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## HOW TO IMPROVE THE HACCP SYSTEM IN AN INTERNATIONAL TOURIST HOTEL GROUP? CAUSE-AND -EFFECT ANALYSIS AND PDCA APPLICATION

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### ABSTRACT

The aim of this study is to discuss not only what the difficulties are to be confronted when a HACCP is introduced into international tourist hotels, but also how to apply effective solutions to overcome these crucial issues. In-depth interviews were applied in this study to analyze the case of Taiwan's X international tourist hotels. Based on the outcomes of interviews, a fish-bone diagram was carried out to analyze the practical difficulties encountered in implementing the HACCP system. Next, with the results of the cause and effect analysis, strategies for different problems were developed according to the interviewee's points of view. PDCA analysis is used repeatedly to develop strategies and recommendations. In comparison to current literature that only provides piecemeal exploration of the difficulties of introducing the HACCP system and the effectiveness of implementing HACCP, this study takes an entire system view into consideration and enables further practical analysis and solutions.

**Keywords:** HACCP, international tourist hotels, cause and effect analysis, food safety.

### INTRODUCTION

*"Expired food was found in the kitchens of tourist hotels during inspections, in a serious embarrassment for Taiwan's tourism industry. The department of Consumer Protection of the Executive Yuan discovered that such landmark hotels as Hotel A and Hotel B in Taipei, Hotel C and Hotel D in Yilan, certified with Guarantees and Five Star Ratings from the Taiwan Tourism Bureau, all had expired food items in their kitchens. The most extreme case was in Hotel E, which had pickles that were out of date more than two and half years ...." (Liberty Times, June 2, 2013)<sup>1</sup>*

The organizational structure of international tourist hotels is characterized by different departments, large number of employees, various types of restaurants, and high capital equipment investment. Many international tourist hotel groups operate as a franchise in order to establish a well-known trademark. International tourist hotels also implement multiple certification systems, such as the ISO 9001 quality management system, in order to enhance their brand value and the efficacy of their operational management. The operational value of international tourist hotels basically comes from brand building, operational know-how, and corporate image (Guo Chunmin, 2014). In addition, introducing creative food and beverages is an important method for international tourist hotels to enhance their brand image. However, if food safety issues occur at an international tourist hotel, this will not only affect guest numbers, but will also have an enormous impact on the corporate image because of negative publicity.

In order to ensure food safety and hygiene in international tourist hotels in the Republic of China (Taiwan), the Ministry of Health and Welfare (formerly the Department of Health, Executive Yuan) promulgated the "Regulations regarding food safety control systems that the food and beverage departments of international tourist hotels must comply" on March 22, 2013. Under these provisions, the food and beverage (F&B) departments of Taiwan's international tourist hotels must within one year (March 2014), have a food safety control system (HACCP) introduced in one of their restaurants. The industry is encouraged to introduce the HACCP system to all of their restaurants.

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<sup>1</sup> See "Famous tourist hotels caught with expired food products," Liberty Times, June 2, 2013, retrieved from <http://www.libertytimes.com.tw/2013/new/jul/2/today-life11.htm> (retrieved on March 2, 2014).

However, HACCP is a multi-faceted and comprehensive system that covers health and hygiene management, production and quality control, storage management, transportation management, test and measurement control, customer complaints management, product recall control, documentation management, education and training, Hazard Analysis, and Critical Control Points. To introduce the HACCP system would involve allocating human resources and training, equipment, systems, costs, schedule improvements... and other complex factors. It will confront resistance and challenge within the organization. For example, during interviews for this study, senior managers of F&B departments from different hotels in the same franchise made the following statements:

*“Do you know how hard it is to change a kitchen’s hardware? How much money is the boss willing to spend on that? He has already spent a fortune getting the star rating that was inspected recently...”*  
(Interview record B1)

*“It is up to the chef” willing or not to run HACCP. It is so busy in the kitchen and serving meal is so complex. How do you check it? Mind you, we’re not as standardized as McDonald’s...”* (Interview record C2)

The purpose of this study is to discuss: How entrepreneurs and the management level face external time pressure and resistance from within the organization to the introduction of HACCP. What are the difficulties to be confronted when a HACCP is introduced into international tourist hotels? How to apply effective solutions to overcome these crucial issues?

