

Exploring crucial features of Kansei hybrid cuisine design: Rough set approach

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ABSTRACT

This paper proposes a solution framework to explore the crucial features of Kansei hybrid cuisine design—an innovative culinary formation with favorable elements of Kaiseki and Hakka foods. Sixteen features of two different cuisines are identified by Kansei engineering technique; the identified features are then mined by rough set theory approach. A pilot example is tested against four representative groups of customers. Preliminary results show that “dishes serving order” is regarded as a crucial feature for status-oriented consumers group, suggesting that this group may view the Hakka-Kaiseki hybrid cuisines as “ceremony” rather than just eating. Moreover, the convenience-oriented consumers group attributes “salty” as a crucial feature, which, in contrast, cannot be accepted by the personalizing consumers group. Hence, the chefs may offer light-flavor hybrid cuisines along with separated sauces to satisfy both groups of customers. The proposed solution framework can serve as a useful tool to innovate on the local foods as tourism destination enablers.

Keywords: Hakka food, hybrid cuisine design, Kansei engineering, Kaiseki cuisine, Rough set theory

1. Introduction

Local gourmet foods often serve as destination marketing enablers because appealing cuisines can be a major component of cultural explorations. This is why many tourism organizations view restaurants as an essential indication about how well the local gourmet foods are experienced in a destination. Moreover, numerous annual gourmet food fairs and festivals are taking place around the world, wherein

innovative hybrid cuisines and traditional local foods are offered to attract a flock of tourists from domestic and overseas. In Taiwan, the Tourism Bureau recently proclaimed that Taiwanese cuisine has great potential for tourism development, as it is the main attraction for overseas tourists. The Council for Economic Planning and Development launched a Gourmet Taiwan International Action Program (GTIAP) in May 2010. It aimed to internationalize Taiwanese cuisines and the restaurant industry has been listed as one of the ten major hospitality industries since then. GTIAP had three main objectives—boosting the global competitiveness of Taiwanese restaurant industry, then flourishing the Taiwan tourism, and ultimately increasing the tourism destination attraction. Localized internationalization and internationalized localization are the two key strategic directions. The former highlighted the issue of how to enrich the attraction of local restaurants for overseas tourists; whereas the latter stressed the concern of how to enhance the capability of local Taiwanese restaurants in opening new stores overseas. Regardless of which directions, here arises a challenging issue of how to create “Kansei” cuisines by either combining the most favorable features of local and some renowned international cuisines or innovating the conventional local cuisines in such a way to catch the tourists’ attractions toward an ultimate goal of increasing the global competitiveness of Taiwanese tourism industry.

“Kansei” is a Japanese word meaning aesthetics. It refers to as such positive emotion or feeling as happiness, contentment, love and pride [1]. Specifically, Kansei represents the impressions that somebody gets from a certain artifact, environment or situation by his/her senses of sight, hearing, smell, taste, touch, or cognition. With all the impressions experienced, a complex mind pattern is formed and stored in the brain and thereby building the foundation for human behavior [2]. By this definition, a Kansei cuisine must contain some essential features or elements, which can attract people, touch their hearts, and impress them with sensory stimuli. Normally, shape, color and material are the three fundamental Kansei elements for any

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artifact. However, for *Kansei* cuisines, the essential elements may be much more important because people can be impressed not only by the food itself, but also by the elegant arrangement of the dishes or courses matching with beautiful utensils, and even more, by the ambiance and *décor* of the background environment while enjoying the cuisines.

Kansei Engineering (KE), a technique to transform human imaginations and sensitivity into physically design elements in order to induce such feelings as beautifulness, comfort, happiness, and passions about a product [3], has been used to deal with a wide spectrum of disciplines ranging from ergonomics to psychology [4-6]. KE can decompose and extract *Kansei* elements of desired goods in order to perform *Kansei* products to attract consumers to purchase; thus, it is particularly useful for new product design or old product renovations. Hsiao et al. [7] noted that customers usually obtain their first impression of a product from visual stimuli (e.g., shape, color, and material) and that if these three stimuli are well coordinated the product is much more appreciated. Moreover, Chen and Chang [8] remarked that the product form can play a critical role in determining the commercial success because a consumer's psychological perception of a product is significantly influenced by its aesthetics. This is also true for the cuisine choices affected by food appearance factors [9]. Hence, *Kansei* cuisine design necessitates building in some essential *Kansei* elements in order to grasp tourists' stomachs, touch their hearts and impress their visual stimuli.

