

## Critical Success Factors for Effective HACCP systems

Adilah Alias Maznun Binti Khalek <sup>a</sup>, Marini Nurbanum Binti Mohamad <sup>b</sup>

<sup>a</sup> *School of Management, Universiti Sains Malaysia, Malaysia.*

<sup>b</sup> *School of Management, Universiti Malaysia, Pulau Pinang, Malaysia (Corresponding Author).*

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### Abstract

Nowadays, technology moves rapidly to transform the world and has fast tracked globalization in all aspects of our lives. The food industry supply chain is not left behind in adopting technologies to produce various types of food due to the changing modern lifestyle. In order to fulfill the demands of consumers, some food producers that are more profit oriented have produced food that do not comply with the regulations and guidelines for producing safer food. Therefore, in view of this issue, Food Safety Management System, such as the Hazard Analysis Critical Control Point system, was introduced in 2002 by the European Union intended to protect the public health from food fraud. However, currently there are many factors that contribute to the barriers that food producers face in implementing the HACCP system. The barriers that are faced by the food producers impact the effectiveness of the HACCP system. Hence, the objective of this paper is to identify the critical success factors (CSF) for the effectiveness of the HACCP system in the food industry. This paper also presents a proposed research model that also covers the effectiveness of HACCP systems on operational performance.

**Keywords:** Food Safety Management System, Critical Success Factors, HACCP system, supply chain

**Acknowledgement:** The authors would like to express their appreciation to Universiti Sains Malaysia Research University (RU) Grant (1001/PMGT/816262) for the financial support to carry out this research.

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## 1.0 Introduction

Food service is one of the distributive trade industries, an industry which is quite sensitive, especially when it comes to being exported to other countries where food manufacturers must meet the requirements by importing countries. The requirements that must be fulfilled by the food manufacturers are normally focused on quality and food safety (FAO/WHO, 2004; Unnevehr & Jensen, 1999). Basically, these two terms, quality and food safety, are used interchangeably. In Malaysia, research on food safety has been done since 2002 (Meftahuddin, 2002). In a developed country such as United States, consumers are very concerned with the issue of food safety. For instance, in the United States, 76 million cases of illnesses are due to food, resulting in 325,000 people being hospitalized and 5,000 deaths estimated to occur every year (Persatuan Pengguna-Pengguna Standard Malaysia, 2008). Due to these numbers, consumers become more aware of taking in their food and therefore demand for safe food. Hence, the food producers or processors should be alert and at the same time be aware of their product quality and reputation.

Everyone needs healthy food to have a better life. Currently, food safety becomes a major concern among consumers, food producers, processors and regulatory agencies. The safety of food must be guarded along the food chain to ensure the food is free from any possible cross contamination. Contaminated food and water causes food borne disease and waterborne disease respectively. Contamination means, “the presence of unwanted and undesirable substances, including pathogens, toxins and foreign bodies, in food” (Hobbs, 2007). Food poisoning can be defined as “any disease of an infectious or toxic nature caused by, or thought to be caused by, the consumption of food or water”(Hobbs, 2007). Furthermore, the food processors need to reduce or prevent any risk to preserve their products from recalls that can affect their product branding reputation (Tang et al., 2015). Risk assessment would be helpful to the food processors to preserve food from any hazards scientifically. The most applied risk assessment is HACCP which facilitates the identification and management of hazards. HACCP is one of the ways to prevent the contaminated food to reach the consumers. So, acquiring HACCP certification can be considered as one of the features that can differentiate ones’ products to the others. Hence, Food Safety Management System (FSMS) such as the HACCP system could help food processors to have product differentiation by improving their product innovation through implementing the regulations and certified logos labelled on the products.