## LITERATURE REVIEW AND METHODOLOGY

### The benefits and difficulties of introducing HACCP system

What are the benefits these organizations will gain from introducing HACCP into the food safety management system? Summarizing relevant literature, implementing HACCP not only benefits the safety of the food production process, it also lowers cost, raises staff morale and confidence, promotes trade opportunities, and raises consumer satisfaction etc. (See Table 1.)

**Table 1: The Effectiveness of Implementing HACCP**

Scholar	Effectiveness of HACCP implement
Qiu (1998)	1. Strengthens execution of food safety 2. Reduces risk of failure 3. Improves efficiency 4. Reduces waste 5. Improves working conditions 6. Improves employee morale and reduces employee turnover rates 7. Improves the level of confidence to meet consumers’ request 8. Increases consumer trust 9. Improves quality 10. Reduces consumer complaints 11. Reduces product recall 12. Employee ongoing training 13. Middle-management re-training 14. Establishes pattern of delegation, communication, leadership, and assessment 15. Establishes assessment of operating processes 16. Integrate documentation of operating procedures and audit measures
Ren (1999)	1. The HACCP system records work, cooked (instant) food was covered completely and labeled for refrigeration. There is significant differences pre- and post- training. 2. The Knowledge and ability of food safety handling all show significant differences pre- and post - training.
Taylor (2001)	1. Trust, 2. Reduced cost and waste 3. Human resources are used more effectively due to team work 4. Using organizational development to build a corporate culture that values food safety 5. Trading opportunities 6. Centralized control points 7. Legal protection
Chen (2001)	1. Movement of food in one direction only and personnel management could effectively prevent reverse 2. Reduce pest damage more effectively 3. Effective management of detergent and disinfecting substances 4. Enhance the effectiveness of cross-contamination prevention.

Source: the summary of this study.

HACCP introduction is both horizontal and vertical. It involves all personnel in the organization, horizontally from the front door to the back door and vertically from the cleaner to the Managing Director. Before the introduction, changing employee concepts, the size of the corporation and the challenges of introducing HACCP throughout different departments are variables which will impact the successful implementation of HACCP.

During the official introduction, the employees, the management, documentation and reporting, basic equipment, the complex preparation process and other factors are likely to affect the progress of introducing HACCP. There are factors to be aware of after the introduction of HACCP. These factors are the confirmation of the HACCP system. There is the contradiction between business development and HACCP, the difficulty of continually operating the existing system and committing to accurate documentation. Limited skill and creation of appropriate procedures influence the degree of HACCP adoption and continued use. (See table 2)

To sum up, although introducing the HACCP system has its positive benefits, it will create a certain level of impact on an organization that involves all departments and operating systems horizontally and vertically. For large organizations such as international tourist hotels, the introduction of HACCP will not only impact the F&B department, but also impact the entire organization. Therefore, to analyze the research questions of this paper, it is essential to interview key people throughout their organizations. The interviews will have a more comprehensive and systemic understanding regarding the influence of implementing HACCP in an organization horizontally and vertically.

