Food Safety Culture and the Creation Model of the Demonstration Schools Operated by Public University

Passanun Yeamchamphai,* Supattra Pranee, Chompoo Saisama & Jomkhwun Suwannarak

College of Innovation and Management, Suan Sunandha Rajabhat University, Bangkok, 10300 Thailand

A r t i c l e i n f o

A b s t r a c t

Food safety for children is an issue affecting children's sickness and impedes their learning and physical development in various aspects. Realizing its importance, the concerned authorities therefore support the establishment of measures and standards for controlling and ensuring better student food safety quality. This study focused on the following: 1) examing the level of the following variables; change leadership, individualism, organizational climate and environmental support that affect the food safety culture of demonstration schools operated by public universities, 2) exploring the influence of factors affecting the food safety culture of demonstration schools operated by public universities, and 3) developed the food safety culture creation model of demonstration schools operated by public universities. The mixed research methodology between quantitative and qualitative terms were applied. In view of the quantitative term, the sample group consisted of executives, managers, dietitians, male and female cooks, teachers and teacher assistants involved with food management of demonstration schools, with a total of 440 persons, whereas the sample size was calculated based on 20-time criteria of the observed variables with the multiple-stage sampling. Data collection was conducted through questionnaires that were later analyzed by the structural equation modelling. For the qualitative term, an in-depth interview was made with the primary informants consisting of 21 school executives and sanitation technical officers. The research findings revealed that 1) change leadership, individualism, organizational climate, environmental support and food safety culture of demonstration schools operated by public universities were all at a high level, 2) change leadership, individualism, organizational climate and environmental support affected the food safety culture of demonstration schools operated by public universities at statistical significance level of 0.05, and 3) the food safety culture creation model of demonstration schools operated by public universities as developed by the researcher was called "ICTS2 (F) Model" (I : Intellectual Stimulation, C : Commitment, T : Training, S : Sanitation, Fsb : Food safety behavior, Fsp : Food safety performance). Additionally, the qualitative findings also

* Corresponding Author
e-mail: passanun.ya@ssru.ac.th

indicated that to create the food safety culture of demonstration schools operated by public universities, networks are required to be established to promote knowledge sharing to concerned personnel for awareness and adequate understanding of safety food manufacturing and consumption under environment appropriate for food management. The findings from this research can be further applied as a guideline to determine a policy for food business operation to minimize unsafe food until the food safety culture becomes more efficient.

Introduction

Children's food safety issues are critical issues that contributes to children's illness and hinders children's ability in education and development. The relevant government agencies have foreseen and encourage the importance of food safety by implementing measures and standards to control and ensure the quality of food safety for students. Measures have been organized such as safe food program in school's cafeterias where standards include the hygiene aspects of school cafeterias. Mass food production makes it possible for human error, as seen from the news media about the occurrence of food poisoning in schools.

Food safety culture mediates knowledge and behavior gaps (De Boeck, et al. 2018). Rinsing, storage procedures, cooking and serving foodprocedures, processes, risks, frequency, and severity depend on the cause of illness or in severe casesof death . Food safety is a major global public health issue. Foodborne diseases contribute to morbidity and mortality. This is especially true in children at high risk for foodborne illness due to an immune system that is not yet fully functioning. Therefore, food service in schools requires the practice of safe food handling to prevent outbreaks of foodborne diseases, according to studies that show that the practice of food contact is an essential factor in preventing foodborne diseases (Griffith, 2013; Yiannas, 2009).

Corporate culture plays a role in changing employee behavior extensively, studied in fields such as education, health, and worker safety . The importance of a safety culture in changing employee safety behavior is well documented. Many industries are showing interest in safety culture to mitigate potential disasters such as healthcare injuries and accidents in the aviation industry and other high-risk industries.The researchers found that safety culture vary across industries, but four dimensions are regularly reported: 1)management/supervision, 2)

security, 3) risk and 4) pressure work . Many other types of cultures have been identified previously, such as customer service culture, learning culture, and innovation culture. All types of culture depend on the perception of each worker about the policies, procedures, and practices .

