A Study of Cognitive Human Factors in Taiwan Aboriginal Twin Cup

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Abstract: With their beautiful and primitive visual arts and crafts, Taiwan’s aboriginal cultures should have great potential for enhancing design value. “Kansei” aspect and being recognized in the global market. Evidence shows that the prospect of Taiwan’s local cultures will undoubtedly become crucial cultural elements in future design applications. The purpose of this paper was to explore the meaning of cultural objects and to extract their cultural features from Taiwan’s aboriginal culture. This paper attempts to illustrate how, by enhancing the original meaning and images of Taiwan aboriginal culture features, and taking advantage of new production technology, they may be transformed into modern products and so fulfill the needs of the contemporary consumer market. Therefore, this paper focuses on the analysis of cultural meaning, operational interface, and the scenario in which the object is used. Then, this paper is intended to establish a cultural product design model to provide designers with a valuable reference for designing a successful cross-cultural product. Results will provide an interface for examining the way designers communicate across cultures as well as the interwoven experience of design and culture in the design process.

Key words: Human factors, Taiwan aboriginal culture, Twin-cup, Cultural and creative design.

1. Introduction

Taiwan Aboriginal crafts and products have a primitive style which displays beautiful and powerful features of both art and utility in daily life. Their utilitarian objects are constructed with a primitive form which provides a basic function, and have a natural pattern as a part of decoration [1,2,3,6]. It is noted that the beauty of Taiwan Aboriginal culture and art demonstrates a great potential for enhancing the design value of modern consumer products. With beautiful and primitive visual art and crafts, Taiwan aboriginal culture should have great potential to enhance the design value, and to be recognized in the global market. Evidence shows that the perspective of Taiwan local culture in design will undoubtedly become crucial cultural elements in future design applications [5,6,7,10]. Therefore, it is important to study and keep the aboriginal cultural characters, then transform the cultural features into modern products to save the aboriginal culture [19,20].

The “Linnak”, literally “twin cup” in the Paiwan language, was chosen as the cultural object for this paper and its appearance, usability, and cultural meaning were studied. In this study, the “Linnak” demonstrates the value of Aboriginal culture in design. The “Linnak” is a special container for drinking wine used in the traditional tribal wedding ceremony and requires two people to manipulate the object smoothly for the drinking task. There are social meanings, ergonomic concerns and the functional achievement associated with this cultural object [11,12,14,15,16].

The “Linnak” is a typical cultural object which can
be transformed into a contemporary design for the current consumer market. The idea of “sharing each other” in the design of the “Linnak” is valuable for enhancing usage in our daily life [15,16,17]. However, the contemporary consumer market may need a new form of the “Linnak” suitable for a modern environment. Therefore, this study focuses on the analysis of cultural meaning, operational interface, and the scenario in which this object is used. Results presented herein create an interface for examining the way designers communicate across cultures as well as the interwoven experience of “Kansei” design and culture in the design process.

2. The cultural features of the “Linnak”

Taiwan is a multi-cultural blend of traditional Chinese with significant East Asian influences including Japanese and such Western influences as American, Spanish and Dutch. Over time, Taiwan gradually developed its own distinct culture, mostly from a variation of Hoklo culture coming from southern China. Of course, the Taiwanese aboriginals also have a distinct culture. The Taiwan Aborigines are the original inhabitants of Taiwan, residing there long before the Chinese immigrants came from Mainland China to Taiwan during the Ching Dynasty from mid-17th century. Taiwan aborigines are identified with 12 tribes: Atayal, Saisiat, Bunun, Tsou, Thao, Paiwan, Rukai, Amis, Puyuma, Tao, Kavalan, and Truku [1,2,3].

Among Taiwan Aboriginal tribes, each tribe has a unique culture and style, which can be identified simply from its sculptures, textile fabrics, webbing, leather craft, and pottery. Furthermore, the tribe can be identified through the applied functions of architectures, daily life objects, tools, ceremonial equipment, weapons, and decorations [24,25,26]. Upon investigation of the equipments and tools of the 12 Taiwan Aboriginal tribes, the “Linnak” from Paiwan tribe displays a remarkable usefulness as a cultural resource. The unique shape of the “Linnak” shows its cultural meaning, usability, and beauty. Therefore, the “Linnak” is used as an example to demonstrate its cultural features in product design application [2,22].

The “Linnak” is a very typical object in Paiwan culture. In the Paiwan language, “Linnak” represents the value of connection to Paiwan traditional culture. The “Linnak” is carved from one piece of wood and usually has two cups with one handle on each side as shown in Figure 1 [22]. Taiwan Aboriginal people often drank rice wine and considered it to be a holy event. “Linnak” represents their drinking culture and the meaning of drinking. In ancient times, therefore, they developed a variety of drinking containers and each container has an associated special events and meaning. For example, one cup can be used only in special events by the chief of Paiwan tribe; two-cups or three-cups was normally used in wedding or festival ceremonies to enhancement the close relationship of drinkers and to increase warm feelings.

