# Exploring how cultural product design models from China/Taiwan can contribute to the design of culturally relevant products in Botswana

***Keiphe Setlhatlhanyo[1], Chinandu Mwendapole[2] and Herbert Mapfaira[3]***

**Abstract**

*Contemporary design involves not only technical standards and functional needs, but also conveys the ideologies and cultural phenomena in a particular society. Botswana's National Development Plan 10 indicates that the economic value of Botswana's cultural and heritage products have not been fully realized due to a lack of exposure. There is, therefore, a need to market these products extensively to enhance consumer recognition and appreciation, which in turn will ultimately benefit the local communities and contribute to the diversification of the economy. This paper explores the design-related cultural models from China and Taiwan and how they may contribute to the development of appropriate culture-related design in Botswana. A case study is used to investigate the application of the Chinese design models in the development of local Tswana cultural products. The results demonstrate the possibility of enhancing product quality and uniqueness by developing brand competitive modern products inspired by Tswana cultural designs.*

**Keywords:** China, Taiwan, culture, design, product design, cultural models

---

1. Lecturer, Department of Industrial Design and Technology, University of Botswana. Email: keiphe.setlhatlhanyo@mopipi.ub.bw
2. Lecturer, Department of Jewellery Management and Design, Botho University. Email: chinandu.mwendapole@bothouniversity.ac.bw
3. Lecturer, Department of Mechanical Engineering, University of Botswana. Email: Herbert.Mapfaira@mopipi.ub.bw

## Introduction

Countries with a vibrant manufacturing sector have strong design capabilities, which have enabled them to produce unique products that are competitive in both the domestic and international markets. Boeijen et al (2013) define 'design' as conceiving an idea for some artefact or system and expressing that idea in a physical form. Best (2006) suggests that 'design' is both the process of making physical objects (designing), and the product of this process (design). In her view, design plays a role in shaping the world and generating new products, systems and services. In other words, design provides the thoughts, ideas and plans that organize the production of new products (material objects or artefacts, systems, services or brands). For the purposes of this study 'design' is defined as the process of designing material products rather than services, programmes, or brands and 'product design' as a set of processes that transform requirements into specified characteristics or into the specification of a product (Boeijen et al, 2013; International Standards Organization (ISO) 9001:2000).

We now live in a small world with a common global market. While the market heads towards globalization, design tends to gravitate towards localization (Lin, 2007). All aspects of human life are profoundly influenced by culture (Schwartz, 1997). Design activity, being an aspect of human life, cannot take place outside of its cultural context. The local and global dimensions of design suggest that international and national cultural elements should be integrated into the design and development of products (Ono, 2005). Countries that have successfully integrated local culture into their designs include Italy and Taiwan. Italian design embodies a cultural connotation of dignity and reliability. Their designs integrate traditional crafts, modern conceptions, natural materials, modern techniques, new materials, and so forth (Yang, 2010). Taiwan is another example of a country designing products with traditional characteristics. In Taiwan, the government introduced 'The Challenge 2008-The New Six-Year Development Plan of the Republic of China (Taiwan)', the goals of which are to nurture creative skills and promote the combination of culture with entrepreneurship to develop cultural industries (Hsieh and Guan, 2011).

As a developing country, Botswana has set itself goals to be attained by 2016 in the national vision (Vision 2016 Council, 2009). One of the aims of the vision is to diversify the economy in order to reduce the country's reliance on the diamond industry. The vision thus aims at growing the different sectors of Botswana's economy, including

manufacturing. Botswana has a rich cultural history, which has not been adequately manifested in the designs of its products. Other countries such as China and Taiwan have been very successful at designing products that are redolent of their cultural heritage. This paper aims to understand how these countries are able to integrate their cultural heritage into their designs. It specifically explores current design-related cultural models from China and Taiwan, and how they may be used to infuse cultural elements into the design of modern products in Botswana.

## Conceptual framework

The purpose of a conceptual framework is to introduce and explain the constructs to be used in the study and how they relate to each other. In this study, the areas to be considered will be: Culture and Cultural Elements; Models of Culture and Culture-based Product Design Models.

