



Facilitating Best Food-hygiene Practices through Effective Leadership

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Abstract

This study aims to show that good leaders imply and reflect positive actions and effective hygiene practices. It also aims to encourage and disseminate the importance of the use of technological tools in detecting risks in Food-hygiene Practices in six government-controlled training centers. The survey and scientific swab method elicited data on leadership effectiveness (LE) prevalent in these organizations, focusing mainly on their impact on human health and the environment. The regression analysis shows that LE significantly affects perception and actual Food-hygiene Practices. Large effect sizes of significant difference for both practices were also detected. Accordingly, recommendations and limitations are highlighted in this study.

Keywords: Food safety; food-hygiene practice; leadership effectiveness; Malaysia

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1. Introduction

The promotion of a food safety system in the food industry begins with preventative controls and environmental monitoring of programs. Despite putting in place various food safety measures, cases of food poisoning are continuously reported in the media, thus indicating a need to investigate factors that may cause the outbreaks. In Malaysia, besides water-borne diseases like cholera, hepatitis A, typhoid and dysentery, food poisoning is also critical to public health. This is especially seen between 2000 and 2012 (Mazni, Toh, & Mohamed Azam, 2013). In short, contamination happens to food and water, but unhygienic food preparation and cooking too can be the source of contamination.

Today, leadership effectiveness (LE) is investigated as having a significant influence on Food-hygiene Practices because good leaders not only ensure workers are highly dedicated and competitive at work but also provide guidance and discipline required for high standard hygiene practices. This study, therefore, focuses on LE's significant influence on Food-hygiene Practices from two points of view: perception and actual implementation of hygiene practices.

2. Literature Review

2.1 Food-contact Surfaces and Cross-contamination

Garnishing, chopping, deboning, and slicing involves food-contact surfaces (FCS). As such, its proper use has to be prioritized so that transmission of foodborne pathogens to ready-to-eat food (RTE) can be controlled (Cosby et al., 2008). Contaminated food has a direct effect on human health, but contaminated FCS is even more critical. It is one of the main causes of food spoilage and happens when RTE comes into direct contact with FCS. Surfaces of plates, cups, cutting boards, food preparation tables, and many others can be re-contaminated even after routine cleaning.

The spread of pathogens on FCS is a risk to public health. FCS contaminated by previous users who do not wash their hands may be touched later by others who wash their hands (Berry et al., 2012). This is confirmed in a survey of restroom users in 48 fast food restaurants and coffee shops which revealed that restroom designs and appliances spread pathogens via human waste and urinals. Hand hygiene was based on respondents' touch, for example, on restroom door entries, toilet stall doors, door locks, and the toilet or urinal flushing mechanism, sink faucet controls, soap dispensers, and hand drying controls. Dirty hands have implications on hand hygiene and diseases. These results demonstrated the moderate and high contamination ability of static surfaces.

2.2 Leadership Effectiveness (LE) and Food-hygiene Practices

One most influential factor that contributes to organizational success including foodservice is LE (Fulmer, Gibbs, and Goldsmith, 2000; Schumacher, Grigsby, & Vesey, 2015).

Talented leaders understand what they do and why they do it, inspire their followers (Hopkins, O'Neil, & Stoller, 2015) and particularly affect their personal characteristics, behaviors, as well as perceptions of empowerment (Den Hartog & Koopman, 2011). Effective leadership displays certain personality traits, a balance of behaviors, a broad set of skills including self-confidence, tolerance for stress and energy, and core competencies (Shipper & Davy, 2002).

Leadership behavior styles, on the other hand, are mostly emphasized in a group, influences, and goals (Norlida, Hassan, Wahab, & Hussein, 2014). These authors studied LE among 298 lecturers at three Malaysian research universities and noted that inspirational motivation addressed by the head of the department is the most appreciated behavior. Lecturers felt they were given assistance and motivation to carry out their responsibilities and work optimistically towards achieving greater success in the future. Additionally, a study of Gwen Burns and Martin (2010) established that teachers believed that respect and trust were the most influential leadership qualities. The principals also viewed trust as the predominant influencing factor for LE.

Effective business supervisions need to sustain the affirmative relationship between leaders and subordinates; an association considered necessary to achieve business objectives. Kimbrough-Walls (2012) investigated students' perception of important teaching behaviors and found that students' success is dependent on the lecturers' effective instruction. This leadership by example is also revealed in Lin, Tou, and Yeh (2014) restaurant industry research. They discussed leadership quality-related performance as an effective management indicator. To Gatling, Castelli, & Cole (2013), this positive relationship improves a subordinate's personal goal setting. To Den Hartog and Koopman (2011), LE affects followers' behaviors, including perceptions and empowerment, while Shipper and Davy (2002) found LE related to specific individual capabilities. Hence, LE traits (e.g. self-confidence, hard work, and patience), leaders and subordinates working closely in kitchen areas of restaurants influence Food-hygiene Practices among subordinates. This happens when there is a positive relationship between outlets.

