

Conference Paper

Design and Evaluation of Innovative Consumer-oriented Kitchens

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Abstract

From the industrialization trends of the nineteenth century to the cyberization trends of the twenty-first, life has become increasingly more fast-paced. The working hours of the average person in Taiwan have reached record highs, which has drastically reduced the time available to cook at home. Dining out is now very common in the daily diet, but frequent dining out has resulted in more people developing metabolic syndrome, which has become a plague in modern people. Furthermore, food scandals have been a regular occurrence in recent years. All of the aforementioned factors have reminded people to reflect on and check their dietary habits, as well as to pursue a healthy diet as the current trend. This trend also involves consumers pushing for improvements to kitchen efficiency. Therefore, this study first analyzes key design factors of ergonomics, the application of smart electric household appliances, and traffic flow planning. The research into innovative kitchen designs conducted through Importance-Performance Analysis shows that consumers' preferences are in the following order: Design F, Design D, Design W, Design C, Design B, and then Design A. The investigation, which was thoroughly conducted based on Miryoku Engineering, the Evaluation Grid Method, and Importance-Performance Analysis, has found that Design F is No. 1 among consumers' preferences. Design F clearly conforms to the following characteristics: improvement of quality of life, user friendly, and sufficient countertop space for preparation, cooking, and cleaning. All these characteristics are highly valued by consumers. Therefore, Design F can serve as a reference for kitchen designers aiming to create related innovative kitchen designs in the future.

Keywords: dietary habits, kitchen design, lifestyle

1. Introduction

The kitchen is to the part of the home used for cooking meals. That main function has not changed since ancient times, but its frequency of utilization, hours, and method of use has all gradually evolved with time. For example, Taiwan's economy gradually began transforming from an agricultural society to an industrial one fifty years ago. Previously, all meals were eaten in the home, but the dietary habits have been affected by the development of industry, increased work hours, and the rise of dual-income

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families. The increased frequency of dining out demonstrates that people are choosing to have meals out quite a lot, and the time spent cooking and the types of dishes enjoyed at home are not as popular as dining out. Dining out is convenient, but it can lead to health problems. As the restaurant industry is booming, diets have become more selective. Dining out is generally for young people, who have almost all meals out; while these young people are still in their development period and most of them in school, such habits can easily cause a food imbalance [1]. Furthermore, the majority of food eaten outside the home has more oil and salt, which has increased the number of chronic diseases every year, with the so-called metabolic syndrome showing a marked increase. Metabolic syndrome has become a modern plague.

Based on this environment, designers have thoroughly discussed how kitchen users can simplify the food cooking process and enhance the added value created by kitchen integration. After understanding the characteristics of Taiwanese ingredients and the requirements for system cooking utensils, the cooking utensil plan & design was innovated to meet the requirements of double-income families and consumer groups pursuing food safety. In summary, the designers established an advantageous model that combined design innovation with function, convenience, and practicality to provide related research foundations with a potential cooking utensil system design. Therefore, the purpose of this study is to integrate design and innovation through "charm engineering EGM" to create a functional, convenient, and practical cooking utensil system.

2. Literature Review

In this study, cooking utensils refers to the following three areas: kitchen furniture, kitchen equipment, and kitchen facilities. Kitchen furniture includes cooking and storage functions, such as cooking countertops, high cabinets, hanging cabinets, base cabinets, etc. Kitchen equipment consists of the equipment used in the cooking process, such as gas stoves, ventilators, refrigerators, dishwashers, microwave ovens, wash basins, etc. Kitchen facilities refer to the water, electricity, gas, and exhaust pipes, as well as other pipelines used during cooking.

Mentioned that the kitchen is one of the most difficult to design spaces within a residential space [2]. The main reason is because kitchen equipment, appliances, worktops, storage space, etc. all need to go through an integral design and combination in order to completely present a consistent vision and function. As a result of this, the selection of materials, the setting & positioning of function, and the operators' usage habits are all factors that must be considered in kitchen design. Furthermore,

the distance from the kitchen to the home's entrance, dining room, and bathroom should not be far so that users do not have to go far to sort out the ingredient storage, and thus the meal line can be shortened. Therefore, the kitchen and dining room can generally be planned together [3].

Since the kitchen space no longer has just a single function and due to the changes in demands and trends, the kitchen space and other spaces linked to the kitchen space to open the degree of distinction can be divided into three categories: the open kitchen, the semi-open kitchen, and the closed kitchen [4]. The so-called open kitchen features the dining table within the kitchen, namely the pattern of the kitchen and the dining room [5]. In this kind of space, it is practical to do the overall planning for the kitchen, dining room, and living room, while expanding storage space and strengthening space function.

