

Selection Model for School Lunch Suppliers of Junior High Schools

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ABSTRACT

The main purpose of this study is to develop the selection model for school lunch suppliers of junior high schools. Firstly, this study collected data and performed literature review. Secondly, this study developed the research structure based on literature review, and used revised Delphi method to collect the opinion feedback of experts anonymously. Thirdly, understand the various dimensions of school lunch of junior high schools to which importance was attached by experts, as well as to find important assessment factors affecting the selection. The results show that, school-related personnel attach the highest importance to the health management of food making process, and the order of importance of overall relevant assessment criteria is health management of food, adjustment of nutritional quality, crisis response capacity, suppliers' operating capacity, and management of kitchen equipment. In the end, the research results can help develop the assessment and selection model of school lunch suppliers of junior high schools.

Keywords: School lunch, Junior High School, Revised Delphi method

INTRODUCTION

The implementation of school lunch in junior high schools can also improve students' dietary balance and health, strengthen their group dining etiquette education, and implement social welfare policies. Therefore, it has been widely promoted in various countries around the world. With the rapid transformation of society, the economic pattern, industrial type, family structure, and social roles all have changed significantly. In the extended family lifestyle of the past traditional agricultural society, the closeness among family members was high, and family members would share the division of labor to complete housework. In terms of diet, most of the families chose home cooking. If there were children studying in school, most of the families would cook for their own lunch. On the contrary, in the double-income family lifestyle of current industrial and commercial society, parents are busy at work and could not take care of the three meals of their children. Although eating out lifestyle is convenient, it also causes the problem of students' dietary balance. Students may intake high-fat and high-calorie food and thus experience unbalanced nutritional intake. Such an unhealthy dietary habit may affect children's growth and development, lead to the early onset of some chronic diseases, such as obesity, diabetes, and hypertension, and cause many psychological problems [1].

Ever since Hsinchu City Government in Taiwan started to implement the social welfare policy of free school lunch in elementary schools and junior high schools on November 1, 2005, more than 40,000 have benefited from this social welfare policy. Hsinchu City Government in Taiwan budgets more than NTD 270 million for school lunch every year to provide every student with a subsidy of NTD 32 per meal. Schools have to supply school lunch of three courses and one group meal, 2 times of fruits every week, and 1-2 times of dairy products as nutritional supplement every month [2].

It is hoped that the assessment and selection model developed in this study can help school-related

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administrative units perform rigorous assessments and select suppliers with excellent performances in food health management and dietary nutritional balance to serve students in schools. There is an urgent need to develop a suitable assessment and selection model to create great external benefits to the society.

Literature Review

This section is divided into 4 parts of discussions, including the history of development of school lunch in Taiwan, school lunch operating model, importance of development of rational assessment and selection model for school lunch suppliers, Delphi method & revised Delphi method.

History of Development of School Lunch in Taiwan

School lunch is also called children lunch, student lunch or nutritional lunch in Taiwan. The history of development of school lunch at various stages is meaningful. After the Ministry of Education reported "5-year Plan for Development and Improvement of School Lunch in Elementary Schools" to Executive Yuan for approval and implementation in 1991, school lunch stepped into a new milestone. The meals prepared by schools for students and the formal meals taken by students are uniformly called "school lunch."

The school lunch plan in Taiwan was developed since 1954, and has been developed for nearly 6 decades. The developmental process can be divided into 5 stages: germination, experiment, self-reliance, development, and empowerment [4]. With the changes of time, the development has entered the current exuberance stage, with a total of 6 stages

Operating Model of School Lunch

Schools in Taiwan started to implement school lunch since 1957, and the policy of school lunch has been developed for nearly 6 decades. According to the history of development of implementation of school lunch Taiwan and relevant studies, various types of operating models have been developed according to the needs of different areas and school properties. In compliance with "Regulations Governing Central Government's Subsidization for School Lunch Expenses of Local Governments" [5], the operating models of school lunch can be divided into:

- Publicly funded publicly operated operating model: A kitchen is installed in a school where chefs cook food to supply students, faculties, and staff.
- Publicly funded privately operated operating model: A kitchen is installed in a school, and a private supplier is authorized to operate the kitchen and supply food to students, faculties, and staff in the school or a neighboring school.
- Central kitchen: A central kitchen is installed in a school to supply food to students, faculties, and staff in the school or a neighboring school.
- External lunch supplier: A school orders lunchbox or group meal to supply food to students.

Importance of Selection Model for School Lunch Suppliers

Ever since the implementation of school lunch in Taiwan in 1957, many improvements have been made. For example, dieticians have been included into school staffing, meal supply process and applicable administrative regulations on examinations have been developed, and central kitchen has been installed. However, compared with advanced countries that use "laws" to protect students' school lunch supply system, the school lunch system in Taiwan still has to be improved.