Food safety for children is another major problem that affects children's healthand hinders their learning and development. The relevant government agencies realize the importance of food safety and promote measures and standards to take control and ensure the quality of food safety for more students as can be seen from the management of the food safety project in schools, the establishment of the standards on the hygiene of the cafeteria . Since the lunch production process involves mass food production, there is a possibility that human errors may occur as can be seen from the food poisoning incidents happening in schools (despite being minor ones). In fact, simply having a food safety management system in place is insufficient to establish a strong food safety culture. Food safety culture was positively associated with employee behavior and the gap between knowledge and behavior could be mediated by food safety culture . Poor food safety culture and environmental conditions can increase the risk of foodborne diseases (Powell et al., 2011) since food contamination can occur during the process of selecting ingredients, cleaning, storing, cooking, and serving. People, processes, hazards, and frequency can all contribute to food poisoning, and depending on the cause, the illness's severity can range from mild to fatal.

Based on the background and importance mentioned above, the researchers are interested in studying about food safety culture, which is a new concept, by taking into consideration the psychological, social, and experiential factors that determine behaviors in 4 aspects: 1) change leadership 2) individuality, 3) organizational climate, and 4) environmental support. Leaders including administrators, supervisors, permanent employees, temporary employees, outsourced employees, and all those involved in food are able to turn food safety into culture and increase its value as well as create a good atmosphere and teamwork. As for employees and staff members responsible for each stage of the student lunch project, they should be knowledgeable and adhere to food safety regulations as their priority. Concerning organizational climate, it is crucial to concentrate on communication, the importance of and understanding toward the proper food safety procedure, the systematic

and proactive approach of risk-based management, the adequate provision of tools, equipment and manpower to support the food management system and the resilience of the system to the effects of food safety hazards. It can be said that food safety culture is an approach that can lead to a successful sustainable food safety management of the organization. As for environmental support, sanitation management, systematic and up-to-date data storage to monitor and evaluate food safety all contribute to the success of the lunch project. The proactive safety culture that continuously reduces the causal factors of foodborne diseases will eventually become a culture that can be fostered throughout the organization.

Objectives

1. To study the level of change leadership, individuality, organizational climate, and environmental support affecting the food safety culture of the demonstration school under the autonomous university.

2. To examine the impact of factors affecting the food safety culture of the demonstration school under the autonomous university.

3. To develop a model for enhancing the food safety culture of the demonstration school under the autonomous university.

Research Hypotheses

1) Change leadership influences food safety culture.

2) Individuality influences food safety culture.

3) Organizational climate influences food safety culture.

4) Environmental support influences food safety culture.