Based on the working triangle concept, proposed dividing the kitchen into the alley type [6], single wall type, U-type, L-type, and G-type. Likewise, suggested classifying kitchen type according to the shape of the countertop space, namely alley type, strip type, L-type, U-type, and G-type [7].

The actions performed in the kitchen include preparation of ingredients, cleaning, cooking, and maintenance (Chen, Ming-Shih, 2009). When a user carries out any of these behaviors, which constitute kinetonema in the kitchen, smooth kinetonema affects the mental state of kitchen users. The low repeatability of cooking kinetonema can make the user feel more relaxed, and the location of kitchen equipment and planning of the kitchen operation line are closely related. According to a study by Cho, Yu-Kai (2015), the user's body size, movement range, gravity, etc. must first be confirmed. Interior design can be performed once the ergonomic research is confirmed from the operational point of view. The residential kitchen is vital for home life, especially with regard to ergonomic applications. Despite the size of a kitchen, the body size, operational behavior patterns, etc. need to be analyzed to determine the size of the kitchen application space and the demand for equipment and to ultimately meet people's needs for timesaving, comfort, and ease of operation in accordance with a clear understanding of the required equipment, furniture, activity patterns and frequency, hours of use, and other elements.

3. Research Design and Methods

3.1. Stages of research

In this study, we conducted in-depth interviews with consumers and system kitchenware experts from different professional backgrounds, focuses, and basic attributes about their degree of preference for the work. Prior to the interviews, pictures of commercially available cooking utensils (Table 2) were prepared for the respondents to view. In this study, the main key design elements are ergonomics, use of intelligent household electrical appliances, and kinetionema planning, among others. We adopted a test sample as the selection method for contract design with builders around Taiwan needing a large number of cooking utensils. In the selection process, the benchmark is to let cooking utensils get close to the overall system. The samples are also common system cooking utensils on the market with few changes to materials and modeling.

Our study included a total of 16 respondents aged between 25 and 60 years old for this interview, including senior kitchen designers, the director of an interior design business association, cooking utensils sales staff, other experts and scholars, and 10 consumers. The original evaluation project is obtained through the interview structure and picture data, and then, based on that, the respondents are asked to describe the specific issues in an objective way, that is, the so-called subordinate concept, as well as more abstract value judgments, that is, the upper seat concept. In this paper, we hope to evaluate the cooking utensils by discussing the works and perform analysis and reach a conclusion based on the study characteristics of the evaluation method. Finally, based on the analysis results, we were able to determine a design and innovation of the overall cooking utensil system.

We synthesized the interview data and summarized the "original reasons" that attracted the respondents; then we asked the respondents about the specific items and abstract reasons with regard to the overall cooking utensils and design innovation. Based on the above, we were able to construct the EGM evaluation structure map (Figure 2) to present the design charm factor of overall cooking utensil systems.

Following the in-depth interviews with the specific respondents, by discussing and concluding the evaluation structure method of the charm factor, we determined the original charming and distinguishing features of cooking utensils in the house kitchen space to be the following: speedy meals, quick cooking; frozen and fresh ingredients; variety of dishes; cleanliness and air quality; shorter working hours; operating procedures; furnace sitting; water and electricity pipelines; ergonomics; and quality of family life.



Figure 1: Research Card Set of Cooking Utensil Systems.



Figure 2: Evaluation structure map.

Based on the evaluation structure map, with regard to the importance of speedy meals and quick cooking within innovative cooking utensil design, the most important five key points for the respondents are as follows: procuring a large number of ingredients and preparation; multi-functional household appliance integration, including steam oven, oven, microwave, coffee machine, and so on; appearance, shape, and color; overall space planning; and dishwasher, washing machine, and vacuum cleaner. The first few elements made the list due to the abstract reasons of convenience, speed, multi-function, efficiency, and safety. Therefore, this study will carry out Importance-Performance Analysis of the discussed charm factors to be the creation basis for innovative cooking utensil designs.

We carried out summarization and analysis according to the research characteristics of the EGM evaluation structure method. The Importance-Performance Questionnaire Survey (TABLE 1.) was developed based on the EGM evaluation structure map and is summarized according to the in-depth interviews. In ascending order, the degree of importance is: 1. Very unimportant; 2. Unimportant; 3. No comment; 4. Important; and 5. Very important.