## 2.0 Problem Statement

Food and Beverages (F&B) is one of the key sectors that contribute significantly to the Malaysian economy (Department of Standards Malaysia, 2016). Growing awareness among consumers about nutrition and fortified health foods has created demand for healthy food. Even though, the programs on food safety exist and complied by the food producers, there are still cases on food safety hazards such as food poisoning, *Leptospirosis* (an infection caused by corkscrew-shaped bacteria called *Leptospira*), fake food cases, and many more, which sometimes can be fatal. Furthermore, due to shortages of healthy food supply, food producers are forced to get the food supplies from other countries to fulfil customer’s demand. So, in this kind of case, some of the food imported is exposed to the risk of being contaminated during transportation of the food. For instance, the food can be contaminated during transportation of raw material, the way the livestock is transported to the other places, or how the livestock or crops were taken care off (Gulam Rusul Rahmat Ali, 2002). As a result, without proper monitoring and control system, the food can be easily contaminated and have a bad impact to the human health.

As the world becomes globalized, food technology has also been developed in the sense of producing food to last longer. Due to this, there are ingredients that are not allowed to be included in the food such as excessive food flavours, additives, preservatives and so on. Excessive use of chemicals in food is not good for health as it can lead to other critical diseases for instance diabetes, kidney failure, clogged arteries and many more. These health effects will be dependent on the safety of the product on one hand, and any potential beneficial effects on health (for example, the nutritional value of the food) on the other. The extent to which the costs associated with human disease for example healthcare and loss of productivity, are borne by society as a whole rather than the individual consumer (Shamsudin, 2016). Food producers face many barriers and the most common barriers that were identified in the literature include lack of expertise, financial problem in terms of investment of money to adopting the system, and cooperation between three levels of management (top, middle and lower management) in delivering the information (Ehiri, Morris, & McEwen, 1997; Kafetzopoulos & Gotzamani, 2014; Macheke, Manditsera, Ngadze, Mubaiwa, & Nyanga, 2013). The barriers that are faced by the food producers impact the effectiveness of the HACCP system. Hence, the objective of this paper is to identify the critical success factors (CSF) for the effectiveness of the HACCP system in the food industry.

### **3.0 Critical Success Factor**

It is strongly and extensively supported in literature that despite their anticipated benefits, the implementation of FSMS is not always successful. In fact, many authors (Anis Najiha, Rusly, Mohhidin, & Ungku Fatimah, 2016; Baş, Yüksel, & Çavuşoğlu, 2007; Fotopoulos, Kafetzopoulos, & Gotzamani, 2011; Fotopoulos, Kafetzopoulos, & Psomas, 2009; Kafetzopoulos, Psomas, & Kafetzopoulos, 2013; Mortimore & Mayes, 2002; Psomas, Fotopoulos, & Kafetzopoulos, 2010; Psomas & Kafetzopoulos, 2015; Taylor & Taylor, 2004) have described a number of factors (implementation barriers, constraints and motives) that may have direct effect on their successful implementation. In order to detect the CSF of FSMS, one should identify: a) the usual barriers/ difficulties/ limitations faced in their implementation, as well as b) the true motives for their implementation, since it has widely been supported in literature that these motives are critical to their overall success and contribution to performance improvement. This study will adopt five latent constructs as CSF for the HACCP systems and will be used as measured variables from the extensive list of possible CSF of HACCP given by Fotopoulos, Kafetzopoulos, & Psomas (2009), Psomas, Fotopoulos, & Kafetzopoulos (2010) and Anis Najiha, Rusly, Mohhidin, & Ungku Fatimah (2016). These constructs are most suggested by scholars as these critical factors identified were mostly faced by the food producers and most problematic in food processing in improving performance. In addition, these five latent constructs are the resources that food producers have in order to sustain their competitiveness in market share with their rivals in the food industry. For “newbie” food producers, focusing on these five constructs can help them to attain competitive advantage for their product development later. The five latent constructs are “internal motivation of the company”, “attributes of the company”, “employee attributes”, “requirements of the quality systems”, and “attributes of the external environment”. One construct is added to the five constructs based on suggestions from the literature. Many studies have found “education and training” is one of the major critical success factor for effective HACCP implementation (Chen, Flint, Perry, Perry, & Lau, 2015; Kafetzopoulos & Gotzamani,

2014; Mortimore & Mayes, 2002). For the purpose of this study, the number of latent constructs that will be studied is six and the descriptions of each of the constructs are explained below.