In the past, a considerable number of studies have addressed the significance of food on tourism destination. These studies have discussed such issues as tourism destination competitiveness, tourist destination selection, tourist decision-making process and food as destination marketing enablers; however, few have highlighted the issue of how to incorporate international cuisine into local gastronomy to develop innovative hybrid gourmets. The task of incorporating international cuisine into local gastronomy to create a new *Kansei* cuisine is a challenging issue because it involves at least two major critical concerns. First, the hybrid cuisine must eventually own its reputation or word of mouth to attract a whole flock of tourists. In order for the hybrid cuisine design to induce *Kansei* feelings, it is presumed that KE could be useful to help transfer human perceptions, emotional feelings and mental images into a tangible food and intangible service. Second, the hybrid cuisine may comprise a number of complex features adopted from international and local gastronomies. Some of the features can be imprecise or vague, which are difficult to solve.

Rough set theory (RST), originally introduced by Pawlak [10], is an excellent tool for dimension reduction in qualitative analysis. It is a useful data mining technique to deal with imprecise or vague concepts. Therefore, it is presumed that RST could be useful to help simplify the set of complex, vague attributes involved in hybrid *Kansei* cuisine design.

In light of this, the objective of this study is to propose a solution framework for hybrid *Kansei* cuisine design by using KE and RST approaches to explore the essential elements of the innovative cuisines. To demonstrate the proposed solution framework, a pilot example of "Hakka-Kaiseki" hybrid gourmet design is presented, in which Hakka food is one of the Chinese cuisines, known as its fatty, salty and savory; whereas Kaiseki cuisine is one of the Japanese cuisines, famous as its light flavor, elegant utensils and artistic arrangement. The rest of this paper is organized as follows. In section 2, some relevant literature is reviewed and the determinants of Hakka-Kaiseki hybrid cuisine are identified. In section 3, the proposed solution framework is presented. In section 4, a pilot example of the essential elements for developing Hakka-Kaiseki hybrid cuisine is demonstrated. Preliminary practical implications and more future challenges are discussed in section 5.

2. Determinants of hybrid cuisines

2.1 The tourists' perspectives

Food is an important reason for traveling, as well as an essential source of tourist satisfaction. In fact, food has many roles to play for tourists. For instance, it is functional for sustaining life; it is entertaining; it is a way of experiencing new cultures and countries; and it is part of a travel experience. In tourism context, food may affect destination image, tourist decision-making, tourist destination selection, and ultimately, tourism destination competitiveness. Many food tourists aim at food tasting and experiencing by visiting food exhibitions, food festivals, restaurants and specific locations. The destinations need to capitalize on foods in order to create their own cultural capital. This is because many tourists, particularly the food tourists, normally have the desire for new tastes, knowledge and concepts.

For the purpose of using foods as destination enablers, it is important to grasp imperative variables that affect tourists' food destination choices. Today, many countries are actively promoting their local foods in order to enhance their tourism destination competitiveness. Although local

foods are often emphasized with a story package, consisting of its cultural history, cooking traditions and special ingredients, it is required to continually evolve to be more competitive and attractive. From destination marketing perspective, no matter how the local food is evolved, the key point is whether it possesses competitive attraction that can appeal and satisfy the domestic and overseas tourists.

In the globalization context, a successful local food requires evolution and innovation, and one of the most effective means is through incorporating international cuisines into local gastronomy. Because international cuisine often possesses the brand effect, more famous and stronger than the local food, it is beneficial to develop a hybrid cuisine by ways of using local gastronomy, ingredients, and culture as the inputs, while employing the best features of an international cuisine as the outputs. For instance, when planning or designing a *Kansei* hybrid cuisine, named “Hakka-Kaiseki gourmet” as the tourism destination enablers, one requires seizing on the features of both Hakka food and Kaiseki cuisine. In order to sustain the uniqueness of local eating culture with fresh, seasonal materials in easy reach, it is reasonable to develop such a Hakka-Kaiseki hybrid cuisine by taking the traditional gastronomy and ingredients of Hakka food as the inputs and the most favorable features of Kaiseki cuisine as the outputs. However, no local food has been completely keeping its original form—the ingredients and/or culinary arts are always altering to cope with the change of lifestyles as well as the taste of new immigrants or tourists.

2.2 Hakka food versus Kaiseki cuisine

The Hakka food is one of famous Chinese cuisines. In early times during the southward migration, the Hakka people in southern China (including Taiwan) needed to carry and preserve food; therefore, they developed various pickling techniques. Salted foods like salted pork and fish, pickled vegetables, brewers’ grains, pickled taros, and pickled radish were very common on the dining table. Moreover, to overcome the hurdle of deficiencies in environment, the Hakka people had to work harder than other people (such as Han) to survive. Their principal concern was simply having enough to eat, but the materials had to be in easy reach and low-cost—primarily local vegetables and meats. As their lives required substantial physical labor, the Hakka people needed and were accustomed to relatively higher fat and more salt. Therefore, when compared with other people’ foods in China, the Hakka food was characterized by relatively parsimonious, fatty, and salty. Figure 1 presents three typical Hakka dishes. Notice that pork, dried seafood such as squid, and pickled vegetables are important ingredients for various Hakka dishes. Nowadays, more people are concerned about their health and they start to watch their diets and lifestyles. It is no exception for the Hakka food, which has been gradually changing into less fatty, lighter flavor. It requires incessantly improvement by incorporating the most favorable features of exotic exquisite cuisines into the local flavor to better accommodate the changing lifestyle as well as the tastes of tourists.