With the increasing implementation of school lunch system in elementary schools and junior high schools, whether the supplies selected by schools can ensure the nutrition, health [6], and safety of school lunch is worthy of the attention, review, and improvement of relevant units. In 2002, the Legislative Yuan approved "School Health Act" after the third reading to stipulate that schools shall strengthen the professional training of health management of cafeterias, kitchens, and student and staff cooperative stores (Article 22). Moreover, this Act also stipulates the responsibilities and employment of school dieticians (Article 12), in order to implement the quality of supervision of lunch suppliers through the peremptory norms of law. In addition, whether the suppliers selected by

schools can ensure the nutrition, health, and safety of lunch is worthy of attention, review, and improvement of relevant units. It is hoped that this study can contribute to this aspect.

Delphi Method and Revised Delphi Method

Delphi method is an experts' prediction method, as well as a group decision-making method. The main purpose of this method is to obtain the consensus of experts reviewing the interviews and seek consistent opinions of the research subjects. This method not only can draw on collective wisdom and absorb all useful ideas, but also can take into account the quality of experts' independent judgment. However, during actual application of “Delphi method,” the situation where the convergence of experts' opinions is not strong tends to occur. To obtain the results of stronger convergence, it is necessary to increase the number of investigations. However, the cost and time required by investigations certainly will increase. Moreover, “Delphi method” uses mean as the basis of screening and assessment criterion. Statistically, this method can be easily affected by extreme values, and the situation where the original intent of experts is distorted tends to occur [7].

Delphi method process is the repeated use of written communication and opinion expression to obtain experts' consistent opinions. However, during this process, due to the influence of factors, such as time, manpower, and fund, the process will be changed or altered to facilitate the conduct of a study. According to Murry and Hammons [8], due to special considerations, some of the studies will revise the steps of Delphi method (i.e. omit the survey of brainstorming open-ended questionnaire), and will directly develop structured questionnaire as the first-round questionnaire survey after referring to a large number of studies. The benefit is to reduce a lot of time. In addition, structured questionnaire survey enables the expert group participating in the study to focus on research theme, and reduces the conjecture of open-ended questionnaire. Therefore, it is called “revised Delphi method.”

Research Structure

This study used literature analysis to understand more factors affecting schools' selection of school lunch suppliers, and used revised Delphi method questionnaire to enable experts to screen out and revise various potential factors among many factors. After two rounds of adjustment and revision, this study developed the structure of various indices affecting the conditions for assessment and selection of school lunch suppliers of junior high schools.

Research Method

This study used literature analysis to summarize the indices affecting selection of school lunch suppliers of junior high schools, and used revised Delphi method to collect experts' opinions on indices and develop the assessment model. Secondly, this study develops the assessment and selection form for schools' selection of school lunch suppliers.

Step 1: Literature Analysis

This study reviewed and analyzed the past data and studies concerning “school lunch suppliers” first, and then developed the preliminary ideas of assessment dimensions of “assessment items of school lunch suppliers of junior high schools.”

Step 2: Revised Delphi Method

This study used revised Delphi method to develop the assessment criteria. Firstly, this study used data collection and literature review to summarize needs as specific goals and develop the structure of main criteria, sub-criteria, and preliminary criteria. The structure of preliminary criteria was developed through revised Delphi method questionnaire survey. Repeated questionnaire surveys were used to obtain the opinions of experts and scholars. Afterwards, this study analyzed the results. If the opinions of experts were inconsistent, the questionnaire content would be amended according to experts' suggestions. The effective and complete criteria structure was not developed until the experts' opinions became consistent. The criteria structure was used as the basis to develop the “AHP Expert Questionnaire on Establishment of Weight of Items of Assessment and Selection Model for School Lunch Suppliers of Junior High Schools.”

Research Subjects

This study enrolled 8 experts and scholar, 2 people from administrative supervision unit, 8 consumers, and 3 school lunch suppliers, who could assess and select school lunch suppliers, as the subjects of Delphi method questionnaire survey.

Research Tools

This study used revised Delphi method questionnaire to conduct a questionnaire survey where experts scored 1-5 points for each criterion of decision-making assessment criteria according to importance. In addition, there was a suggestion field of "Others" in the semi-closed questionnaire where the experts receiving interviews could complete their suggestions or opinions on revisions as reference for improvements.