### **3.1 Internal motivation of the company**

Company mission and vision drive the internal motivation of companies (Oackland, 2014). Strategies are put in place, to achieve the company's target. One of the strategies that food producer companies can implement is a system that can help the company to work more efficiently and effectively in utilizing the resources, especially raw resources such as crops, raw meat, seafood and so on. The system helps food producers to meet customer's quality needs and expectations through improvement of the production processes. Consequently, the cost for production and waste of products are decreased. Other than that, support and commitment of senior management is also one of the internal motivations to move a company to go further (Singh, Feng, & Smith, 2006). This is for the goodness of brand name and reputation of the product. Concerning the food industry, brand name and reputation are very important because customers put their trust in the brand of the product that they buy and consume. According to Chamhuri & Batt (2015), five top rank food features that consumers in Malaysia are looking for include "freshness", "price", "cleanliness", "nutrition" and "freedom from chemicals". Consumers' demand is considered as one of the internal motivation for food producers implementing effective FSMS. Hence, internal motivation is a critical success factor in implementing the HACCP system.

### **3.2 Attributes of the company**

HACCP is the best approach on safety and quality in the food industry. Beforehand, the company must have run a prerequisite program to equip the company to apply the highest qualification certificate (Baş et al., 2007). Examples of prerequisite programs include, Good Manufacturing Practices (GMP), Good Agriculture Practices (GAP), and Good Hygiene Practices (GHP). In Malaysia, the government has provided the minimum prerequisite program named Makanan Selamat Tanggungjawab Industri (MeSTI) to encourage food producers to expand their product in international market (Fernando, Ng, & Walters, 2015; Fernando, Ng, & Yusoff, 2014). However, the commitment from the manager in charge is crucial so that the validation and verification of the HACCP plans conducted are better and well understood by the food handlers later on. Therefore, attributes of the company is a critical success factor in implementing the HACCP system.

### **3.3 Employee attributes**

Human resources are the essential resource in the food industry as they are the ones who handle the food from the beginning of the food process until the end of the product (Luning & Marcelis, 2007). Even with usage of technology, food handlers are crucial in the food industry for producing safer and quality food (P. Kafetzopoulos, D. Gotzamani, & L. Psomas, 2014). Thus, commitment from the employees to get involved in the system and work the plan is important. Besides that, to achieve the cooperation from the employees, management should provide appropriate training, so that employees know how to implement the plans that have been developed by top management and recognize the importance of their roles. Following the importance of the issues related to the human resources of food producers, makes employee attributes a critical success factor in implementing the HACCP system.

### **3.4 Requirements of the quality systems**

Food producers have financial problems with regards to implementing the HACCP system (Tunalioglu, Cobanoglu, & Demet Karaman, 2012). Financial problems here means, in terms of investment to continuously implement the system. Applying for the system is not a big deal for a company. However, in order to sustain the system, higher maintenance cost would be needed. Thus, the food producers need to allocate a budget for the systems maintenance (i.e. cost for external auditor) and they might need supportive funding or incentive from the government or related authorities. In some cases, Small and Medium Enterprises (SMEs) producers refused to implement the system because of financial requirement of the HACCP system. Besides that, the HACCP system requires the company to record all the processes involved and to have proper record keeping. Moreover, once the producers managed to get the certificate of qualification of implementing the HACCP system, they need to sustain the certification. Thus, the process requires a high commitment of time and money which some companies are reluctant to commit to. For this reason, a requirement of the quality systems is a critical success factor in implementing the HACCP system.