Figure 1. Illustration of popular Hakka food

2.3 *Kansei* Engineering (KE)

The Kaiseki cuisine, on the other hand, is one of the most famous Japanese haute cuisines. It is a multi-course set dinner originated in the sixteenth

century and created as a frugal meal to fight off the hunger discomforts of those attending the tea ceremony. Its philosophy is still rooted in the Buddhist idea of simplicity, thus the Kaiseki cuisine usually comprises only a bowl of miso soup with

three small side dishes served in a simple, tatami-matted room. There is a set of aesthetics and principles that help define the preparation, order of Kaiseki dishes and serving, including the type and look of utensils. These principles have evolved over the centuries to maximize the sensory stimuli. The majority of Kaiseki restaurants offer both private and shared rooms for their guests and the décor is always very simple—often one artwork with a beautiful flower arrangement underneath—both chosen to capture the mood of the season and the food. However, multifaceted Kaiseki rules have been evolved to enable the chefs to create tasty sets of meals with tiny courses, which can capture the feelings of natural world in ways that ensure the taste, texture, appearance, smell and color of the food evoking the seasons. To this end, only fresh seasonal ingredients are used aiming to enhance their flavor. Local ingredients are often included as well. Finished dishes are carefully presented on plates that are chosen to enhance both the appearance and the seasonal theme of the meal.

Dishes are elegantly arranged and garnished, often with real leaves and flowers, as well as edible garnishes designed to resemble natural plants and animals. As the guests started the Kaiseki meal, they could either envisage the calligraphy arts with accompanying real flower arrangement or gaze on to a tiny garden. Figure 2 demonstrates the typical Kaiseki cuisine and its eating ambiance. Today, many Kaiseki restaurants are changing to be more Western in décor. It has evolved to include more luxury food including appetizer, sashimi (raw fish), simmered dish, grilled dish, steamed course, and other dishes at the discretion of the chefs. During a Kaiseki dinner, the guests often take time to appreciate every aspect of the meal—from the sheer beauty of each dish to the sensual feel of the carefully selected utensils (e.g., porcelain, lacquer ware and glass). Consequently, Kaiseki cuisine nowadays is thought as the ultimate gourmet lifestyle experience and among the finest in luxury Japanese haute cuisine.

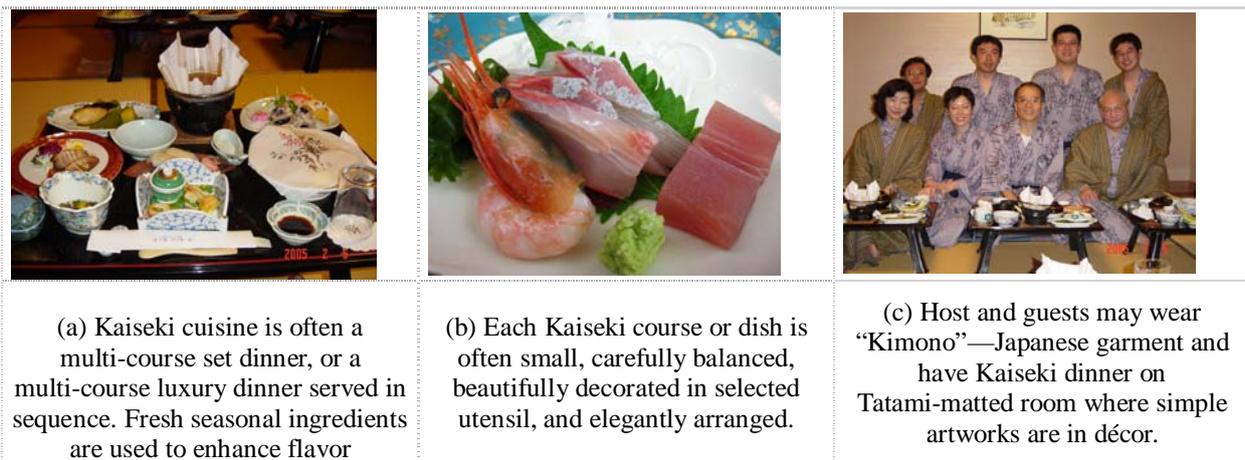


Figure 2. Illustration of Kaiseki cuisine and its eating ambiance

2.3 Targeted customers for hybrid cuisines

Market segmentation is to segment customers into significant sub-groups that are measurable, accessible and profitable. Market targeting is to select segmented customers that marketers intend to promote the products and services. Product positioning is to make products and services distinct and valuable for appealing to the targeted customers. In this sense, market segmentation is to ensure who potential customers of the Hakka-Kaiseki cuisines are. Berman and Evans [11] identified five types of customers, including Economic consumers whose major concern is price; Status-oriented consumers who are more interested in a symbolic benefit (e.g.,