Conceptual Framework

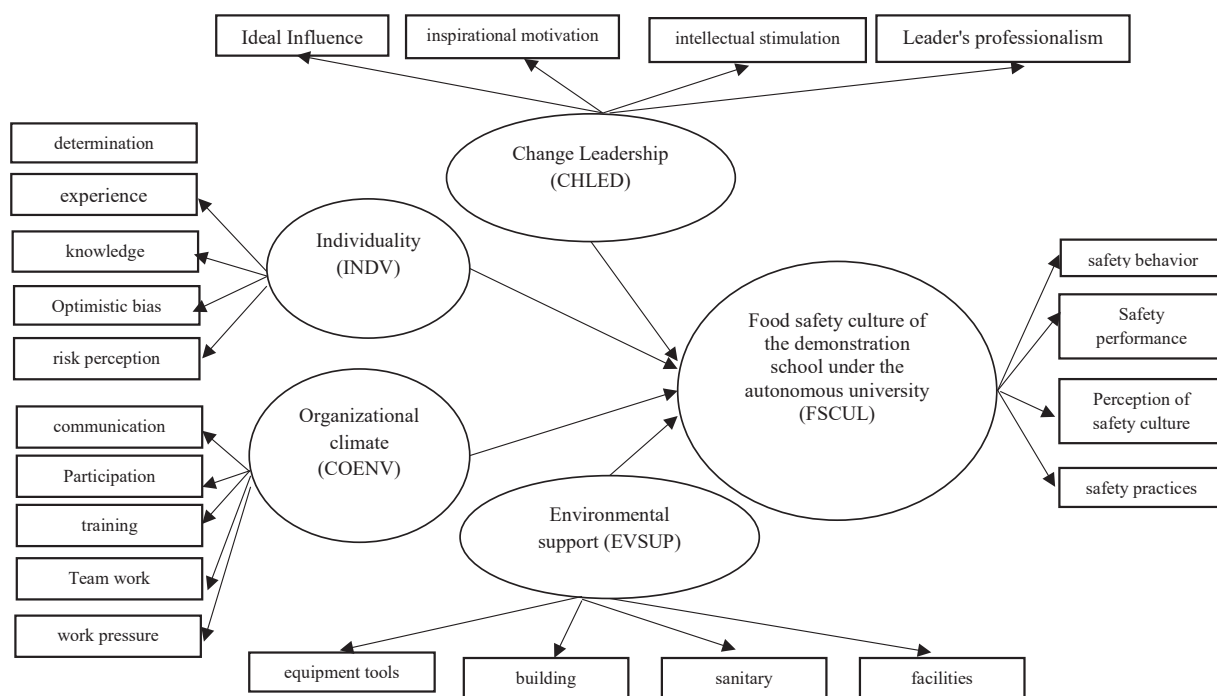The conceptual framework can be summarized as shown in Figure 1.

Figure 1 Conceptual Framework

Research Methodology

Population and Samples

The research samples were school administrators, managers of the school , dietitians, cooks, teachers, and childcare assistants responsible for food management of the demonstration school. The sample size was determined by estimating the observed variables in the proportion of 1:20 for 440 people (22 empirical variables x 20). A purposive sampling method was employed.

Research Instruments

A questionnaire was employed to collect the data. The first part of the questionnaire consisted of multiple choice closed-ended questions to collect personal information of the respondents. From Part 2 to Part 6 of the questionnaire, a 5-point interval scale was implemented to measure the level of opinion toward the sub-sections of each factor influencing the food safety culture of the demonstration school under the autonomous university. The content validity was evaluated by calculating the Index of Item Objective Congruence (IOC) with a criterion greater than 0.50 . It was found that all questions in the questionnaire had an IOC value greater than the above criteria i.e., in the range of 0.80 to 1.00. The result indicated that all items in the questionnaire had a content validity value and were able to be used in the research.

Collection of Data

The questionnaires were collected by the researchers. Data from the returned questionnaires were processed using software, displayed in tables, and given a descriptive interpretation.

Data Analysis

Frequency, percentage, mean ($\bar{x}$), Standard Deviation (S.D.), and Structural Equation Model (SEM) were used to analyze the data.

Results

1. Results of the respondents' personal information analysis

It was found that the majority of the respondents, 226 people (51.40%), were female. 130 respondents (Gen X) were between the ages of 41-55 years (29.50%). 187 people had a bachelor's degree (42.50%), and 128 respondents were teachers (29.00%). 92 people had 15 years of work experience (21.00%), while 301 people had attended food safety training (68.50%), 79 people received training from external trainers (18%), and 306 people had certificates (69.50%). In addition, it was found that 319 respondents reported that the school's food management was self-operated (72.50%), while 141 people informed that between 100 and 500 students received food services daily (32.0%), and 158 people stated that food operations of the school primarily focused on food production and services (36.00%).

2. Analysis results of the change leadership level, individuality, organizational climate, and environmental support affecting the food safety culture of the demonstration school under the autonomous university

The results indicated that change leadership (CHLED) had the highest mean, followed by individuality (INDV) and environmental support (EVSUP) with the same mean values, and food safety culture of the school (FSCUL) and organizational climate (COENV), respectively. When examining each aspect individually, it was found that for change leadership (CHLED), a latent variable, idealized influence indicator (IDIF), had the highest mean. As for the latent variable, individuality (INDV), the risk perception indicator (RSPCT) had the highest mean, while the building indicator (BLD) within the environmental support (EVSUP) latent variable had the highest mean. With regard to the last two latent variables, the food safety behavior indicator (FSBH) under the food safety culture of the school (FSCUL) variable and the work pressure indicator (WKPS) under the organizational climate (COENV) variable had the highest mean values.