### **3.5 Attributes of the external environment**

External pressure such as the customer demand always urges the food producers to do their best to serve the best quality and safe food for their customers. Other than the pressure from customers (Herath, Hassan, & Henson, 2007), the government and authorities contribute to external pressures to producers as well. This is due to some certification requirements which are mandatory or voluntary. Mandatory qualifications are those rules and regulations introduced by the government (Jin, Zhou, & Ye, 2008). In Malaysia, food producers are required to comply with the Food Act, Food Hygiene and others. On the other hand, voluntary qualifications are like the HACCP system, GMP, GAP and GHP provided by the third party. Consequently, all these become the external pressures for food producers to implement the system effectively.

### **3.6 Training and education**

Most previous studies strongly agree that training and education is vital in implementing effective FSMS (Boccas et al., 2001; Chen et al., 2015; Ehiri et al., 1997; Macheke et al., 2013; Mensah & Julien, 2011). Training and education on food hygiene should be provided early in the process of receiving the raw products from the supplier. Food handlers should be aware of cross contamination and monitoring of received products. During the preservation of the raw products or semi-finished products, monitoring and control of the temperature of the products should not be ignored. Training and education will create awareness among the food handlers by educating and giving knowledge about the HACCP strategy (Jevšnik, Hlebec, & Raspor, 2008; Violaris, Bridges, & Bridges, 2008) and hands-on or in-house training on application of HACCP. Successful training and education will tend to lead to good attitudes towards the effectiveness of the HACCP system.

### **4.0 Effectiveness of the Food Safety Management System (FSMS)**

In any organization, a system is introduced to make or help the task to be easier, more efficient and most importantly more effective. Thus, effective is commonly defined as to what extent is the implementation

of the practices meet the system objectives (Al-Nakeeb, Williams, Hibberd, & Gronow, 1998). There are three main HACCP systems objectives that are commonly claimed by other studies and HACCP system own objectives, which are hazard identification, hazard assessment and hazard control. Thus, in order to achieve the objectives of the system, the critical success factors are used to indicate the vital parts of the implementation that should be focused on more by the food manufacturers. The constructs are based on the studies done by Kafetzopoulos & Gotzamani (2014) and Psomas et al. (2010).

#### **4.1 Hazard identification**

The first step in the HACCP plan is the identification of the hazards that may occur during the process. Due to the initial step in HACCP plan, identification is paramount importance in achieving the effectiveness of the system (Panisello, Quantick, & Knowles, 1999). Brainstorming is used to identify food safety hazards. Besides that, the literature databases can be used to identify the food borne safety hazards as well. The data can be gathered from the scientific literature that explains more about the process flow at the processing plant. Later at the plant, hazards must be clearly identified and recorded (Untermann, 1999). The HACCP team who are the experts should identify which of the product characteristics that have potential to create food safety hazards.

#### **4.2 Hazard assessment**

After identifying the safety hazards, the next step is the hazard assessment stage. This can only be done after the employees fully recognized the significance and criticality of the food safety hazards. During this stage, there are two factors that should be explained carefully, which are possibility and severity of hazard (Kafetzopoulos et al., 2013). In order to conduct the hazards assessment, documented procedures are implemented. Documentation is crucial to ease the HACCP team to assess and classify each food safety hazards based on the critical level and the probability of it occurring. For assessing the criticality of hazards, the HACCP team must collect data at the processing plant. The action that needs to be taken to identify hazards is to decide whether there is significant risk of food safety or it is still in an accepted preventive limit. Untermann (1999) investigated that a HACCP team should evaluate the suspicious hazards condition that might develop along the entire production process (during storage or during the intended utilization) of food product. At this stage, the knowledge and know-how of the HACCP team to assess the food borne safety hazards is important.