the prestige of a brand, the received service) than in price; Assortment-oriented consumers who are looking for experiential purchases with variety; Personalizing consumers who prefer to shop at familiar stores to seek personal relationships with the employees; and Convenience-oriented consumers who are mainly concerned with functional benefits such as location and hours of operations. Moreover, Myung et al. [12] identified eight types of purchasers, including Extended purchasers who rely on logical criteria and functional reasons; Symbolic purchasers who highlight social approval; Repetitive purchasers who make a routine purchase because of loyalty to certain sellers; Hedonic purchasers who pay for

favor things; Exploratory purchasers who pay for curiosity or variety; promotional purchasers who pay for on sale; Impulsive purchasers who buy things just on impulse; and Casual purchasers who buy things just as it happens. To decide who will be targeted for the Hakka-Kaiseki hybrid cuisines, one may adopt customer types of Berman and Evans [11] rather than those of Myung et al. [12] because the former is more accessible and simpler than the latter. In this study, among the five types of customers identified by Berman and Evans [11], apart from Economic consumers, the rest will be used as targeted tourists.

2.4 Potential features for Hakka-Kaiseki cuisine design

To determining the product positioning, it is required to realize what determinants make the Hakka-Kaiseki cuisines acceptable and attractive. Apart from the basic Kansei elements, we need to grasp the essential features of both Hakka and Kaiseki gastronomy. As mentioned, conventional Hakka food is regarded as high fat, salty and savory, while Kaiseki cuisine is known as exquisite and light flavor. More importantly, Kaiseki cuisine possesses other important non-food features, including dishes servicing sequence, elegant dishes arrangement, beautiful garnishes, selected utensils, environment decor, lighting, performance shows, music, gardening, etc. Such non-food factors are imperative. This is because that food means more than eating. In fact, food consumption is not just for sustaining life; it is entertaining and a way of experiencing new stimuli. Those non-food elements create added-values. Additionally, several studies have confirmed that meal choice is not merely depend on food itself. For example, Lewis [13] found that food quality is the most important variable, followed by atmosphere, price, and variety of menu. Schroeder [14] reported imperative restaurant choice variables including quality of food, quality of service, ambiance, pricing, menu variety, nutrition, and quantity of food. Clark and Wood [15] also identified important restaurant choice variables including price of food and drink, speed of service, quality of food, friendliness of staff, and range of food choice. Kivela et al. [16] found that when making decisions about future dining choices, consumers care for presentation of food, menu item variety, nutritious food, and food tastiness, freshness, and temperature. Especially, Okumus et al. [17] also claimed that images of food can be used effectively in destination promotion, because food appeals to a wide spectrum of tourists to experience and

communicate the exotic culture with eating. From the above, there are numerous factors that can affect the meal choice. In order to guide the Hakka-Kaiseki cuisine design, this study will focus on 16 attributes including price, three Kansei elements (shape, color, and material), three Hakka features (high fat, salty and savory) and nine Kaiseki features (dishes serving order, elegant dishes arrangement, beautiful garnishes, selected utensils, environment decor, lighting, performance shows, music, gardening).

3. Methodology

3.1 Rough Set Theory

As above-mentioned, the issue incorporating Kaiseki cuisine into Hakka gastronomy to develop a new Kansei Hakka-Kaiseki cuisine involves numerous attributes, ranging from price, Kansei elements, Hakka features and Kaiseki features—some of which are imprecise, vague qualitative variables. In addition, this issue also involves various tourist types, which can be clustered by dissimilar segmentation variables. RST seems appropriate to deal with such an issue because RST is not only a data mining technique but also a soft computing approach. As data mining, RST is good at discovering hidden patterns within the data. As soft computing, on the other hand, RST is proper for solving analytical tasks in qualitative format that involves imprecision, partial truth, and uncertainty.