### *Culture and cultural elements*

It is widely accepted that cultures are different, but because of the complexity of the concept of culture, it is difficult to pinpoint a precise definition. Indeed, there is disagreement between various academic disciplines as to how best to define culture (Hall, 1990). From a corporate perspective, culture is viewed as the beliefs and values shared by an organization and they include: beliefs and convictions about the world and how it works, and the community's assumptions about what ideals are worth pursuing, such as striving for success or avoiding debt (Hofstede, 1980). McHarch (1992) defines culture as a way of life for an entire society. Lin (2007) suggests that the concept generally refers to a pattern of human activities and the symbolic structures that give such activities significance. An understanding of the concept of culture is important in product design as cultural meanings guide how users interact with products based on their value systems, traditions, beliefs, habits, experiences and aesthetic tastes.

### *Models of culture*

Models are considered conceptual summaries of complex relationships that we observe in the real world. Models represent the breakdown of complex realities into manageable units through the use of graphic abstractions, mathematical equations and taxonomies. Matsuhashi et al, (2009) suggest that culture can also be described by means of visual models and include the Onion Model by Hofstede (1991) and the Iceberg model by Selfridge and Sokolik (1975). In their opinion, these

models have the common view that culture can be described as a set of elements forming layers in an embedded structure. For example, the Onion model by Hofstede views cultural differences as four layers of an onion. The outside layers represent symbols (words, gestures, pictures or objects that carry a particular meaning which is only recognized by those who share the culture); heroes (persons, alive or dead, real or imaginary, who possess characteristics which are highly prized in a culture, and thus serve as models for behavior); and rituals (collective or social activities, technically superfluous in reaching desired ends, but which, within a culture, are considered as socially essential) that are more visible and easier to discern. On the other hand, the inner level of the Onion model consists of values; that is, it has tendencies to prefer certain states of affairs over others and is difficult to discern or articulate.

From a design perspective, cultural-based product design researchers have identified three layers of culture in product design as: (1) the physical or material culture - including daily related objects and tools, (2) the social/behaviour culture - including human related rituals and customs, and (3) the spiritual or ideal culture including - art and religion that designers need to consider when designing products (Moalosi et al, 2004; Lin 2005, 2006, 2007; Lee, 2004).

Desmit and Hekkart (2007) suggest that the emerging interest in user-centred design has stimulated a shift of focus from the user's behaviour and cognition to the user's affective experience of the human-product interaction. In their view, there are three levels of product experience: aesthetic experience (the degree to which all our senses are gratified), the experience of meaning (the meanings we attach to a product) and emotional experience (the feelings and emotions that are elicited by a product). The models of culture assist designers in identifying the frame of reference of beliefs, expressive symbols, and values which will guide how consumers think, feel and act in their interaction with products.

### *Culture-based product design models*

Lin (2007) argues that cross-cultural product design models are of value to designers because they can help turn culture into modern products, as well as provide designers with a valuable reference for designing a successful cross-cultural product. Young (2008) adds that a model of culture provides a framework to examine cultures, guides the design of culture-based products and services, and fosters cross-cultural relations,

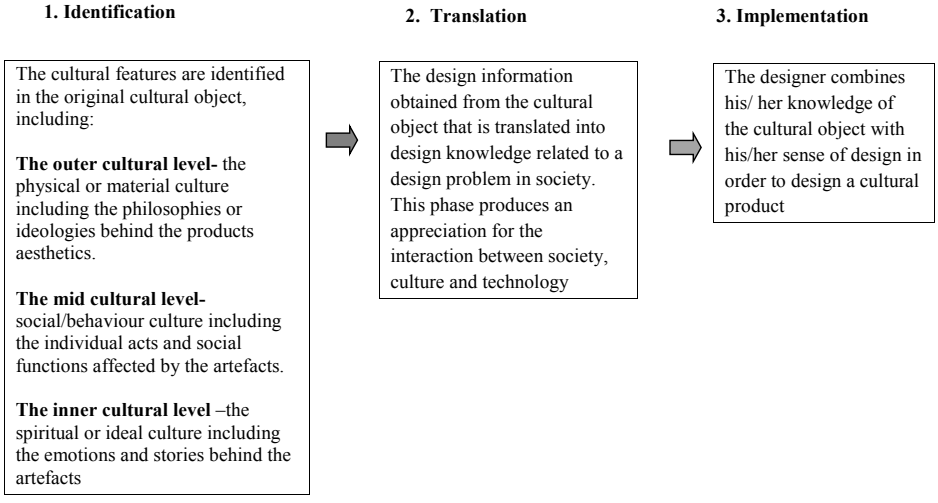
communications and meanings. Cultural product design models provide a framework for explaining the relationship between culture and form, particularly in ways that enable the designer's communicative intent to be interpreted by the consumer. To the framework of models of culture in design, Leong and Clark (2003) added three special levels or layers that can be used in the analysis of cultural features in existing products during the design process. The three special levels or layers are divided into the outer, middle and inner layers of culture.