The previous research about the using and making of aboriginal twin cups could be found in the book -- “The culture arts of Taiwan aborigine” [22]. The “Linnak”, a twin cup, is a very typical object in Paiwan culture. This object represents their drinking culture and the meaning of drinking. In ancient times, Taiwan Aboriginal people often drank rice wine and considered it to be a holy event. Therefore, they developed a variety of drinking containers and each container has an associated special principle and meaning. In the Paiwan language, “Linnak” represents the value of connection to Paiwan traditional culture. The “Linnak” is carved from one piece of wood and has two cups with one handle on each side, with the long-hooded pit viper pattern and figures of the ancients which displayed the symbolic meaning and value of the object since only a chief can have the long-nodded pit viper pattern on his cup. The pitch (the distance between the centers of two cups) symbolized close relationship and has particular standards and specifications for difference situations [2,3,22].

![Fig.1 The variety forms of aboriginal twin cup](image)

With the aborigine, the drinking is a sacred social contact activity and every tribe made the objects about drinking by their culture. The twin cup stood for the culture value of Paiwan tribe and their relationship. It had a special meaning in the modern society. The twin cup made of woody sculptured and contained two cups which had a suitable distance and had two handles in the
two sides of twin cup. In Figure 2 [15,19,20], there were beautiful sculptures and totems about the ancestors and hundred-pace snakes in the cup’s body and the handles to increase the value of the cup. The cock used the single cup and when the hunter hunted successful, they would cut the meat of captive’s hind leg to their cock and then the cock would give the hunter a single cup drink for his valiant. The double cups and triple cups used in ceremony, and the couple stood the different sides, then the cock stood in middle to witness the love. It was the greatest blessing [15,16,19,21].

There are social meanings, ergonomic concerns and the functional achievement associated with this cultural object. To provide an ideal drinking cup at a wedding, both the social and operational interfaces of the “Linnak” need to be well-designed. The design features of “Linnak” has been identified with three levels of cultural features: (1) outer-level focus on the “Linnak” formation which is associated with material, colors, texture, and pattern; (2) Mid-level focus on the consumer behavior and the scenario in which people will use the “Linnak” in what kinds of occasion; and (3) inner-level focus on the symbolic meaning of the “Linnak” [8, 13, 23, 28, 29].

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3. Method

The method consists of two main parts that are to study the human factors related problems and to explore the “Kansei” related issues of twin-cup. To study the human factors related problems, this paper tried to using the systematized and scientific method to study the human factors of twin-cup. First, anthropometric measurements of twin cup across the users of different sizes and cultures are conducted to identify the relationship between the twin cup and the users. Then, based on the cultural feature transformation model, the

“Linnak” has been identified with three levels of cultural interfaces and used as an example to demonstrate how to design cultural products. In other words, a transformation of the “Linnak” is necessary for the modern market.

Cultural product design is a process of rethinking or reviewing cultural features and then redefining them in order to design a new product to fit into society and satisfy consumers through culture and esthetic (Ho et al., 1996). Using Cultural features to add extra value to a product can not only benefit economic growth, but also promote unique local culture in the global market. Therefore, because transferring cultural features into a cultural product becomes a critical issue, a framework was proposed for combining culture levels, layers and design features as shown in Figure 3 which facilitates understanding cultural product design [4,9,20].

In Figure 3, the cultural product design model consists of three main parts: conceptual model, research method, and design process. The conceptual model focuses on how to extract cultural features from cultural objects and then transfer these features to the design model to design cultural products. The research method consists of three steps; identification, translation and implementation, to extract cultural features from original cultural objects (identification), transfer them to design information and design elements (translation), and finally design a cultural product (implementation). Based on the cultural product design model, the cultural product was designed using scenario and story-telling approaches. In a practical design process, four steps are used to design a cultural product, namely, investigation (set a scenario), interaction (tell a story), development (write a script), and implementation (design a product) as shown in the bottom of Figure 3 [4,15,19,20].

Fig. 3 A framework of cultural product design model
4. Results and discussions

4.1 The anthropometric measurements of twin cups

The outer level of the “Linnak” cultural features is illustrated by the embossed decoration such as figures, heads, and long-hooded pit viper and deer patterns. The physical dimension includes the total length of the “Linnak” from 43cm to 91cm and the pitch between the two cups from 29cm to 42cm as shown in Figure 4. These dimensions have indicated the way in which this object was used and this distance indicated an invisible space between two people. From a usability point of view, the diamond shape cup illustrates that an angular mouth was used for ease of drinking wine. Furthermore, the drinking process has emphasized the meaning of “working together” and “sharing with each other” [3,6,15,19,20,21,26,27].