In RST, any vague attribute is characterized by a pair of precise concepts which can be defined as the lower and upper approximations—the lower approximation is the set of all objects that can be certainly classified by values of attributes; whereas the upper approximation consists of the lower approximation set and the boundary region where objects cannot be completely distinguished. Using the lower and upper approximations of a set, the accuracy and the quality of approximation can be defined [18]. Data mining based on the RST starts from a data table, called information table, which contains data about objects of interest characterized in terms of certain attributes. An information table dividing attributes into condition/explanatory attributes and decision/class attributes is called decision table. By analyzing the decision table, the knowledge hidden in the table can be explored and expressed in the form of decision rules. In practice, however, we often need to cut redundant attributes for better understanding or improved decision-making [19]. It has been found beneficial to implement the following steps: calculating the approximation, finding the reducts of attributes and

the core of attributes, and creating the decision rules with the Covering Index (CI)—a covering ratio indicating the ratio of how many objects with the same attribute value in a class to how many objects belong to that same class [20].

3.2 The proposed solution framework

This paper proposes a solution framework for Kansei cuisine design as shown in Figure 3. The proposed solution framework consists of six steps briefly described as follows.

- Step 1: Defining the research purpose. In this study, the research purpose is to incorporate the features of international and local foods in order to develop innovative Kansei hybrid cuisines. As aforementioned, the local culture and food materials will be the inputs, while the best features of international cuisine will serve as the outputs.
- Step 2: Using the RST approach. It is necessary to conduct essential effort of understanding

the RST, together with choosing suitable RST-based software for use.

- Step 3: Confirming class attributes. It is vital to confirm decision/class attributes based on selected targeted tourists.
- Step 4: Deciding explanatory attributes. As discussed, developing a new Kansei Hakka-Kaiseki cuisine involves attributes ranging from price, Kansei elements, Hakka features and Kaiseki features. It is imperative to decide which features will serve as the condition/explanatory attributes.
- Step 5: Data analysis with the RST. Implementation of data analysis based on the RST requires conducting essential tasks suggested by [21].
- Step 6: Discovering strategic implications. Referring to the analytical results based on the RST, we may uncover hidden knowledge as strategic implications for Kansei cuisine design.

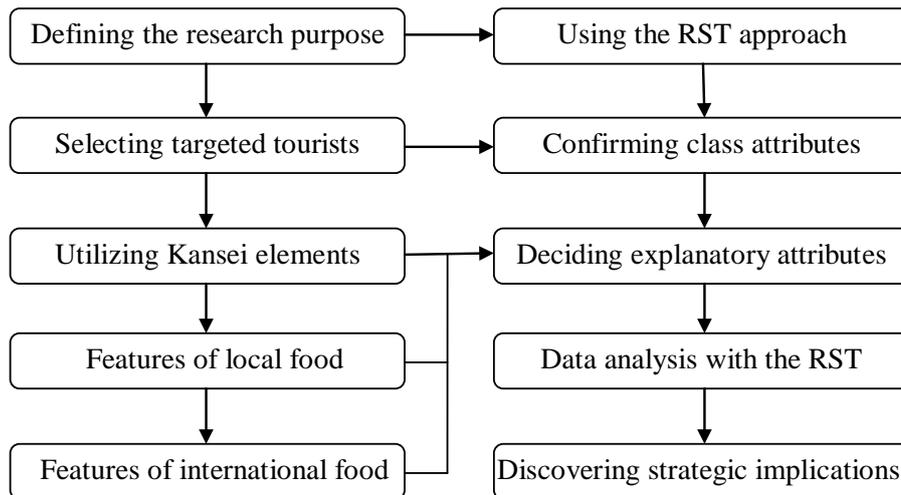


Figure 3. Proposed solution framework for Kansei hybrid cuisine design

4. A pilot example

In order to illustrate the application of the proposed solution framework, a step-by-step procedure for the Hakka-Kaiseki gourmet design is presented below.

Step 1 is to define the research purpose. Here we aim to mingle features of Hakka food and Kaiseki gastronomy, together with the key Kansei elements, in order to create favorable Hakka-Kaiseki cuisines.

Step 2 is to use the RST approach and to choose

the appropriate software for use. Here we employ the software called Rough Sets Data Explorer (ROSE) which implements knowledge discovery techniques based on RST.

Step 3 is to confirm decision/class attributes according to selected targeted tourists. From marketing perspective, prior to new product development, it is required to conduct marketing strategy that consists of market segmentation, targeting and positioning (STP). Among the five types of customers classified by Berman and Evans [11], apart from the economic consumers, the

remaining four types of customers will be regarded as our targeted tourists for the new Hakka-Kaiseki cuisines. Hence, in the following, we use one decision/class attribute (T) with four attribute values—Hereinafter, T1 represents the type of status-oriented consumers, T2 indicates the type of assortment-oriented consumers, T3 stands for the type of personalizing consumers, and T4 corresponds to the type of convenience-oriented consumers.