3. Results of the preliminary analysis to examine the structural equation model of the factors affecting food safety culture of the demonstration school under the autonomous university.

The analysis of the normal distribution of the empirical variables in the structural equation model indicated that all of the empirical variables in the model were statistically significant ($p > 0.05$). This result demonstrated the non-normal distribution of the empirical variables. However, according to the Central Limited Theory concept, the large sample size ($n \geq 300$) could be statistically assumed that the data measured with the estimation scale questionnaire have a normal distribution curve .

The analysis results of the relationship between all pairs of the empirical variables in the structural equation model revealed that each pair of the empirical variables in the model had a correlation coefficient of less than 0.80. The most correlated pair of the empirical variables were experience (EPRE) and knowledge (KNLD) with a correlation coefficient of 0.573

and statistical significance at 0.01 indicating that none of the variables studied were overly correlated.

Regarding the statistical analysis of the KMO and Bartlett's Test of the empirical variables studied in the structural equation model, the result was that the correlation matrix of the empirical variables was not the identity matrix (Bartlett's Test of Sphericity = 3640.152. **p = 0.000). This result indicated that the overall empirical variables were adequately connected to be applied in the analysis in the same structural equation model. When considering each empirical variable, it was found that the overall adequacy values or KMO of the samplings (Kaiser-Meyer-Olkin: KMO) was equal to 0.926, which was greater than .05, indicating that each empirical variable was adequate and suited to be used in the same structural equation model.

Lastly, the confirmatory factor analysis was used to examine the quality of the latent variables in the structural equation model. It can be concluded that the component of every latent variable had the standardize factor loading greater than 0.40 with a value ranging from 0.59 to 0.79 and a confidence value of the latent variables (Constuct Realiability, ρ_c) greater than 0.70 with a value ranging from .81 to .86. In addition, the average variable extracted, ρ_v, was greater than 0.50, ranging from 0.51 to 0.55. In conclusion, the empirical variables and latent variables studied in this research adequate according to the statistical agreement of the structural equation modeling (SEM) analysis.

4. The analysis results of the model for enhancing the food safety culture of the demonstration school of the autonomous university

It was found that the adjusted structural equation model of the relationship between change leadership (CHLED), individuality (INDV), organizational climate (COENV), and environmental support affecting the food safety culture of the demonstration school of the autonomous university was consistent with the empirical data at an acceptable level as shown by the fit Index as follows: Chi-square (χ^2) was 362.10, the degrees of freedom (df) was 186 with the relative chi-square ((χ^2/df) of 1.94. The root mean square error of estimation (RMSEA) was .046 and the root mean square residual (RMR) was .016. The standardized root mean square residual (SRMR) was .048. The comparative fit index (CFI) was .98 and the goodness-of-fit index (GFI) was .93. The adjusted goodness - of - it (AGFI) was 0.91 and the critical N (CN) was 296.41 (See Figure 1). All indices revealed a good fit of the model with the empirical data. Therefore, it can be concluded that the structural equitation model developed by the researchers was consistent with the empirical data at a good level and fulfilled the research objectives.