Fig.4 The dimensions of aboriginal twin cup

The most important ergonomic consideration for designing daily-life products is “designing for human use.” Especially, when the issue of applying anthropometric data is addressed. In human factors considerations, the requirement in anthropometric design is to determine a value for some design parameter in terms of a percentile cutoff for an anthropometric value in order to meet a target percentage for a population of interest [18]. For example, the total length of twin cup is from 43cm to 91cm as shown in Figure 4. The minimum length of twin cup is 43cm (low percentile), and the maximum length of twin cup is 91cm (high percentile), and the average length is about 74.4cm (50 percentile). In addition, the average width of twin cup is 11cm, and the height of twin cup is 7.3cm. The distance between the center of two cups is 29 -- 42cm, and the capacity is about 600cc.

The anthropometric database is used as a design reference for daily used product design. However, the most effective application of such data in product design is another important issue. Ergonomic considerations and manufacturing principles can sometimes present conflicting recommendations for design. The optimal product design must consider both of these objectives for developing guidelines that integrate ergonomics and manufacturing principles. In this way, product design can both improve response to consumers’ needs and maximize profitability for manufacturers [18]. Therefore, this study focuses on the application of anthropometric data by presenting the suitable dimensions of twin cup as shown in the Table 1. Then the minimum, the average, and the maximum sizes are chosen as the examples to be simulated using 3D drawing software as shown in the Table 2.

Table 1. The anthropometric data of twin cup

<table>
<thead>
<tr>
<th>Selected the human factor measure data</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bideltoid (shoulder width)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>male</td>
<td>female</td>
</tr>
<tr>
<td>The minimum size -- age 15</td>
<td>429.49mm</td>
<td>393.62mm</td>
</tr>
<tr>
<td>average data : 429.49mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The average size -- Age -- 25-34</td>
<td>460.05mm</td>
<td>426.25mm</td>
</tr>
<tr>
<td>average data : 460.05mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. The simulated twin cup by 3D drawing software

1. the minimum size: 43cm*8cm*7cm
2. the average size: 74cm*11cm*7.3cm
3. the maximum size: 91cm*11cm*7.3cm

3D present

minimum    average    maximum

According to table 1 and 2, a 3D drawing software was used to simulate the situation of twin cup while two users are drinking together. Figure 5 showed the average size of twin cup: 74cm*11cm*7.3cm. It included three situation of using: man to man, man to woman, woman to woman. Then, Figure 6 showed the maximum size of
91cm*11cm*7.3cm, and included three situation of using: man to man, man to woman, woman to woman. Finally, Figure 7 followed the same process and showed the minimum size of 43cm*8cm*6cm, and which included three situation of using: boy to boy, boy to girl, girl to girl.

Finally, Figure 7 followed the same process and showed the minimum size of 43cm*8cm*6cm, and which included three situation of using: boy to boy, boy to girl, girl to girl.

Using anthropometric data in design involves art as well as science. However, in the use of such data for designing daily-life products, there are generally two aspects: 1) determine what anthropometric design principle should be applied, and 2) how to achieve the anthropometric considerations in the most cost effective manner [18]. When applying anthropometric data, three anthropometric design principles must be considered: extreme individuals, an adjustable range, and the average. Based on these principles, the recommendations of ergonomic dimensions for the ideal twin cup were proposed. For example, using the average size twin cups for imitated, the results showed that their heads would not touched to each other, while they are drinking. In this situation, they will not feel uncomfortable about their body, but in their shoulders. It would be said that the body angle of their drinking posture as shown in the Figure 8.

After reviewing the literature and simulating the drinking situation, the following drinking situation are identified that when the aborigine used twin cup.

1. When the twin cup used in wedding ceremony, the couple will be at the drinking situation as shown in the bottom of Figure 8. That was the close mode by face to face nearly which are presented intimate close relationship.

2. When the twin cups used in the normal situation, the antagonistic people drink the wine together to present their friendship, and the drinking situation will be at the shoulder to shoulder as shown in the upper of Figure 8.

3. As the age under 15, the minimum size twin cup was used, they will feel uncomfortable for the “twin cup” too deep to drink. For this situation, the height of container should be reconsidered for the child’s anthropometric data to fit the children’s need.