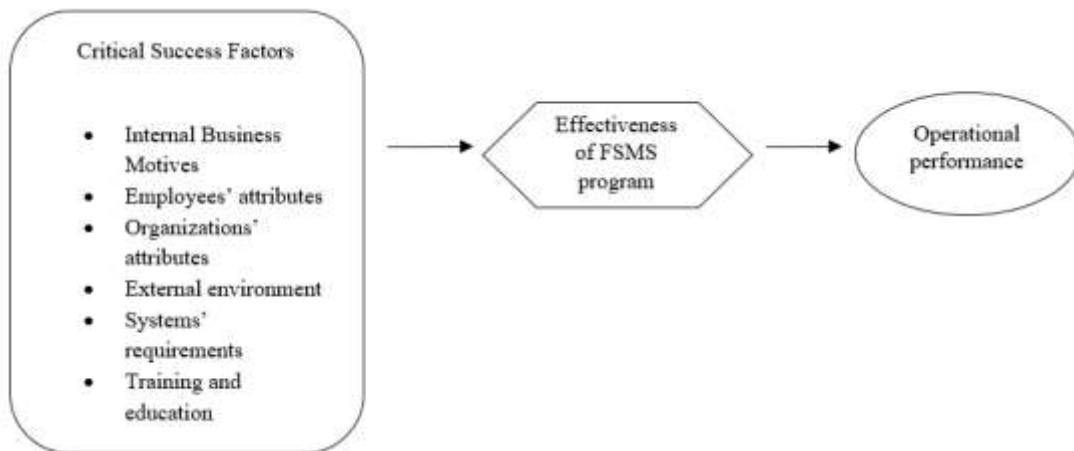
#### **4.3 Hazard Control**

Another crucial stage in the HACCP system is control. In order to monitor and control food safety hazards, reliable and valid procedures are used. However, to ensure the suitability of the method used for monitoring and controlling requires the endorsement from external audit. Thus, control measures must be aligned with the acceptable level of the hazards that need to be eliminated or reduced (Untermann, 1999). Monitoring and controlling food safety hazards are detecting the excess of limit in the Critical Control Points (CCPs). However, to fulfill the CCP requirement, the right monitoring procedures are priority, only then the control measures function well (Kafetzopoulos et al., 2013). Once the food safety hazards are detected in the product or at any stage of food processing, the HACCP team analyses the CCP, and then implements suitable actions for monitoring and controlling.

## 5.0 Operational Performance

The main goal of the effective implementation of the HACCP system is to protect human health that may be affected by any hazards from the farm to fork. There are many barriers that food producers face in implementing the HACCP system (Fotopoulos et al., 2011). However, the most evident problem that food manufacturers face, not only limit to SMEs, is financial commitment. Even big food companies might refuse to implement or face financial difficulties to meet the HACCP system's requirements. So, in addition to the identification of the CSF that affects effectiveness of the HACCP system, it is also important to study the impact of implementing effective HACCP systems towards food manufacturers in terms of operational performance. Operational performance means the improvement of an organization resources such as cost, flexibility and productivity of facilities (Clegg, Gholami, & Omurgonulsen, 2013). Thus, operational performance can be measured based on the company's productivity, efficiency and effectiveness from the system implemented. At the same time, operational cost, delivery ability and positive image of the company can be measured as well. In addition, as the employees play an important role in the system implementation, employees' satisfaction also is considered. The proposed research model for this research is depicted in Figure 1. The research model is adapted from the study by Kafetzopoulos & Gotzamani (2014).

**Figure 1: Proposed Research Model (Adapted from Kafetzopoulos & Gotzamani, 2014)**



## 6.0 Conclusion

The objective of this paper is to identify the critical success factors for the effectiveness of the HACCP system in the food industry. This paper also presents a proposed research model that also covers the effect of effectiveness of HACCP systems on operational performance. To ensure the effectiveness of the HACCP system can be achieved, it is crucial to identify the critical success factors. It is important to identify and detect the initial problem from the first step of implementation of the system and at the beginning of the food supply chain. Prevention is always better than cure to reduce any food safety incidents and most importantly to avoid any loss that comes from ineffective implementation of food preparation and production.

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