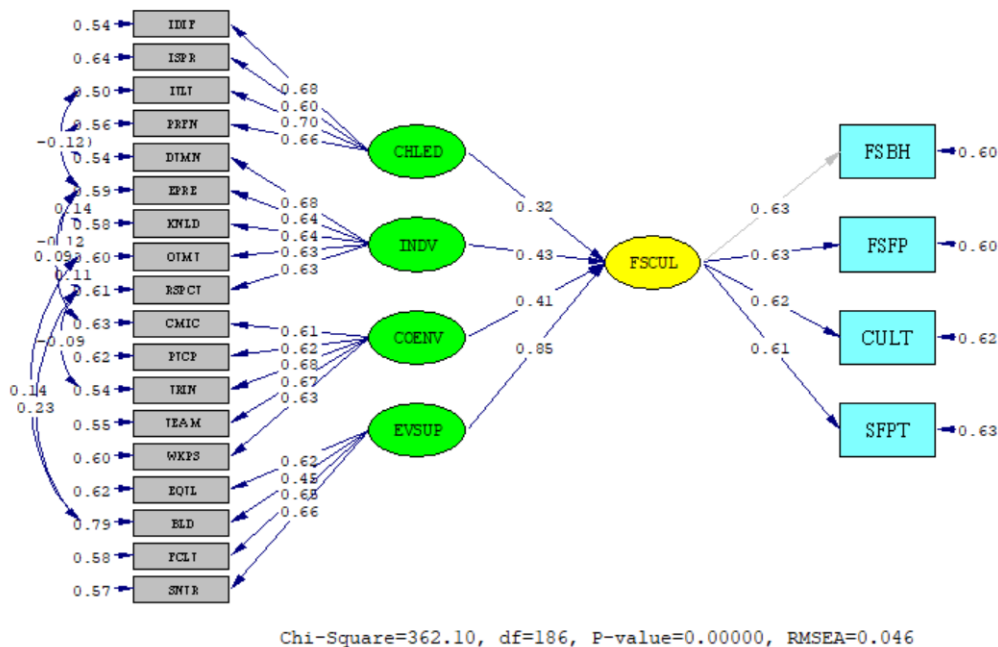Chi-Square=362.10, df=186, P-value=0.00000, RMSEA=0.046

Figure 2 Analysis results of the adjusted structural equation model (n=440).

The direct effect of the latent variables on the food safety culture of the school variables (See Table 1) can be explained as follows:

4.1 Change leadership (CHLED) had a direct effect on the food safety culture of the school (FSCUL) with a path coefficient of 0.32*(8.43) and a statistical significance of 0.05. The result was in accordance with Hypothesis 1, which predicted that the change leadership would have an impact on the food safety culture.

4.2 Individuality (INDV) had a direct effect on the food safety culture of the school (FSCUL) with a path coefficient of 0.43*(7.86) and a statistical significance of .05. The result was in accordance with Hypothesis 2, which predicted that individuality would have an impact on food safety culture.

4.3 Organizational climate (COENV) had a direct effect on the food safety culture of the school (FSCUL) with a path coefficient of 0.41*(7.03) and a statistical significance of 0.05. The result was in accordance with Hypothesis 3, which predicted that organizational climate would have an impact on food safety culture.

4.4 Environmental support (EVSUP) had a direct effect on the food safety culture of the school (FSCUL) with a path coefficient of .85*(6.05) and a statistical significance of .05. The result was in accordance with Hypothesis 4, which predicted that environmental support would have an impact on food safety culture.

4.5 Change leadership (CHLED), individuality (INDV), organizational climate (COENV), and environmental support (EVSUP) collectively were able to predict the food safety culture of the school (FSCUL) at a 94% accuracy rate.

Table 1 Hypotheses Result

Hypotheses	Path	Standardized path Coefficients	T-Value ›1.98	Results
H1	CHLED → FSCUL	0.32*	8.43	supported
H2	INDV → FSCUL	0.43*	7.86	supported
H3	COENV → FSCUL	0.41*	7.03	supported
H4	EVSUP → FSCUL	0.85*	6.05	supported

In addition, when considering the components of the variables used in this structural equation model, all of the components had a standardized factor loading greater than 0.40 with a value between 0.57 to 0.79, and a statistical significance of 0.05. The result can be used to explain the constituent factors for each variable, as follows:

1. The latent variables of change leadership factor (CHLED) consisted of 4 empirical variables, namely, idealized influence (IDIF), inspirational motivation (ISPR), intellectual stimulation (ITLT), and professionalism of leaders (PRFN).

2. The latent variables of individuality factor (INDV) consisted of five empirical variables: determination (DTMN), experience (EPRE), knowledge (KNLD), optimism bias (OTMT), and risk perception (RSPCT).