Research Process

This study collected relevant studies in domestic and foreign journals, and summarized the dimensions of structure of assessment factors and assessment indices affecting the assessment and selection of school lunch suppliers of junior high schools. In order to reach the consensus, this study used revised Delphi method to screen out the assessment factors. This study used 5-point Likert scale to conduct two rounds of revised Delphi method questionnaire survey, and enrolled experts and scholars in various fields, such as supervisors (experts, scholars, and health inspectors), consumers (school-related people in charge, representatives of parents' associations), and school lunch suppliers as the subjects. After the experts and scholars reached consistent consensus, various dimensions and assessment criteria of the hierarchical structure in this study were confirmed. In the end, this study designed the formal questionnaire, and collected and arranged the data. Afterwards, this study performed paired comparisons on assessment factors to determine the various dimensions and assessment criteria. The specific research procedures and methods were divided into 2 stages, including:

- This study used literature analysis to investigate the definitions of school lunch and relevant studies of school lunch of junior high schools. This study analyzed the assessment and selection criteria for school lunch suppliers to which the government, school-related units, and parents attach importance according to the existing theories. In addition, this study summarized data to compile the dimensions and assessment factors for assessment and selection of school lunch suppliers.
- This study preliminarily developed the hierarchical dimensions and assessment factors/indices based on literature review, and used them to develop the revised Delphi method questionnaire. This study conducted two rounds of revised Delphi method questionnaire survey where experts and scholars were enrolled. The dimensions of hierarchical structure, assessment criteria, and questionnaire items were not confirmed until the subjects reached consistent consensus.

Results and Discussion

Table1. Results of the revised Delphi method questionnaire survey on main criteria

Indices of References	Results of Round 1 Revised Delphi Method Questionnaire	Results of Round 2 Revised Delphi Method Questionnaire
Investigation on operating meaning of supplier	Supplier's operating capacity	Supplier's operating capacity
Management of health and safety of food	Health management of food	Health management of food
Hardware equipment repair of kitchen	Management of kitchen equipment	Management of kitchen equipment
Nutritional standards of school lunch	Adjustment of nutritional quality	Adjustment of nutritional quality
Unexpected situation of food poisoning	Crisis response capacity	Crisis response capacity
Indices of school effectiveness assessment	Past contract performance	Experts suggested the inclusion of this index into supplier's operating capacity

This study mainly performed in-depth investigations on the issues of assessment and selection of school lunch suppliers of junior high schools, and used revised Delphi method to understand the factors affecting the assessment model.

After two rounds of revised Delphi method questionnaire survey, this study enabled the experts to reach consensus by revising the dimensions according to experts' opinions. The 6 assessment

dimensions (supplier’s operating capacity, health management of food, management of kitchen equipment, adjustment of nutritional quality, and crisis response capacity, past contract performance) of main criteria of the original references were revised as 5 assessment criteria (supplier’s operating capacity, health management of food, management of kitchen equipment, adjustment of nutritional quality, and crisis response capacity) according to experts’ opinions, as shown in Table 1.

After two rounds of revised Delphi method questionnaire survey, the criteria were revised according to experts’ opinions. The experts’ consensus was reached, and the criteria for assessment and indices of school lunch suppliers of junior high schools were developed, as shown in Table 2.

Table2. Results of the Revised Delphi Method Questionnaire Survey

Hierarchy 1	Hierarchy 2	Hierarchy 3
Goal	Main Criteria	Sub-criteria
To develop the assessment and selection model for school lunch suppliers of junior high schools	Supplier’s operating capacity	1 Company organization and scale
		2 Professional licenses
		3 Supplier’s excellent performance certificate
		4 CVS within the recent 3 years
	Health management of food	1 Transport and supply plan
		2 Goods inspection capacity
		3 Health of food manufacture
	Management of kitchen equipment	1 Boiler maintenance
		2 Regular environmental disinfection
		3 Tableware and cart repair
		4 Waste disposal
	Adjustment of nutritional quality	1 Meeting nutritional needs
		2 Diversified menu design
		3 Promotion of nutrition education
	Crisis response capacity	1 Emergency handling
2 Ingredient shortage handling		
3 Food poisoning handling		

CONCLUSION

This study provided an overall description on the research results of the assessment and selection of school lunch suppliers of junior high schools, and proposed the conclusions according to the research purposes, results, and discussions as basis for school administrative units to use a suitable and rational assessment and selection model to select school lunch suppliers. The research conclusions are as follows:

This study summarized 5 major dimensions: (1) supplier’s operating capacity, (2) health management of food, (3) management of kitchen equipment, (4) adjustment of nutritional quality, and (5) crisis response capacity.

Among the 5 major dimensions, the order of factors is as follows: (1) health management of food, (2) adjustment of nutritional quality, (3) crisis response capacity, (4) supplier’s operating capacity, and (5) management of kitchen equipment.

Among the 5 major dimensions, the most important factors are as follows:

- Supplier’s operating capacity: A professional licenses
- Health management of food: B health of food manufacture
- Management of kitchen equipment: C regular environmental disinfection
- Adjustment of nutritional quality: D meeting nutritional needs
- Crisis response capacity: E food poisoning handling

In terms of the order of overall assessment and selection model for school lunch suppliers of junior high schools, the order of importance of top 10 is:

- Health of food manufacture
- Goods inspection capacity

- Transport and supply plan
- Meeting nutritional needs
- Food poisoning handling
- Emergency handling
- Professional licenses
- Diversified menu design
- Regular environmental disinfection
- Boiler maintenance.

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