TABLE 1: Importance-Performance Questionnaire Survey.

No.	Question
1.	How important is a cooking utensil design that provides quick cooking and a variety of dishes?
2.	How important is a cooking utensil design that provides a large number of ingredient procurement and preparation and frozen and fresh ingredients?
3.	How important is an interworking cooking utensil design that is equipped with a variety of high-performance cooking appliances and functional cleaning appliances?
4.	How important is a cooking utensil design that provides enough storage space, table for preparation, and washing section?
5.	How important is a cooking utensil design that provides safety, planning, and completeness of the hydroelectric pipeline?
6.	How important is a cooking utensil design that provide materials that are easy to clean?
7.	How important is a cooking utensil design that improves quality of life and is user-friendly?
8.	How important is a cooking utensil design that provides good air quality and a comfortable indoor temperature?
9.	How important is a cooking utensil design that provides with beautiful modelling, reasonable kinetonema, and overall space color system match-up and lighting?
10.	How important is it for a cooking utensil design to be based on the user's current electrical equipment budget and reserve the future expansion of house appliance procurement?

Furthermore, according to the EGM evaluation structure map, the satisfactory performance questionnaire is shown in TABLE 2. In ascending disorder, the degree of satisfaction is: 1. Very dissatisfied, 2. Dissatisfied, 3. No comment, 4. Satisfied, 5. Very satisfied.

TABLE 2: Importance-Performance Questionnaire Survey.

No.	Question
1.	How important is a cooking utensil design that provides quick cooking and a variety of dishes?
2.	How important is a cooking utensil design that provides a large number of ingredients procurement and preparation and fresh and frozen ingredients?
3.	How important is an interworking cooking utensil design that is equipped with a variety of high-performance cooking appliances and functional cleaning appliances?
4.	How important is a cooking utensil design that provides enough storage, table for preparation, and washing section?
5.	How important is a cooking utensil design that provides safety, planning, and completeness of the hydroelectric pipeline?
6.	How important is a cooking utensil design that provides materials that is easy to clean?
7.	How important is a cooking utensil design that improves quality of life and is user-friendly?
8.	How important is a cooking utensil design that provides good air quality and a comfortable indoor temperature?
9.	How important is a cooking utensil design that provides beautiful modelling, reasonable kinetonema, and an overall space color system match-up and lighting?
10.	How important is it for a cooking utensil design to be based on the user's current electrical equipment budget and reserve the future expansion of house appliance procurement?

The data results of this questionnaire was effectively collected from 52 effective respondents. The consumers consider the importance of the overall properties and specific evaluation of the performance (satisfaction) in evaluating innovative cooking utensils and then give preferences for innovative cooking utensils (TABLE 3.).

3.2. Design works series of overall cooking utensil systems

The overall cooking utensil system designs are design A, design B, design C, design D, design E, and design F, as shown in TABLE 4.

TABLE 3: Importance-Performance Analysis.

	Importance (M=4.53)	Order of Importance
How important is a cooking utensil design that provides quick cooking and a variety of dishes?	4.36	8
How important is a cooking utensil design that provides a large number of ingredient procurement and preparation and fresh and frozen ingredients?	4.44	6
How important is an interworking cooking utensil design that is equipped with a variety of high-performance cooking appliances and functional cleaning appliances?	4.34	9
How important is a cooking utensil design that provides enough storage, table for preparation, and washing section?	4.73	2
How important is a cooking utensil design that provides safety, planning, and completeness of the hydroelectric pipeline?	4.69	3
How important is a cooking utensil design that provides materials that are easy to clean?	4.84	1
How important is a cooking utensil design that improves quality of life and is user-friendly?	4.55	4
How important is a cooking utensil design that provides good air quality and a comfortable indoor temperature?	4.53	5
How important is a cooking utensil design that provides beautiful modelling, reasonable kinetonema, and an overall space color system match-up and lighting?	4.44	6
How important is it for a cooking utensil design to be based on the user's current electrical equipment budget and reserve the future expansion of house appliance procurement?	4.40	7