Step 4 is to decide condition/explanatory attributes for developing the Hakka-Kaiseki cuisines. As discussed above, this study will focus on 16 condition/explanatory attributes, which are hereinafter respectively denoted as price (p1), three Kansei elements—shape (p2), color (p3), and material (p4), three essential Hakka features—high fat (p5), salty (p6) and savory (p7), and nine Kaiseki features—dishes serving order (p8), elegant dishes arrangement (p9), beautiful garnishes (p10), selected utensils (p11), environment décor (p12), lighting (p13), performance shows (p14), music (p15) and gardening (p16). Each of these explanatory attributes (p1~p16) has three attribute values: NI (Not Important), I (Important), and VI (Very Important).

Step 5 is to conduct data analysis. For demonstration purposes, our dataset is based only on 17 selected customers in a Hakka food restaurant located in Hsinchu, Taiwan. The owner of this restaurant is interested in the new Hakka-Kaiseki cuisine design. Of these 17 customers, eight expressed that they stand for status-oriented consumers (T1), four for assortment-oriented consumers (T2), two for personalizing consumers (T3), and three for convenience-oriented consumers (T4). The values of class attribute and explanatory attributes expressed by 17 customers are detailed in Table 1. Based on this dataset, the software ROSE is further applied, generating seven decision rules as shown in Table 2. Lee [22] remarked that a good decision rule should be short in path length (the shorter the better) with high CI value (the higher the better). Accordingly, we elaborate our preliminary findings as follows:

A. Both Rule 1 and Rule 2 apply to the status-oriented consumers (T1). These two rules have the same length but Rule 1 has higher CI value than Rule 2 does. Obviously, Rule 1 (CI=87.50%) is superior to Rule 2 (CI=37.50%). It simply says that 87.50% of the status-oriented consumers (T1)

consider “dishes serving order” (p8) “very important” (VI) for the Hakka-Kaiseki hybrid cuisine design.

B. Both Rule 3 and Rule 4 apply to the assortment-oriented consumers (T2). Rule 3 achieves higher CI (75.00%) than Rule 4 does (CI=25.00%); but Rule 4 has shorter path than Rule 3 does. In other words, neither Rule 3 nor Rule 4 is favorable to elucidate the features of the Hakka-Kaiseki hybrid cuisine design.

C. Rule 5 applies to the personalizing consumers (T3). It says that 100.00% of the personalizing consumers (T3) regard “salty” (p6) “not important” (NI) for the Hakka-Kaiseki hybrid cuisine design.

D. Both Rule 6 and rule 7 apply to the convenience-oriented consumers (T4). These two rules arrive at the same CI values (66.67%), but Rule 6 has a shorter path than Rule 7 does. Therefore, Rule 6 is selected. It says that 66.67% of the convenience-oriented consumers (T4) view “salty” (p6) “important” (I) for the Hakka-Kaiseki hybrid cuisine design.

Finally, step 6 is to discover strategic implications based on the preliminary analytical results. In facing such a problem as 16 explanatory attributes (p1~p16) multiplied by 3 attribute values (VI, I, NI) for 4 types of targeted tourists (T1~T4), one can see how complex this problem is. Nonetheless, based on the preliminary results of step 5, we can easily grasp some valuable clues. For instance, 87.50% of the status-oriented consumers consider that “dishes serving order” is very important; 100.00% of the personalizing consumers think that “salty” not important, but 66.67% of the convenience-oriented consumers regard that “salty” is important. These preliminary findings have provided a good starting point to develop the Hakka-Kaiseki hybrid cuisines.

For example, among the 16 explanatory attributes, the feature of “dishes serving order” should be a MUST build-in element because the status-oriented consumers group may regard the Hakka-Kaiseki cuisine as a “ceremony” rather than just eating. Moreover, the convenience-oriented consumers group attributes “salty” as a crucial feature, which, in contrast, cannot be accepted by the personalizing consumers group. Hence, the chefs may offer light-flavor hybrid cuisines along with separated sauces to satisfy both groups of customers.