**Table 2: Difficulties Encountered When Introducing HACCP**

Stage	Research findings
Before introduction	<ul style="list-style-type: none"> <li>• Changes in concepts (Mortlock et al., 1999)</li> <li>• The size of corporation (Taylor, 2001)</li> <li>• Challenges faced by each department (Bernard et al., 1994):               <ol style="list-style-type: none"> <li>1. Lack of good product produced and process management</li> <li>2. Personnel lack of professional knowledge and hygienic training</li> <li>3. Issue created by personnel who have different level of professional and education background during rotation</li> <li>4. Food presentation and service work flows</li> <li>5. Increased workload</li> </ol> </li> </ul>
During introduction	<ul style="list-style-type: none"> <li>• Personnel (basic personnel) (Taylor, 2001)               <ol style="list-style-type: none"> <li>1. Personnel retain old habits and attitudes</li> <li>2. Personnel lacking motivation and supervision</li> <li>3. Lack of sufficient training</li> </ol> </li> <li>• Managers (senior management) (Taylor, 2001): Whether or not managers fulfill their roles properly: encouraging and motivating personnel; communicating HACCP concepts to personnel; focusing on leadership and supervision.</li> <li>• Too much internal documentation and reporting (Taylor, 1998)</li> <li>• Basic equipment (Panisello &amp; Quantick, 2001)               <ol style="list-style-type: none"> <li>1. Lack of basic equipment (chilled and frozen storage, cooking utensils, sensitive food monitors and temperature measurement instruments)</li> <li>2. Inappropriate position and line</li> </ol> </li> <li>• Complex preparation process: Every food preparation process must be designed, have a food preparation flowchart detailing the preparation process, and must include establishing critical control points and monitoring; employees must accept the standardized process, and act accordingly; the complex preparation process often creates rejection. (Panisello &amp; Quantick, 2001)</li> </ul>
After introduction	<ul style="list-style-type: none"> <li>• Difficult to confirm an HACCP project (Panisello &amp; Quantick, 2001)               <ol style="list-style-type: none"> <li>1. Supervision system</li> <li>2. Supervising personnel</li> <li>3. Supervision documentation</li> </ol> </li> <li>• Rather than invest in business promotion (Panisello &amp; Quantick, 2001)</li> <li>• After introduction, the constant maintenance of operating the system is not easy (Chen, 2001)               <ol style="list-style-type: none"> <li>1. The system's implementation level is not easy to maintain</li> <li>2. Filling forms completely and accurately is difficult to maintain</li> </ol> </li> <li>• The limit of creation, innovation, and skills (Panisello &amp; Quantick, 2001)               <ol style="list-style-type: none"> <li>1. The standard operation process of HACCP require assistance from food technology</li> <li>2. Personnel and manager may fear that their creation, innovation and skill will be restricted.</li> </ol> </li> </ul>

Source: the summary of this study.

## RESEARCH METHODOLOGY

The researchers conducted in-depth interviews with personnel in international tourist hotels in Taiwan. A total of 30 samples were collected from July 2009 to November 2013 covering all major international tourist hotel groups in Taiwan. The interviewees were senior managers (more than 10 years of experience) and owners of international tourist hotels. From among the samples, hotel chain X was selected for further case analysis. Within this group, three international tourist hotels were taken for sub-sample analysis (3-5 interviewees from each hotel). The sub-sample hotels had been established for various lengths of time: international tourism hotel A: less than 5 years; international tourism hotel B: around 10 years; international tourism hotel C: over 20 years.

The results of the interviews were summarized as an interview record. The interview record was the major input for “cause-and-effect analysis” and “PDCA” (Plan-Do-Check-Action) analysis. Secondly, the difficulties encountered in reality when implementing HACCP as reported in the interviews, were analyzed through a cause and effect analysis using a Fish-bone Diagram. The cause and effect analysis is carried out and divided into the four dimensions “Personnel”, “Equipment / Environment”, “Material”, and “System and documentation.” Next, based on the cause and effect analysis, the solutions of different questions from interviewees were summarized. The issues under these four dimensions were then analyzed through a PDCA analysis. Finally, practical recommendations will be provided according to the result of analysis.