1) The outer tangible or visible cultural level includes the design elements, like colours, materials, spatial organization, fonts, shapes, icons and metaphors, patterns, texture or form of the existing cultural products.
2) The middle cultural level includes the performance, use, function and safety issues of the existing cultural products.
3) The inner intangible cultural level includes feelings, cognition and emotions accumulated over time associated with the existing cultural product.

Lin (2005, 2006) proposed a cultural-based design model which is an amalgamation of the three special levels proposed by Leong and Clark (2003) and the three layers of culture.

The three phases of the cultural design model includes three steps: identification, translation and implementation (see Figure 1 below). These three phases of the model were used as a reference in this study.

**Figure 1: Cultural design model phases**



According to Lin (2005) the user's reactions to a product are determined by the emotional experience at three different levels: visceral design (the external and appearance and texture of products), behavioural design (product function), and reflective design (individual feelings and perceptions). The relevance of Lin's model is that it is not only able to capture all three layers of culture and link them into the three cultural levels of product experience; it creates a better understanding of the aesthetic, behavioural and philosophical considerations that go into the infusion of culture in the design process. In addition, Lin's model provided a framework for the designers in this project to identify and gather information relevant to the design of cultural products.

**Research methodology**

This paper reports on a study that investigated the cultural-based product design models from China and Taiwan with the aim of using a selected model in the design and development of a contemporary product that is inspired by Botswana's cultural heritage. The study used a qualitative approach. Archer (1995) argues that the difference between quantitative research methods and qualitative research methods is that the former seeks to explain and the latter to evaluate. For the purpose of the research, a case study approach was used to explore how local designers in Botswana can integrate cultural knowledge into a modern product using the culture-based design model by Lin (2005, 2006). Hinnells (1993) writes that in design-related research, the case study method is used as a detailed analysis of some aspect of reality.

**Data collection and analysis methods**

Data collection methods included a literature review of the secondary documents on existing cultural products and the interaction between society, technology and culture in Botswana, a focus group discussion and online survey through Facebook. The target of the focus group and online survey were middle income consumers between 24-35 years, a demographic considered most likely to appreciate quality over quantity and proud of their cultural heritage. A multi-method approach was deemed the most appropriate for identification and translations phases of the case study.

Purposive sampling was used for selecting participants for the focus group and the Facebook online survey. Purposive sampling is a form of non-probability sampling in which decisions concerning the individuals to be included in the sample are taken by the researcher, based upon a variety of criteria (Oliver, 2006). For the focus group, an invitation was

sent out on a bulletin board inviting middle income Batswana within the age group 24-35 to participate. The targeted focus group size was 10-12 people, on a first come first serve basis. The purpose of the focus group, venue, date and details of the activity that the focus group was expected to be involved in were provided as part of the invitation. Twelve (12) people participated in the focus group. For the online survey, the lead author created a link on their Facebook page, asking participants to rank cultural features according to their preferences on a scale of 1-10. The invitation was sent to people on the author's contact list, and the recipients of the invitation were requested to also send the invitation to people who meet the criteria on their contact list. One hundred (100) people in total participated in the online survey.