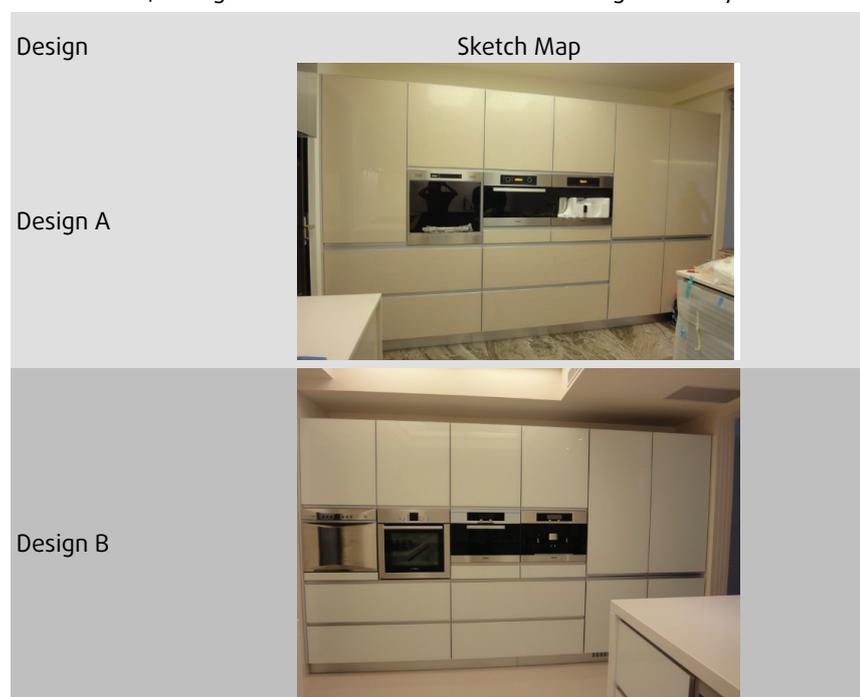
3.3. IPA performance analysis of overall cooking utensil system design works

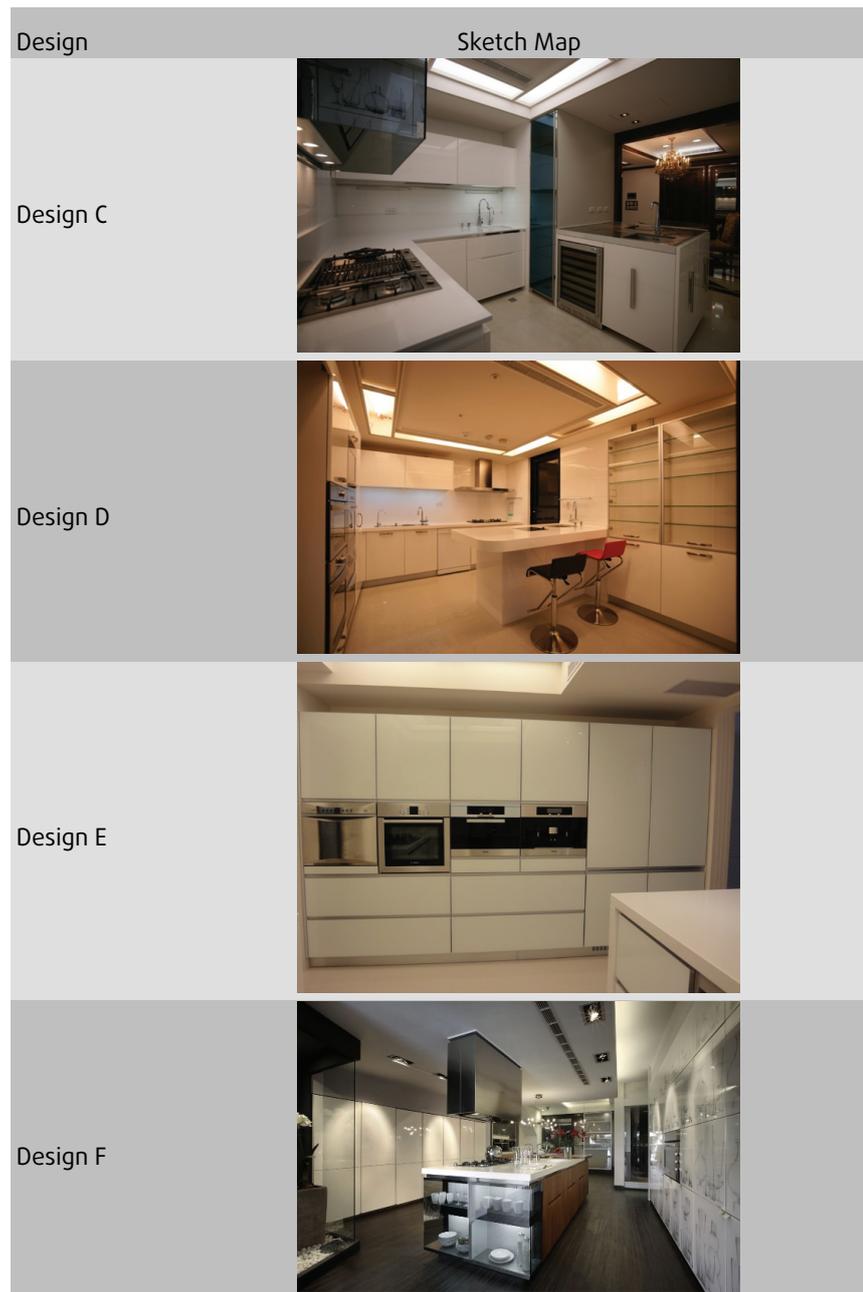
The IPA performance analysis of the overall cooking utensil system design works of design A, design B, design C, design D, design E, and design F is shown in Fig.3.