## RESULTS

### The summary of essential issues

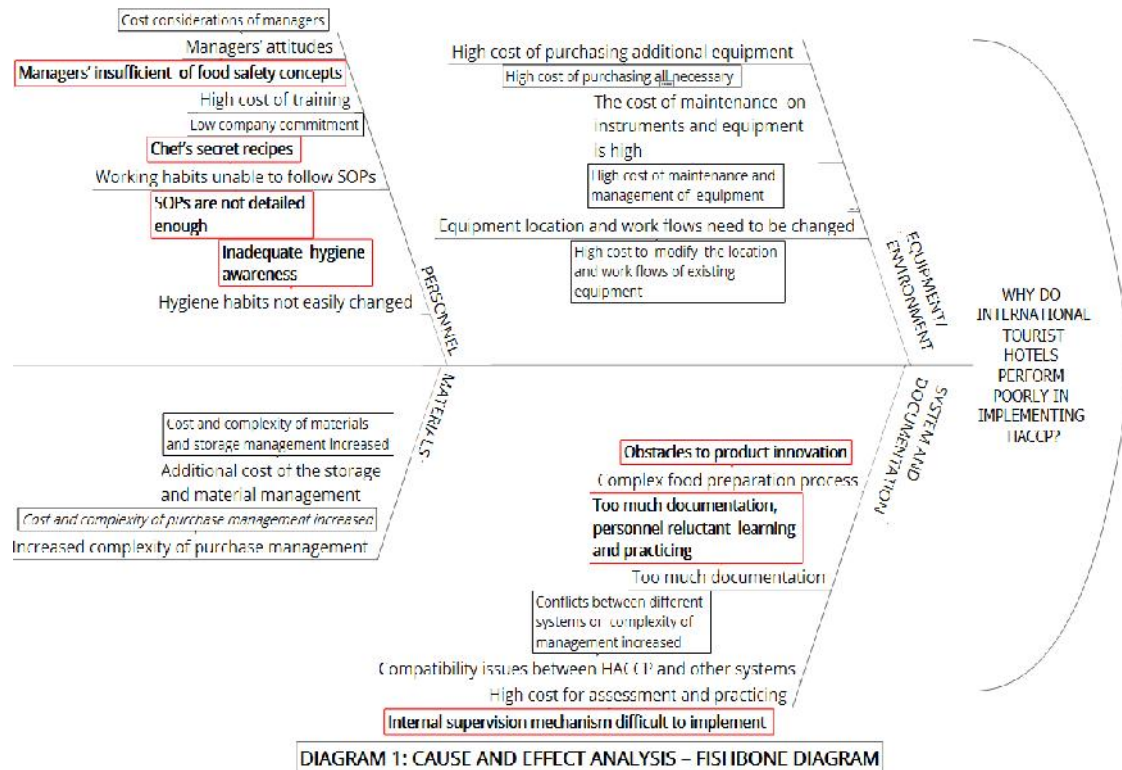
According to the interviews, the factors influencing the introduction of HACCP in international tourist hotels were categorized into two sides: logistic support side and on-site side (See Table 3).

**Table 3: The Summary of Key Issues**

<b>Logistic support side</b>	<b>On-site side</b>
<ul style="list-style-type: none"> <li>• The way management perceives and drives the HACCP system</li> <li>• Long personnel training time and high cost of training</li> <li>• Increase personnel cost for additional food technician(s)</li> <li>• Multiple food products, various meal services, high cost of implementation and supervision, difficult to integrate performance assessment</li> <li>• Too much documentation, maintain compliance is difficult</li> <li>• Compatibility issues between the HACCP system and other certification systems as well as star-rating hotels assessment (e.g. ISO 22000, ISO 9001)</li> <li>• Increased complexity of purchase management</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to have large modification on existing equipment and work flows</li> <li>• High cost and time consuming to modify existing facilities</li> <li>• Increase cost to purchasing additional equipment</li> <li>• Concepts and working habits of front-line personnel not easy to change</li> <li>• Food standard preparation process required to be re-designed due to its complexity</li> <li>• Increase the cost of storage and material management</li> <li>• Complex food preparation process makes personnel reluctant to achieve full compliance and limits product innovation</li> </ul>

*Source: the summary of this study.*

These key issues could be further divided into the four categories: (1) Personnel: includes manager’s attitude, high training costs, work habits unable to follow SOPs, hygiene habits are not easily changed; (2) Equipment / Environment: includes the high cost of purchasing additional equipment, high maintenance costs of equipment, equipment location and line that needs to be modified; (3) Material: mainly includes increase cost for additional storage and materials management, increased complexity of purchase management; (4) Systems and documents: includes complex food preparation process, too much documentation, compatibility issues between HACCP and other systems, high cost and difficulty of implementing supervision and assessment. A fish-bone diagram was applied to map out the following characteristic factors. (See Diagram 1)



Source: the summary of this study.

### Defining the current situation and goals setting

From the findings of analyzing the above-mentioned special factors, this study selects “decreasing the difficulties of personnel, systems and documentation when introducing HACCP” as its main object of analysis because (A) Over 2/3 of interviewees believed that the importance and relevance of the issues are high; (B) The system impact on the front-line is high; (C) The system is operated by people, which affects pre, during and post introduction of HACCP; (D) The impact on preparation processes is high, and the level of relevance with back office support is high.