In food safety, cleaning methods ensure that food is fit for consumption. Appropriate implementation of correct hand-hygiene practices in clinics (Sharma, 2012) revealed that only 55 out of 255 i.e. 21.6% of respondents among dental professionals had either adequate awareness of hand-hygiene practices or actual practice them at work. It shows that professionals too can lack knowledge and awareness of correct hand-hygiene practices. Consistently, Stevens, Hemmings, Scott, Lawler, and White (2014) found a negative relationship between leadership style and hand hygiene compliance when they interviewed 53 medical and dental staff to unravel clinical leadership style and hand hygiene compliance. In this sense, leadership role modeling is effective in improving patient safety performance through increasing hand hygiene compliance.

As LE qualities are displayed by leaders at work, food handlers too seem to exercise acceptable, standardized and proper Food-hygiene Practices while working in the kitchen. LE's role in strongly supporting and promoting good food-hygiene practices mentioned in these studies confirm the positive relationship between LE and Food-hygiene Practices. It is therefore hypothesized that (i) LE has a significant relationship with perceived Food-hygiene Practices and (ii) LE has a significant relationship with the actual implementation of Food-hygiene Practices.

3. Methodology

A mail survey and a microbial experiment were used to collect data from six foodservice establishments as suggested by the Malaysian Ministry of Health (MOH). Food handlers were the captive population as they not only have specific knowledge of food handling activities but also work under controlled conditions where food quality outcomes are constantly monitored by the MOH. In the absence of a complete list of food handlers in foodservice establishments, this study allocated approximately 10 to 20 sets of questionnaires per center in November 2012. The sampling used in this survey is judgmental.

This study adapted the 5-items of Reave (2005) to measure LE and 16-items from Bolton, Meally, Blair, McDowell, and Cowan (2008) to measure Food-hygiene Practices of food premises and food handling. The 6-point Likert scale was adopted to avoid having midpoints as an option. Even-numbered Likert scales lead the response to set at a certain point (Croasmun & Ostrom, 2011). A statistical analysis of the results was performed using the IBM SPSS Statistics package. A regression analysis, a one-way multivariate analysis of variance (MANOVA), and t-test were mainly used to answer the hypotheses and research questions.

A microbiological investigation of FCS was also conducted to estimate a specific microorganism (total coliform) present in the kitchen and dining area. The focus on food serving trays and dining table tops is consistent with several other reported studies that included a microbial evaluation of FCS items (Cosby et al., 2008; Mazni, Toh, Mohd Faiz Foong, & Norazmir, 2013; Schlegelova et al., 2010). Using triplicates of each sample, the microbial assessment of total coliform was 36 (3 samples x 2 subjects x 1 parameter x 6 foodservice establishments). Coliforms on FCS are a universally accepted hygiene indicator of microbial contamination due to human or animal activities (de Quadros Rodrigues et al., 2014). The microbial assessment tools used included the Promedia ST-25 swab test kit and the RIDA® Count Coliform count kit. For t-test purposes, both data from the survey and hygiene scorecard were computed to log₁₀.

4. Results

4.1. Demographic profile data

63 sets of usable data from a total of 90 sets of questionnaire were coded and analyzed. The 70% response rate is considered excellent, since responding to mail questionnaires is not a widely accepted practice in Malaysia (Osman & Wheeler, 1996). Male food handlers aged between 18 and 30 years old (40%) with less than five years working experience (63.5%) were the majority respondents (60%).

4.2. Food serving tray and dining table top

The cleanliness of food serving trays and dining table tops is essential for hygienic food handling practices at the final processing stage. Swab experiment results show that total coliforms contaminated almost all samples. Figure 1 shows how dining table tops are kept clean as it is an open flat surface which is located in the open dining hall and is sometimes used to place clean food serving trays. Contamination of serving trays could be due to improper cleaning or the occurrence of secondary contamination during the drying and store stage. The presence of total coliform represents environmental contamination and is a risk to consumers.