4.2 Transforming twin cup to modern products

The application of cultural features is a powerful and meaningful approach to product design. Consumers nowadays require a design which is not only functional and ergonomic, but which also stimulates emotional pleasure. The results of studying the “Linnak” demonstrate that cultural features are a valuable element
to embed into a product to emphasize its value or meaning. Lin [19,20] had brought up the culture product design model as shown in the Figure 3, which included the human factors, product story, and the script design. And the four step included: (1) Investigation -- set a scenario: to construct a thinking space and move the heart; (2) Interaction -- tell a story: based on the culture and memorize; (3) Development -- write a script: the design concept description; (4) Implementation -- design a product: which based on the culture of Taiwan. The following design cases designed by the different student groups but all directed by Professor Lin, and this research contacted the culture of twin cups with these design cases [15,16,17,19,20].

4.2.1 Our cups

During the wedding ceremony, two people are required to hold the handles of the “Linnak” at the same time and to manipulate it with good coordination in order to drink wine smoothly. In this case, the handle plays an important role as an invisible space to imply the relationship between two people, for example, a shorter pitch represents a closer relationship between two people. Based on the cultural meaning of the “Linnak”, our cups set was designed to show the close relationship between mother and child. In Figure 9, the main idea of our cups set emphasized the handles. From the usability point of view, the small cup with two handles was designed for a child learning how to use the cup to drink water easily, and the big cup with one handle was designed for the mother. When the two cups are not in use, the cups connected by the handles represent the close relationship between mother and child [15,16,19,20].

4.2.2 Our pots

In the inner-level of the “Linnak”, humanity is the key factor in the design of symbolic patterns to show the harmony between human and nature. Figure 10 shows two small cups connected together, one cup is for cultivating a plant and the other cup for drinking (pouring) water. The main idea for our pots came from the inner meaning of the “Linnak” for respecting nature. If you have cultivated plants in the office, after drinking water you shared the water with the plants showing the close relationship between human and plants. Furthermore, this application of new material and technology can bring a creative form to enhance the traditional cultural value in modern society [15,16,19,20].

4.2.3 Our airs

In the cultural context, the “Linnak” can enhance a social interactive environment such as a festival, wedding ceremony, restaurant, and even in the living room where the use of the twin-cup can emphasize emotional sharing, relationship building, and pleasure.

Fig.9 Our cups designed from the “Linnak”

Fig.10 Our pots designed from the “Linnak”

Fig.11 Our airs designed from the “Linnak”
(plants) and the technology to put them together as a form of twin cup. In Figure 11, the nature and technology will set together in the same product. The technology worked and brought the clean air, and the plant worked too. The CO₂ came nearly and absorbed by plant, then the machine share the fresh air. That will be a circle of air cleaning between nature and technology.

5. Conclusions

“Culture” plays an important role in the design field, and “cross cultural design” will be a key design evaluation point in the future. Designing “culture” into product will be a design trend in the global market. Obviously, we need a better understand of cross-cultural communications not only for the global market, but also for local design. While cross-cultural factors become important issues for product design in the global economy, the intersection of design and culture becomes a key issue making both local design and the global market are worthy of further in-depth study. The importance of studying culture is shown repeatedly in several studies in all areas of technology design.

In recent years, if you have seen BENQ, ASUS, DUCK, or other design teams on the prize list of international design contests and wondered if there were Taiwanese designer behind them, you would have been correct. Recently, Design teams from Taiwan have become regular winners of international design contests. The capability of Taiwan’s industrial design is coming to the fore in the global design arena through international design contests. Therefore, based on “Taiwan culture”, the purpose of this paper is to show how “Branding Taiwan” into “Taiwan Design” can reinforce design value upwards. For “Branding Taiwan”, we must think about how to use the Taiwan culture. For the “Taiwan Design”, we need to design “Taiwan cultural features” into modern products.

The “Linnak” provides a good example of applying cultural features to design while still retaining a meaningful cultural value. Taking “Linnak” as an example, this article demonstrated the cultural features of “Linnak” found in three culture levels and how to transform those features into a new cultural product design which can fit into the contemporary market. Cultural products, hence, can extend the heritage and traditional values of Taiwan Aboriginal Culture to the consumer and increase the sense of spiritual essence in human life. Perhaps the best way to extend Taiwan Aboriginal Culture is to promote it in consumers’ daily lives through impressions made by the use of products such as garments, crafts, decorations, utensils, furniture, ornaments, and packages whose designs are based on that culture.

For future study, we suggest field investigations and interviews with Taiwanese Aboriginal people as well as literature review in order to accurately understand Aboriginal culture and art so as to avoid incorrect interpretation of the culture when transforming cultural features into modern product design. In addition, a detailed design process needs to be developed in order to provide designers with the specified procedures for designing cultural products in the future.

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7. References

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