### Cause-and-effect analysis

After defining the current situation and setting goals by using the fish-bone diagram, a sequential analysis was carried out on the related subtopics. This includes the difficulties of introducing HACCP caused by personnel, system and documentation. The analysis headings include issues, situation analysis, verify explanations and the result of judgment (See Table 4 and Table 5).

### The strategies and recommendation of implement based on PDCA

Based on the results of the cause & effect analysis, the PDCA was applied to address following issues the “difficulties of introducing HACCP caused by personnel: SOPs are not detailed enough”; “difficulties of introducing HACCP caused by systems and documentation: internal supervision mechanism difficult to practice”; “difficulties of introducing HACCP caused by systems and documentation: obstacles to food product innovation.”

The PDCA is involved to analysis the current situation, strategies development, the effect of improvement, and implementation review. The concrete countermeasures and implementation recommendations for these issues are provided. (See Table 6, Table 7, Table 8).



**Table 4: Cause-and-effect analysis: Difficulties of introducing HACCP caused by personnel**

Factor	Issue	Analysis of situation	Verify explanations	Judgment
Difficulties of introducing HACCP caused by personnel	Managers' insufficient cognizance of the food safety concepts	<ul style="list-style-type: none"> <li>Managers view HACCP as a "task", not as a comprehensive operating system</li> <li>The preconceived ideas of managers will impact on their willingness to improve training, instruments, equipment and environment</li> </ul>	<ul style="list-style-type: none"> <li>This can be improved through managers' basic HACCP training and other food safety training</li> </ul>	No
	Working habits unable to follow SOPs	<ul style="list-style-type: none"> <li>SOPs are not detailed enough               <ol style="list-style-type: none"> <li>The front-line personnel do not follow SOP during preparation</li> <li>The front-line personnel indicates SOPs are not detailed enough</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>The personnel has difficulty comprehending the content of SOP completely and quickly due to it only having pictures and written text</li> </ul>	Yes
		<ul style="list-style-type: none"> <li>Chef's secret recipes: chef is reluctant to reveal his secret recipe or the formulation of his sauces</li> </ul>	<ul style="list-style-type: none"> <li>Identify secret recipes as corporation's trade secrets, and high profile documents</li> <li>HACCP team, hygiene management team and other related personnel must sign non-disclosure agreements</li> </ul>	No
	Inadequate hygiene awareness	<ul style="list-style-type: none"> <li>Front-line personnel feel food safety and hygiene rules are too cumbersome and influence the efficiency of food preparation</li> </ul>	<ul style="list-style-type: none"> <li>This could be improved through hygiene lectures, internal education and HACCP training</li> </ul>	No

Source: the summary of this study.

**Table 5: Cause-and-effect analysis: Difficulties of introducing HACCP caused by systems and documentation**

Factor	Issue	Analysis of situation	Verify explanations	Judgment
Difficulties of introducing HACCP caused by systems and documentation	Too much documentation, personnel reluctant to learn and use	<ul style="list-style-type: none"> <li>HACCP form is viewed as extra work by front-line personnel. Thus the documents usually completed before audit</li> <li>Personnel often misidentify documents due to too many documents</li> </ul>	<ul style="list-style-type: none"> <li>This could be effectively improved through hygiene lectures, internal education, training, HACCP training, scheduled and unscheduled audits by hygiene personnel</li> </ul>	No
	Internal supervision mechanism difficult to implement	<ul style="list-style-type: none"> <li>The role of internal supervisors and users are overlapping</li> <li>Too frequent auditing will impact the efficiency and morale of front-line personnel</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to improve through hygiene lectures, internal education, training, and HACCP training</li> </ul>	Yes
	Obstacles to food product innovation	<ul style="list-style-type: none"> <li>Every food item must have a complete preparation process and flowchart that impacts the efficiency and willingness to create new products</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to be improved through hygiene lectures, internal education, training and HACCP training</li> </ul>	Yes

Source: the summary of this study.