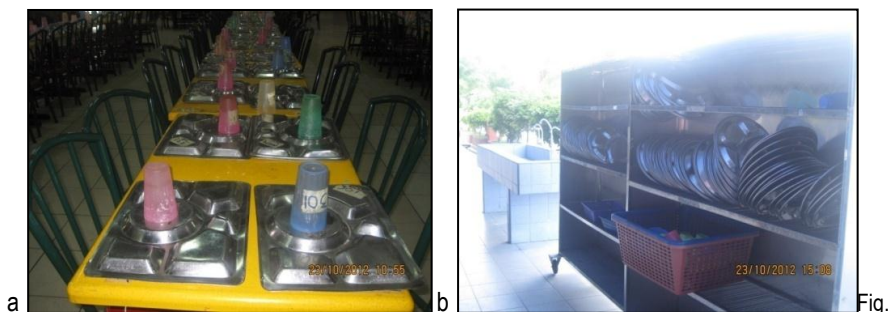


Fig. 1. (a) Dining table top at Location 5; (b) Food serving tray storage at Location 6

Hypothesis Testing

H1: LE has a positive and significant relationship with perceived Food-hygiene Practices

A simple regression analysis was conducted to test the significant effect of LE on perceived Food-hygiene Practices. Table 1 shows a regression model predicts perceived Food-hygiene Practices variable as significant with, p -value =0.012, which is less than 0.05.

Statistically, the overall regression model significantly predicts perceived Food-hygiene Practices, although it is in a negative relationship. Thus, hypothesis H1 is not supported.

Table 1. ANOVA test for significance Box's Test of Equality Covariance Matrices

Model	Sum of Square	df	Mean of Square	F-Value	p-value
Regression	2.874	1	2.874	6.772	0.012
Residual	25.885	61	0.424		
Total	28.758	62			
R	0.316				
R ²	0.100				

From the results in Table 1, we can predict the R² values. The R value represents a simple correlation of 0.316, which indicates about 31.6% correlation between LE and LE survey practices. The R² value is 0.100 indicating about 10% variation in the LE survey practices variable. In this case, the 10% is very small. Table 2 represents the coefficient result of the regression model, the equation of which is:

$$FHP = 4.483 - 0.282LE$$

The coefficient results in Table 2, however, indicate that there is a negative relationship between LE and perceived Food-hygiene Practices.

Table 2. The coefficient

Model	β_i	Std. error	t-test	p-value
Constant	4.483	0.552	8.116	0.000
LE	-0.282	0.108	-2.602	0.012

H2: LE has positive and significant relationship between the actual implementation of Food-hygiene Practices

Firstly, a test for normality, linearity, outliers, homogeneity of variance-covariance, and multicollinearity was conducted, and no serious violation was found. A one-way multivariate analysis of variance (MANOVA) was then conducted to test the hypothesis that there would be one or more mean difference between dining table top and food service tray and LE scores. Table 3 shows the statistically significant result of the MANOVA effect with Pillai's Trace =0.680, F(48, 96) = 1.765, p < 0.010. Thus, there is a significant effect of LE on dining table top and food serving tray at six different locations. The multivariate effect size was estimated at 0.340 (*partial* $\eta^2 = 0.340$), which implies that 34.0% of the variance in

the canonically derived y Food-Hygiene Practice (dining table top and food service tray) variables were accounted for by LE.

Table 3. Significance multivariate effects

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power ^b	
Intercept	Pillai's Trace	.262	8.359 ^a	2.000	47.000	.001	.262	.877	
	Wilks' Lambda	.738	8.359 ^a	2.000	47.000	.001	.262	.877	
	Hotelling's Trace	.356	8.359 ^a	2.000	47.000	.001	.262	.877	
	Roy's Largest Root	.356	8.359 ^a	2.000	47.000	.001	.262	.877	
	LE	Pillai's Trace	.680	1.765	28.000	96.000	.022	.340	.936
		Wilks' Lambda	.404	1.927 ^a	28.000	94.000	.010	.365	.960
Hotelling's Trace		1.271	2.088	28.000	92.000	.005	.389	.975	
Roy's Largest Root		1.080	3.702 ^c	14.000	48.000	.000	.519	.984	

When the results for the Food-hygiene Practice variables were considered separately, the only difference to reach statistical significance when using the Bonferroni-adjusted alpha level 0.015 is the food serving tray, $F(14,48) = 3.672$, p -value = 0.000. Results depicted as in Table 4.

Table 4. A significant effect of LE

Source	Dependent Variable	df1	df2	F	Sig	Partial Eta Squared	Observed Power ^b
Corrected Model	Dining table top	14	48	.759	.706	.181	.218
	Food serving tray	14	48	3.672	.000	.517	.983

Does LE affect Food-hygiene Practices (perceived vs. actual implementation)?

A t-test was conducted for the research question of this study. Table 5 shows the

descriptive statistical results of three different variables - perceived Food-hygiene Practices, dining table tops, and food serving trays. It indicates that there is a mean difference between perceived Food-hygiene Practices (Mean = 3.0419, SD = 0.66877) and dining table tops (Mean = 1.7155, SD = 0.15465) and also food serving trays (Mean = 1.2876, SD = 0.15192)

Table 5. Descriptive Statistics

Variables	N	Mean	SD
Perceived Food-hygiene	62	3.0419	0.66877
Dining table tops	62	1.7155	0.15465
Food serving trays	62	1.2876	0.15192

Then a paired-sample t-test was conducted to evaluate the significant difference between perceived Food-hygiene Practices and dining table tops, and also serving trays. There was a statistically significant difference between perceived Food-hygiene Practices and dining table tops, $t(61) = 7.351$, p -value < 0.000, with the eta square (η^2) 0.4739 indicating a large effect size (Cohen, 1988). There is also a significant difference between perceived Food-hygiene Practices and food serving trays, $t(61) = 11.341$, p -value < 0.000, with the eta square (η^2) 0.6819, also indicating a large effect size. Table 6 gives the detailed results.