Table 1 Values of attributes

| p1 | p2 | p3 | p4 | p5 | p6 | p7 | p8 | p9 | p10 | p11 | p12 | p13 | p14 | p15 | p16 | T |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|----|
| I | NI | VI | NI | I | VI | VI | VI | I | NI | VI | NI | I | VI | VI | VI | T1 |
| NI | I | I | NI | NI | VI | NI | VI | NI | I | I | NI | NI | VI | NI | VI | T1 |
| I | NI | I | I | NI | VI | NI | VI | I | NI | I | I | NI | VI | NI | VI | T1 |
| NI | I | I | NI | NI | VI | NI | I | NI | I | I | NI | NI | VI | NI | I | T2 |
| NI | I | VI | NI | I | VI | VI | VI | NI | I | VI | NI | I | VI | VI | VI | T1 |
| VI | NI | NI | NI | NI | I | VI | I | VI | NI | NI | NI | NI | I | VI | I | T4 |
| NI | VI | I | NI | I | NI | I | NI | NI | VI | I | NI | I | NI | I | NI | T3 |
| I | NI | I | VI | NI | VI | VI | I | I | NI | I | VI | NI | VI | VI | I | T1 |
| I | I | NI | I | NI | VI | NI | NI | I | I | NI | I | NI | VI | NI | NI | T2 |
| VI | I | NI | I | NI | I | NI | I | VI | I | NI | I | NI | I | NI | I | T4 |
| NI | VI | NI | NI | I | VI | NI | I | NI | VI | NI | NI | I | VI | NI | I | T2 |
| NI | I | VI | VI | I | VI | NI | VI | NI | I | VI | VI | I | VI | NI | VI | T1 |
| I | NI | NI | NI | I | VI | NI | I | I | NI | NI | NI | I | VI | NI | I | T4 |
| NI | NI | VI | NI | I | VI | VI | VI | NI | NI | VI | NI | I | VI | VI | VI | T1 |
| VI | I | VI | VI | I | VI | VI | VI | VI | I | VI | VI | I | VI | VI | VI | T1 |
| VI | VI | NI | I | NI | NI | VI | NI | VI | VI | NI | I | NI | NI | VI | NI | T3 |
| NI | VI | I | NI | NI | VI | NI | NI | NI | VI | I | NI | NI | VI | NI | NI | T2 |

Table 2 Decision rules mined by RST

| |
|-------------------------------------------------------------------------|
| Rule 1. (p8 = VI) => (T = 1); [CI= 87.50%] |
| Rule 2. (p4 = VI) => (T = 1); [CI=37.50%] |
| Rule 3. (p1 = NI) & (p7 = NI) & (p8 in {NI, I}) => (T = 2); [CI=75.00%] |
| Rule 4. (p1 = I) & (p8 = NI) => (T = 2); [CI= 25.00%] |
| Rule 5. (p6 = NI) => (T = 3); [CI=100.00%] |
| Rule 6. (p6 = I) => (T = 4); [CI= 66.67%] |
| Rule 7. (p2 = NI) & (p3 = NI) => (T = 4); [CI= 66.67%] |

5. Discussion and Implications

Food means more than eating—it acts not only as the destination marketing enabler for marketers, but also as the travel experience catalyst for tourists. Destinations should utilize their local cuisine and gastronomic products as a source of tourist attraction or as a major image differentiator from their competitors [23]. With the following significance, food has been acting as a vital trip motivator: it can add value to the image of a destination; it is one of the most enjoyable activities during traveling; it is the item that tourists are least likely to consider reducing expenditure to consume; it represents a core manifestation of a destination's intangible heritage; and it offers tourists a truly authentic cultural experience [17,23]. Consequently, it is becoming more indispensable for the destination marketers to design innovative local cuisines for differentiating and branding destinations. The

globalization can be a threat to local gastronomic identities as well as an impetus to open up new opportunities for reinvention of local gastronomic products [23]. Many restaurants nowadays have recognized the importance of innovation as the destination enablers to succeed in competitive environments, yet it is not always clear how to successfully innovate the new cuisines [24].

This study is the first attempt to systematically deal with such a complex issue as innovative hybrid cuisine design. We proposed a solution framework, which used the Kansei engineering conceptions to include the potentially impressive features of local and international cuisines, and solved the complex problem by RST approach. A pilot example of Hakka-Kaiseki cuisine design was demonstrated, which has explored the essential features of the innovative Hakka-Kaiseki cuisine. This proposed solution framework provides a useful analytical tool for innovating the local foods to reinforce the global

competitiveness of the local restaurants, promote the local tourism and eventually increase the tourism destination attraction of a country.

However, this study has some limitations and calls for further explorations. First, different class attributes and explanatory attributes can lead to diverse results; thus, it requires more in-depth understandings of the epitomes of both local and international foods evolutions in order to seize on

the cores of the culinary merits. Second, small groups of people (17 persons) representing four types of customers participated in the pilot example. The sample size was too small. In the future, it is necessary to enlarge the scale of participants to reach results that are more reliable. Third, tourists' needs are never static in globalization contexts. It calls for incessant development of new local cuisines to cope with the exotic tourists' changeable tastes.