3. The latent variables of organizational climate factor (COENV) consisted of five empirical variables including communication (CMIC), participation (PTCP), training (TRIN), teamwork (TEAM), and work pressure (WKPS).

4. The latent variables of environmental support factors (EVSUP) consisted of 4 empirical variables, namely, equipment and tools (EQTL), buildings (BLD), facilities (FCLT), and sanitation (SNTR).

5. The latent variables of the food safety culture of the school (FSCUL) consisted of 4 empirical variables: food safety behavior (FSBH), food safety performance (FSFP), food safety culture perception (FSFP). (CULT) and safety practices (SFPT).

The researchers developed the ICTS2F Model (I = Intellectual stimulation, C = Commitment, T = Training, S = Sanitation, Fsb = Food safety behavior, Fsp = Food safety performance) as a model for promoting food safety culture at the demonstration school under the autonomous university as follows:

3.1 Intellectual stimulation - Department heads at all levels should motivate their staff members to work hard and make them feel dedicated to achieving their goals. It is also crucial to foster an environment where employees believe their work matters and is challenging, and they should be proud of what they are doing. In addition, staff members should be asked questions that encourage them to find solutions on their own. People in positions of authority should also speak and behave in a way that inspires subordinates to continue producing quality work.

3.2 Commitment - Those responsible for managing food safety in schools should be dedicated to their work, ready to develop and improve their performance, as well as recognize and prioritize the importance of food preparation by adhering to food safety and hygiene measures as stated in the handbook.

3.3 Training - Everyone involved in food production and services should be knowledgeable and practice good hygiene habits. To continuously improve up-to-date food safety practices, adequate training and

seminars must be made available. These include upskilling - elevating existing skills to the next level - and reskilling - developing essential skills related to food safety operations.

    3.4 Sanitation - The school should develop a hygienic environment. A grease trap in the sewer pipe of the school kitchen should be installed. The area needs to be kept clean at all times. Wet waste, food waste, dry waste, and plastic waste must be sorted. Cooking utensils are washed and blanched in hot water, steamed, or sun dried before storing. Insects and vectors must be regularly eliminated. School kitchens should be inspected by the environment and sanitation section on a regular basis.

    3.5 Food safety behavior - Safety practice, especially the annual health check for employees working with food, is essential. Everyone is required to strictly follow the food safety system, write a report when noticing something that could be harmful and send daily reports to the LINE group chat.

    3.6 Food safety performance: Schools should integrate food science and health education for school students. The schools also need to monitor the nutritional status of the students and allocate funds to provide materials, equipment, tools and activities that will keep school food services up to date. Additionally, it is important to develop a detailed food safety manual and guidelines and frequently review the work system for food safety in order to stay current and functional.

    The model in Figure 2 below is a food safety culture promotion model for demonstration schools under autonomous universities.

Figure 3 ICTS2(F) Model, a model for promoting food safety culture for demonstration schools under autonomous universities

Discussion

    The key findings from the results of the hypothesis testing data are discussed as follows:

    1. In this research, the result indicated that food safety culture was influenced by change leadership. This finding is consistent with the study by Wiśniewska et al., (2019) which reported that leadership commitment toward food safety had a significant impact on the development of food safety culture. Focusing on issues of employee retention and food safety culture found a positive relationship between shared leadership style and organizational performance.

    2. In this study, individuality had an influence on food safety culture. Similarly, study of Fujisaki et al. (2018) on food safety culture among food handlers at Tokyo schools in Japan also found the influence of individuality on food safety culture. Ungku & Ungku (2013) and Aquino, et al. (2021) found that the kitchen staff's perception and awareness of the factors relating to food safety culture in the workplace are factors motivating behavior adjustments and developing good management practices. In addition, knowledge and training related to food safety had a significant impact on food safety practices. Fast food restaurant managers with accurate food safety knowledge were more aware of different types of food safety. 3. Organizational climate (COENV) had a direct influence on food safety culture in schools (FSCUL). This result is in accordance with the findings of who found that training, communication, and staff member participation had positive effects on the effectiveness of food safety performance. Taylor & Rostron (2018) also found that food corporations primarily used training and communication to promote food safety and quality. Similarly, the research results on the food safety culture (FSC) assessment of SUBWAY franchise restaurants conducted by Wiśniewska et al. (2019) revealed that communication about food safety policy and training in food safety conformity with the food safety principles was highly evaluated by the research participants. According to research, communicating and promoting corporate ethics among employees, encouraging teamwork, and obtaining support from the organization to accomplish assigned missions and objectives were positively correlated with leadership behavior and job satisfaction.