**Table 6: PDCA– “Difficulties of introducing HACCP caused by personnel: SOPs are not detailed enough”**

<b>Issue: Difficulties of introducing HACCP caused by personnel: SOPs are not detailed enough</b>	
<p><b>Plan</b></p> <p>1. The personnel have difficulty comprehending the content of SOP completely and quickly due to it only having pictures and written text.</p>	<p><b>Do</b></p> <p>1. Create instruction videos , to be approved by hygiene personnel, the executive chef and the F&amp;B manager</p> <p>2. Old personnel require re-training in batches; the awareness of new personnel is addressed during orientation and assessed.</p>
<p><b>Action</b></p> <p>1. Before implementation, the SOPs only have pictures and written text making it impossible for learners to comprehend the practical situation completely. This causes SOP unable to be practiced.</p> <p>2. All learners’ learning effectiveness was improved after videos were implemented as well as SOPs practice rate.</p>	<p><b>Check</b></p> <p>1. Reduce the defect rate to less than 5% within three months through having hygiene personnel, the executive chef, and the F&amp;B manager unscheduled check for SOP accuracy.</p>

Source: the summary of this study.

**Table 7: PDCA– “Difficulties of introducing HACCP caused by systems and documentation: internal supervision mechanism difficult to practice”**

<b>Issue: Difficulties of introducing HACCP caused by systems and documentation: internal supervision mechanism difficult to practice</b>	
<p><b>Plan</b></p> <p>1. The role of internal supervisors and users are overlapping.</p> <p>2. Too much frequent auditing will impact the efficiency and morale of front-line personnel.</p>	<p><b>Do</b></p> <p>1. Raise the level of Chief Food &amp; Safety Office to vice-general manager</p> <p>2. Invite external professional to assist with internal auditing</p> <p>3. Hygiene team performs unscheduled supervision and double checking</p> <p>4. The important of practicing HACCP is promoted and communicated through manager meeting and education</p>
<p><b>Action</b></p> <p>1. It was difficult to improve this issue through hygiene lectures, internal education, training and HACCP training before implement.</p> <p>2. The effectiveness of internal supervision was increased. The negative impact on efficiency and moral of front-line personnel was reduced after implementing strategies such as raising the level of supervision, inviting external professionals, unscheduled double checking and promoting internal communication.</p>	<p><b>Check</b></p> <p>1. Raise the effectiveness of practice rate to more than 95% within three months through the strategies above</p>

Source: the summary of this study.

**Table 8: PDCA– “Difficulties of introducing HACCP caused by systems and documentation: obstacles to food product innovation”**

<b>Issue: Difficulties of introducing HACCP caused by systems and documentation: obstacles to food product innovation</b>	
<p><b>Plan</b></p> <ol style="list-style-type: none"> <li>Every food item must have a complete preparation process and flowchart that impacts the efficiency and willingness to create new products.</li> </ol>	<p><b>Do</b></p> <ol style="list-style-type: none"> <li>The members of the hygiene management team attend new product meetings and assist with creating the required documentation and flowchart for each new food product.</li> <li>The food technician is responsible to complete required document and flowchart for each new product item. This will be confirmed by hygiene management personnel, the executive chef and the F&amp;B manager.</li> </ol>
<p><b>Action</b></p> <ol style="list-style-type: none"> <li>It was difficult to improve this issue through hygiene lectures, internal education, training and HACCP training before implementation.</li> <li>The creation of new products is increased by hygiene management personnel attending new product meetings, a specialist being responsible for creating the required documentation and flowchart.</li> </ol>	<p><b>Check</b></p> <ol style="list-style-type: none"> <li>Within two months, all new food products are included in the HACCP system through not only new strategies (listed above) but also through contribution and confirmation from the hygiene management personnel, executive chef and the F&amp;B managers.</li> </ol>

*Source: the summary of this study.*

## CONCLUSION AND DISCUSSION

In this study, the case of international tourist hotels of the X chain was explored through in-depth interviews regarding what key issues were encountered in introducing HACCP and what practice strategies could solve these issues. The issues were analyzed, solutions were explored and actionable recommendations were provided after applying a fish-bone diagram, cause and effect analysis and the PDCA cycle.

This study found that the four main difficulties that international tourist hotels encounter in the introduction of the HACCP system include “Personnel”, “Equipment/Environment”, “Material”, and “System/documentation”. These findings are consistent with the conclusions of Bernard et al. (1994), Taylor (2001), and Chen (2001). The classifications of these issues in the current literatures are diverse and inconsistent. This study classified the issues from a systematic view in order to address the key issues of introducing HACCP comprehensively.