The results of the Importance-Performance Analysis (TABLE 5.) present the kitchen design principles to which consumers attach the greatest importance, starting with materials that are easy to clean, followed by enough storage, table for preparation, and washing section; safety, planning, and completeness of the hydroelectric pipeline; improving quality of life and being user-friendly; good air quality and a comfortable indoor temperature; beautiful modelling (reasonable kinetonema and an overall space color system match-up and lighting); a large number of ingredients procurement and preparation; fresh and frozen ingredients; being based on the user's current electrical

equipment budget and reserving the future expansion of house appliance procurement; quick cooking and a variety of dishes; and interworking of a variety of high-performance cooking appliances and ;functional cleaning appliances. Analyzing the aforementioned six sets of innovative works and comparing the innovative design principles guided from the results of the performance analysis, our results meet the innovative design principles. Q.1:This creation has the characteristics of fast cooking and a variety of dishes; Q.2:This creation has the characteristics of procuring a large number of ingredients and preparation and fresh and frozen ingredients; Q.3:This creation has an interworking cooking utensil design that is equipped with a variety of high-performance cooking appliances and functional cleaning appliances;Q.4:This creation has the characteristics of enough storage, table for preparation, and washing section;Q.5:This creation has the characteristics of safety, planning, and completeness of the hydroelectric pipeline;Q.6:This creation has the characteristic of materials that are easy to clean;Q.7:This creation has the characteristics of improving quality of life and being user-friendly;Q.8:This creation has the characteristics of good air quality and a comfortable indoor temperature;Q.9:This creation has the characteristics of beautiful modelling, reasonable kinetonema, and an overall space color system match-up and lighting;Q.10:This creation has the characteristics of being based on the user’s current electrical equipment budget and reserving the future expansion of house appliance procurement;Q.11:The degree of preference for you to own this work and install it in your own home (TABLE 5).

TABLE 4: Design Works Series of the Overall Cooking Utensil Systems.





4. Conclusion

This study provided 11 characteristic issues, and our investigation into the innovative kitchen designs conducted through the Importance-Performance Analysis shows the consumers ranked the designs in the following order: Design F, Design D, Design E, Design C, Design B, and Design A. According to the Importance-Performance Analysis method, the characteristics of improving quality of life and sufficient countertop space for preparation, cooking, and cleaning, mostly belong to the advantage maintenance

