expertise, but rather to an over-simplified representation or approach toward making cost decisions. The authors also state that there is an element of optimism or 'wishful thinking' on part of the management when costs are not accurately accounted.

The findings of this paper are consistent with those in this literature in at least three ways. First, HACCP implementation costs are not being traced, particularly at the unit level. Second, the respondents were especially unconcerned about the labor costs. One of the reasons for not tracing labor costs was that these costs were assumed to be accounted as part of the employees' wages. While that might be true for accounting purposes, management decisions would benefit from knowing how much labor time (and value) was being dedicated to HACCP processes. Finally, many of the respondents felt that food safety was such a "critical" issue that costs were not a consideration. We would argue that if

TABLE 3. Costing framework; none of these costs are traced for HACCP purposes

		Labor costs		Non-Labor costs	
		Corporate	*Unit*	*Corporate*	*Unit*
One-time costs	Accounted	Not Applicable	Not Applicable	Equipment, equipment testing, third party inspections	Third party inspections
	Unaccounted	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ongoing costs	Accounted	Planning and development, training, higher wages.	Training	Equipment, training, food safety software, outsourced employee training, equipment maintenance, public communication / consumer awareness	Training, equipment maintenance and upgrades, violation fines.
	Unaccounted	Verification and corrective action, documentation and records development.	Monitoring, Verification and corrective action, training for corrective action, documentation and records maintenance, public communication / consumer awareness	Not Applicable	Not Applicable

costs were known, and were considered to be higher than expected, management would try to find better ways of implementing HACCP (or in general to ensure food safety).

Comparative assessment

There were some differences in responses among the target sample groupings. For instance, establishments that had a clear HACCP plan (both grocery stores and restaurant 1) were able to identify more clearly details that may help in costing HACCP processes. For instance, these establishments had clearly identified individuals responsible for various aspects of the HACCP plan, be it at the corporate office or unit level. Costing labor time would be relatively simpler in such cases than in cases in which responsibilities were not clearly delineated.

One important difference that might be prevalent between national versus regional chains would be the line of decision-making. Because relatively smaller regional chains would have mostly company-owned units, it would be easier for them to make changes in the HACCP plan and its implementation. Therefore, tracing costs of such processes would be simpler in smaller regional chains. The larger national chains would have franchised or managed units and thus less control and ability to trace costs. To alleviate this situation, contractual agreements could be put in place to ensure compliance.

CONCLUSIONS

The purpose of this study was to develop a costing framework (Table 3) and characterize costs of implementing HACCP in select foodservice establishments. We found that those establishments that were doing more with HACCP knew relatively more about the costs. They also appeared to have a better understanding of where these costs were, but appeared not to be concerned with these costs. While we applaud such commitment to ensuring safe food, we also argue that knowledge of actual costs could remove the uncertainty associated with management decisions. As one would expect, employee costs were the most critical but were not being traced as HACCP costs. Furthermore, these costs were also mostly at the unit level. The costing framework is proposed as a tool for researchers and industry to improve understanding of HACCP-related costs. Better understanding of such costs could potentially help improve implementation.

IMPLICATIONS

Future studies could investigate in more depth costs at the unit level. Also, an assessment of perceived versus actu-

al costs at the unit level, and perceived differences among corporate and unit managers, could be incorporated into such analyses. Industry practitioners could utilize the costing framework to assess HACCP implementation costs at their respective establishments. Another challenge for the industry would be to incorporate food safety costs (and benefits) into a broader management decision-making framework. Accounting for such financial indices would require a markedly holistic approach. We hope that the proposed costing framework could help guide research and practice.

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