Cause and effect analysis in this study found that “reducing the difficulties caused by personnel and system/documentation in introducing HACCP” is the key issue for international tourist hotels. This is consistent with the findings of many scholars who point out that personnel and systems/documentation impact on HACCP performance (Bernard et al, 1994; Taylor, 1998; Taylor, 2001; Panisello & Quantick, 2001; Chen, 2001). Furthermore, this study pointed out that personnel work under the direction of a system. The documentation is produced and used in response to the system’s needs. Whether the operational design of the HACCP system could meet the needs of different international tourist hotels is a key factor for the performance of the HACCP system once it has been introduced.

As, in the case of hotel group X in this study; “managers’ lack of food safety concepts”, “SOPs unable to be followed” (including SOPs are not detailed enough, chefs’ secret recipes, etc.), “lacking hygiene awareness and poor hygiene habits” are the main issues among difficulties caused by personnel when the HACCP system was introduced. “Too much documentation, personnel reluctant to learn and use”, “internal supervision mechanism difficult to practice”, “obstacles to food product innovation” were the main issues among difficulties caused by systems and documentation when the HACCP system was introduced.

This study used interview data and literature exploration as its basis for analysis. Applying cause and effect analysis, PDCA and other management tools, the study formulated practical solutions to issues such as “difficulties of introducing HACCP caused by personnel: SOPs are not detailed enough”, “difficulties of introducing HACCP caused by systems and documentation: internal supervision mechanism difficult to practice”, “difficulties of introducing HACCP caused by systems and documentation: obstacles to food product innovation”. This could be a reference for industry, when introduction of HACCP is being considered to be



introduced into the system. The current literatures provide only piecemeal exploration of the difficulties of introducing the HACCP system and the effectiveness of HACCP implement. This study puts forward more practical analysis and solutions from an entire system view.

Regarding suggestions for future research, the countermeasures and recommendations in this study through the PDCA have not been confirmed for their effectiveness, nor have their results been reviewed, and their standardization and maintenance have not been managed yet. The research findings of this study await actual application and validation. It is suggested that future research apply quantifying research methods as a basis for analysis of effects of HACCP implementation.

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#### REFERENCES

1. Bernard, D., Gavin, A., & Scott, V. N. (1994). The application of the HACCP system to different sectors of the food industry. Report of the FAO expert technical meeting, Technical manual No.58. Rome: FAO.
2. Chen, Y. K. (2001). A comparison of recognition and practical execution before and after implementing HACCP system in domestic food service operators. Master's Thesis, Institute of Food Engineering, Da-Yeh University, Zhonghua, Taiwan.
3. Guo, C. M. (2014). Hotel management: Theory and practice (2nd edition). Taipei: Yang-Chih Book.
4. Lin J., Xie W., You, M., & Jiang, Z. (2013/07/02). 'Famous tourist hotels caught with expired food products,' Liberty Times, June 2, 2013, retrieved from <http://www.libertytimes.com.tw/2013/new/jul/2/today-life11.htm> (retrieved on March 2, 2014)
5. Mortlock, M. P., Peters, A. C., & Griffith, C. J. (1999). Food hygiene and hazard analysis critical control point in the United Kingdom food industry: Practice, perceptions, and attitudes. *Journal of Food Protection*, 62(7), 786-792.
6. Panisello, P. J., & Quantick, P. C. (2001). Technical barriers to hazard analysis critical control point (HACCP). *Food Control*, 12, 165-173.
7. Qiu, J. R. (1998). Management of food quality and hygiene safety. Taipei: Yi-Hsien Publishing.
8. Ren, Z. (1999). Comparison of HACCP system set up in the restaurant industry before and after training, Proceedings of the Fifth Food and Beverage Management Symposium, Taipei: Chinese Food Culture Foundation.
9. Taylor, E. A. (1998). Securing public health through the application of HACCP: A UK perspective. Proceedings of environmental health paradise in focus, challenges and risks, National Conference of the Australian Institute of Environmental Health, 37-41.
10. Taylor, E. A. (2001). HACCP in small companies: Benefit or burden? *Food Control*, 12, 217-222.
11. Wu, S. L. (2012). Factors influencing the implementation of food safety control systems in Taiwanese international tourist hotels. *Food Control*, 28, 265-272.