References

- [1] F. J. M. Laros and J. E. M. Steenkamp, "Emotions in consumer behavior: A hierarchical approach," *Journal of Business Research*, vol. 58, no. 10, pp. 1437-1445, 2005.
- [2] S. T. W. Schutte, J. Eklund, J. R. C. Axelsson and M. Nagamachi, "Concepts, methods and tools in Kansei Engineering," *Theoretical Issues in Ergonomics Science*, vol. 5, no. 3, pp. 214-231, 2004.
- [3] C. Y. Kung, T. Y. Wang, K.T. Hsu and C. S. Lai, "Engineering to build up an analytical model of key marketing demand factors-study of green industries," *International Journal of Kansei Information*, vol. 1, no. 1, pp. 31-42, 2010.
- [4] S. Ishihara, K. Ishihara, M. Nagamachi and Y. Matsubara, "An automatic builder for a Kansei Engineering expert system using self-organizing neural networks," *International Journal of Industrial Ergonomics*, vol. 15, no. 1, pp. 13-24, 1995.
- [5] A. Horiguchi and T. Suetomi, "A Kansei Engineering approach to a driver/vehicle system," *International Journal of Industrial Ergonomics*, vol. 15, no. 1, pp. 25-37, 1995.
- [6] M. Nagamachi, "Kansei engineering as a powerful consumer-oriented technology for product development," *Applied Ergonomics*, vol. 33, no. 3, pp. 289-294, 2002.
- [7] S. W. Hsiao, F. Y. Chiu and C. S. Chen, "Applying aesthetics measurement to product design," *International Journal of Industrial Ergonomics*, vol. 38, no. 11-12, pp. 910-920, 2008.
- [8] H. Y. Chen and Y. M. Chang, "Extraction of product form features critical to determining consumers' perceptions of product image using a numerical definition-based systematic approach," *International Journal of Industrial Ergonomics*, vol. 39, no. 1, pp. 133-145, 2009.
- [9] H. Kildegaard, A. Olsen, G. Gabrielsen, P. Moller and A. K. Thybo, "A method to measure the effect of food appearance factors on children's visual preferences," *Food Quality and Preference*, doi:10.1016/j.foodqual.2011.06.009, 2011.
- [10] Z. Pawlak, "Rough sets," *International Journal of Computer and Information Science*, vol. 11, no. 5, pp. 341-356, 1982.
- [11] B. Berman and J. R. Evans, *Pricing in retailing. Retail Management: A Strategic Approach*. Prentice-Hall, Upper Saddle River, NJ. 2003.
- [12] E. Myung, A. C. McCool and A. H. Feinstein, "Understanding attributes affecting meal choice decisions in a bundling context," *International Journal of Hospitality Management*, vol. 27, no. 1, pp. 119-125, 2008.
- [13] R. Lewis, "Restaurant advertising: appeals and consumers' intentions," *Journal of Advertising Research*, vol. 21, no. 5, pp. 69-74, 1981.
- [14] J. J. Schroeder, "Restaurant critics respond: we're doing our job," *Cornell Hotel and Restaurant Administration Quarterly*, vol. 25, no. 4, pp. 57-63, 1985.
- [15] M. A. Clark and R. C. Wood, "Consumer loyalty in the restaurant industry: a preliminary exploration of the issues," *International Journal of Contemporary Hospitality Management*, vol. 10, no. 4, pp. 139-144, 1998.
- [16] J. J. Kivela, J. Reece and R. Inbakaran, "Consumer research in the restaurant environment: part 2: research design and analytical method," *International Journal of Contemporary Hospitality Management*, vol. 11, no. 6, pp. 269-286, 1999.
- [17] B. Okumus, F. Okumus and B. McKercher, "Incorporating local and international cuisines in the marketing of tourism destinations: The cases of Hong Kong and Turkey," *Tourism Management*, vol. 28, no. 1, pp. 253-261, 2007.
- [18] Z. Pawlak, "Rough set approach to knowledge-based decision support," *European*

- Journal of Operational Research*, vol. 99, no. 1, pp. 48-57, 1997.
- [19] W. W. Wu, "Exploring core competencies for R&D technical professionals," *Expert Systems with Applications*, vol. 36, no. 5, pp. 9574-9579, 2009.
- [20] Y. F. Huang, W. W. Wu and Y. T. Lee, "Simplifying essential competencies for Taiwan civil servants by using the rough set approach," *Journal of the Operational Research Society*, vol. 59, no. 2, pp. 259-266, 2008.
- [21] W. W. Wu, "Mining significant factors affecting the adoption of SaaS using the rough set approach," *Journal of Systems and Software*, vol. 84, no. 3, pp. 435-441, 2011.
- [22] Y. T. Lee, "Exploring high-performers' required competencies," *Expert Systems with Applications*, vol. 37, no. 1, pp. 434-439, 2010.
- [23] A. H. N. Mak, M. Lumbers and A. Eves, "Globalisation and food consumption in tourism," *Annals of Tourism Research*, doi:10.1016/j.annals.2011.05.010, 2011.
- [24] M. Ottenbacher and R. J. Harrington, "The innovation development process of Michelin-starred chefs," *International Journal of Contemporary Hospitality Management*, vol. 19, no. 6, pp. 444-460, 2007.



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