Table 6. The significance test

Research Question	df	Std. Error of Mean	t-test	95% Confidence Interval		P-value	Effect size
				Lower	Upper		
H3a	61	0.18044	7.351	0.96564	1.68726	0.000	0.4739
H3b	61	0.15469	11.341	1.44504	2.06367	0.000	0.6819

Hypothesis Testing

Table 7 presents the overall results related to hypotheses. Of the four hypotheses, only the first was not supported.

Table 7. Summary of hypothesis testing

H1	There is a positive and significant difference between LE and perceived Food-hygiene Practices	Not Supported
H2	There is a positive and significant difference between LE and actual implementation of Food-hygiene Practices	Supported

5. Discussion and implications of the study

The above findings highlight the importance of LE in predicting two outcomes of Food-hygiene Practices: (1) LE has a significant effect on perceived Food-hygiene Practices, and (2) LE has a significant effect on the actual implementation of food handling practices by organizational leaders. Firstly, food handlers have a poor perception of their leaders' management of food-hygiene practices, which Stevens et al. (2014) and Sharma (2012) also found. This negative outcome suggests that other factors like environment, education, role modeling, and knowledge may be more important determinants. Leaders may not be professional practitioners but are still considered role models because of other management qualities or personality traits. Secondly, the swab analysis which is consistent with Lin et al. (2014) and Kimbrough-Walls (2012) confirmed that it is hard to measure efficient leadership because the concept itself has several different interpretations.

From the management perspective, the result from Hypothesis 1 may have different implications and interpretations. The ministry's involvement is actually part of the management's effort at inculcating good hygiene practices. The findings lend support to the view that perception and actual implementation of Food-hygiene Practices reflect the management of these government-controlled centers and their LE. A strong and effective leadership that promotes positive foodservice qualities further enhances the overall management skills of employees to maintain the cleanliness, and hygienic environment of their outlets is critical in the food service industry.

From the practical perspective, the use of the technological tool or swab test on FCS provides significant implications on the effectiveness and efficiency of FCS after the cleaning process (Mazni, Toh, Mohd Faiz Foong, et al. 2013). The result from the microbial analysis reflects the actual contamination status of Food-hygiene Practices. Food serving trays and dining table tops are important samples because if the food does not go through the heating process before being served to consumers, direct contact with a contaminated FCS can easily transpire a bacterial infection of the food. Due to the effectiveness of their leaders, the equipment, utensils, and the area where the food is prepared or processed were given full attention during the cleaning process. The hygiene scorecard should be utilized as a commercial tool rather than limiting its use for laboratory purposes only.

6. Limitations and Future Research

The first limitation of the study is the small size of the sample (63 sets). The data, however, did represent the population at each center. Thus, to meet the statistical expectations of ANOVA, the *Pillai's* trace test was used.

Secondly, the experimental sampling of the cleanliness of food serving trays and dining table tops represent only the final stage of the foodservice process. Future studies could

investigate the first and intermediate processes to reflect the whole food premise. A longitudinal study is recommended when eliciting the actual food-hygiene practice pattern.

Finally, an exploration of the positive relationship between perceived and actual implementation of Food-hygiene Practices could find out if the food handlers' perception is actually accounted for in the actual implementation of these practices. Further studies could also introduce other factors like food handlers' attitude or spiritual intelligence as the mediating variable.

7. Conclusion

LE in this study seems to significantly impact and reflect positive actions and effective hygiene practices in the implementation process. The MOH's regular monitoring activities allow food handlers to perceive that they are actually practicing good work. Contradicted findings between perception and actual implementation may create different reflections of practices although both are equally significant. The survey and scientific swab method reflect their impact on human health and the environment. So do the statistically large and significant effects. Nevertheless, this study would like to emphasize that the use of the technological tool i.e. the hygiene scorecard via swab assessment is valuable as it reflects the foodservice establishment's effective and efficient control and monitoring of environmental hazards in reaching a hygienic environment.

The current study triggers a question that requires explanation. If the leaders had a powerful influence on hygiene practices, could it be that other factors are causing the recurrence of food-related outbreaks in the government-controlled centers? This calls for the consideration of a new study on food hygiene practices in the future.

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