    4. The result indicating that environmental support influenced food safety culture is consistent with

the finding of De De Andrade et al. (2020) who pointed out that environmental support was crucial for food safety since food safety culture could create a suitable environment for adequate food management and reduce the violation of food safety regulations. Similarly, Fujisaki et al. (2018) reported that environmental support affected food safety culture while found that creating a work environment that fostered food safety behaviors and services was an essential food safety practice that would result in a strong food safety culture and reduce the risk of food-borne disease outbreaks.

Suggestions

1. Since the findings of this study are in accordance with the objectives and results set in all respects, further research should be carried out to determine whether the research would yield similar results in other educational settings, such as child development centers, elementary schools, private school or educational institutions, or with other target groups, especially students and parents to compare and expand upon the findings of this study to gain more comprehensive and diverse knowledge relating to this issue. In addition, to achieve more in-depth and detailed results, additional research should concentrate on one of the areas included in this study, such as those related to finances and budgets, external context, economy, government policies, etc.

2. In order to acquire in-depth information, a qualitative method like focus group discussions should be carried out following in-depth interviews to obtain more insightful results that could lead to successful and sustainable practices.

Reference

Aquino, H.V.A., Yap, T., Lacap, J.P.G., Tuazon, G. & Flores, M. (2021). Food safety knowledge, attitudes, practices and training of fast-food restaurant food handlers: a moderation analysis. *British Food Journal, 123*(12), 3824-3840.

De Andrade, M. L., Stedefeldt, E., Zanin, L. M., & Da Cunha, D. T. (2020). Food safety culture in food services with different degrees of risk for foodborne diseases in Brazil. *Food Control, 112,* 107152.

De Boeck, E., Jacxsens, L., Bollaerts, M. & Vlerick, P. (2015). Food safety climate in food processing organizations: development and validation of a self-assessment tool. *Trends in Food Science and Technology, 46*(2), 242-251.

Griffith, C. J. (2013). Advances in understanding the impact of personal hygiene and human behavior on food safety. In J. N. Sofos (Ed.), *Advances in Microbial Food Safety* (pp.401–416). Philadelphia, PA: Woodhead Publishing Ltd.

Fujisaki, K., Shimpo, M. & Akamatsu, R. (2018): Factors related to food safety culture among school food handlers in Tokyo, Japan: a qualitative study, *Journal of Foodservice Business Research, 22*(1), 9 -13

Manning, L. (2018). The value of food safety culture to the hospitality industry. *Worldwide Hospitality and Tourism Themes, 10*(3), 284–296.

Powell, D., Jacob, C., & Chapman, B. (2011). Enhancing food safety culture to reduce rates of foodborne illness. *Food Control, 22,* 817-822.

Taylor, J.Z. & Rostron, K.I. (2018). The development of a safety and quality culture assessment tool from a longitudinal, mixed-method research journey. *Worldwide Hospitality and Tourism Themes, 10*(3), 313-329.

Wiśniewska, M., Czernyszewicz, E. & Kałuża, A. (2019). The assessment of food safety culture in small franchise restaurant in Poland: The case study. *British Food Journal, 121*(10), 2365-2378.

Ungku, F. & Ungku, Z.A., (2013). *Measuring food safety culture: Insights from onsite foodservice operations (Graduate Theaes and Dissertation).* Iowa State University, Iowa.

Yiannas, F. (2009). *Food safety culture: Creating a behavior-based food safety management system* (pp. 11-14). New York, NY: Springer.