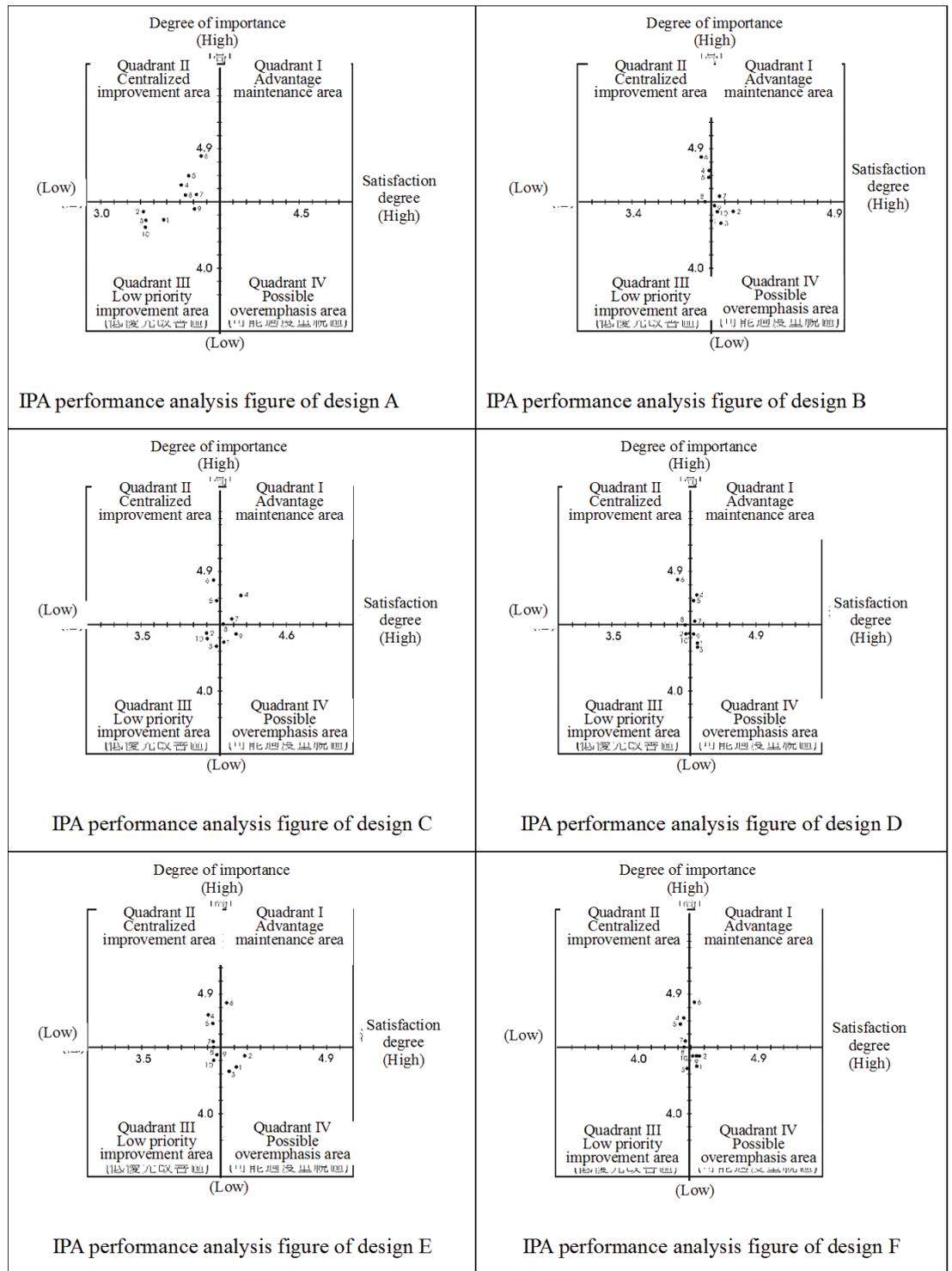


Figure 3: IPA Performance Analysis of Overall Cooking Utensil System Design Works.

area. We confirmed that these three characteristics are advantages of an innovative

TABLE 5: Analysis of Innovative Works.

	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Q.9	Q.10	Q.11
Order of Importance	8	6	9	2	3	1	4	5	6	7	Order of preference
Design A	3.48	3.32	3.44	3.61	3.67	3.76	3.73	3.65	3.71	3.34	3.36/6
Design B	4.01	4.17	4.07	4.0	4.0	3.92	4.07	3.96	4.03	3.90	3.86/5
Design C	4.13	4.0	4.09	4.25	4.09	4.05	4.19	4.13	4.21	4.01	3.96/4
Design D	4.46	4.38	4.46	4.46	4.42	4.30	4.44	4.38	4.42	4.40	4.34/2
Design E	4.21	4.28	4.15	4.01	4.03	4.13	4.05	4.05	4.07	4.05	4.01/3
Design F	4.44	4.46	4.38	4.36	4.32	4.42	4.34	4.36	4.44	4.40	4.38/1

cooking utensil design. The characteristics of materials that are easy to clean, improving quality of life, being user-friendly, good air quality and a comfortable indoor temperature all belong to the centralized improvement area and low priority improvement area, which should be handled first.

Through the investigation thoroughly conducted based on Miryoku Engineering, the Evaluation Grid Method, and Importance-Performance Analysis, we have found that Design F is consumers' number one preference. Design F clearly conforms to the following characteristics: improving quality of life, being user-friendly, and sufficient countertop space for preparation, cooking, and cleaning. All these characteristics are largely desired by consumers. Design F can serve as a reference and direction, as well as provide future creative designers with design reference for innovating cooking utensils. Following the in-depth research and discussion of this series of innovative cooking utensils, we hope that the design ability of innovation can be improved, resulting in more varieties of innovative cooking utensils and more vigorous development.

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