Data analysis methods included the following: Fallon Decision Matrix (FDM), grounded theory and descriptive analysis.

*Fallon Decision Matrix*- was invented by Fallon (2005), a value analyst, mathematician and philosopher. The Fallon Decision Matrix is an orderly process for making decisions and its effectiveness lies in its ability to show clearly how the answer was obtained. Fallon stated the decision making system must have the following steps: (1) select criteria, (2) define limits, reference levels, and sensitivity curves, (3) establish weights or relative importance factors, (4) rate each alternative on each criterion, and (5) calculate relative figures to give a solution.

The criteria for the study were based on the following description of terms of reference- fashion, novel, practical, desirable, weight, comfortable and ergonomics, manufacture cost and culture. The next step was to weight each of the criteria. Each criterion was then compared to the others until all had been compared to each other using a technique called paired comparison. The latter technique eliminates the complexity and greatly minimizes provincialism and subjectivity. The purpose of using the FDM, was to avoid the researchers' design bias influencing the focus group decision.

*Grounded Theory*- Respondents in qualitative research view the world in their own way, impose their own analysis and use their own words to express their views (Bryman and Burgess (1994). As a result, the analysis of qualitative data requires the researcher to contextualize, make sense of the raw data they acquire. A theory according to Oliver (1997) is a general statement which links together two or more concepts or ideas, and which indicates how one concept affects the other. In his view the most appropriate way to generate a theory is to base it or

'ground' it in the data being studied.

Strauss and Corbin (1990) note that in grounded theory analytical descriptions are developed on the basis of data obtained during the primary research by coding the work into descriptive or conceptual categories. Descriptive categories list the key ideas or themes in which the researcher is interested. Conceptual categories are the ideas or themes that will contribute to the construction of a theory. Since the study was descriptive and did not aim to produce a theory, we limited our use of grounded theory to the development of descriptive categories.

*Descriptive analysis* - According to Oliver (1997) descriptive statistics are used to describe numerical data collected from surveys into manageable forms. Descriptive statistics make use of percentages and frequency distributions in the form of bar charts to describe, compare and determine interrelations among data in a sample. Other methods of summarizing data include mathematical procedures such as averages which identify the mean, mode or median in a given sample or standard deviation calculations which describe how widely spread the data in a sample are.

***Step 1:*** *Identification phase*

In the identification phase a literature review of existing documentation on the spectrum of traditional products in Botswana was undertaken, in order to identify the original Tswana cultural object. Oliver (1997) highlights that researchers make use of documentary research for a number of reasons:(1) the data cannot sometimes be collected in other ways; (2) a lot of time can be saved; (3) a large amount of detailed data may be available; (4) data can help to develop a research idea and lend itself to varied types of analysis.

Once the original cultural object was selected a grounded theory analysis of it was undertaken using the three cultural levels framework (outer-appearance or design elements, middle-functions, and inner-cultural levels- cultural meanings). According to Hammersley and Atkinson (1995) immersion into data allows the researcher to identify patterns, possibly surprising phenomena, and also to become sensitive to inconsistencies such as the divergent views offered by different groups of individuals. The emerging themes from the original cultural object were coded to develop a descriptive category that was used to identify the cultural features to be infused into a modern design product.

***Step 2:*** *Translation phase*

Data collection for the translation phase included a literature review, focus group and online survey. The literature review served to inform the study on the interaction between society, culture and technology in Botswana. A focus group was then asked to select which domestic or personal product they would like to see infused with the cultural features using the Fallon Decision Matrix (criteria include **FDM**).

According to Oliver (1997) surveys are used to measure the extent to which an attitude, life style, or social custom is present in a population, the development of trends in a population, and the characteristics of a particular population, e.g. those individuals in a single profession or type of employment. The aim of the survey was to identify the respondents' preferences concerning the selected cultural features and obtain general market information from the respondents.

The online questionnaire was divided into two parts. Part one asked the respondents to rank the selected cultural features according to their preferences on a scale of 1-10. The respondents were then asked to specify the reasons for their preference. Part two focused on market data and included questions on age, gender, income group, buying behaviours, what they would like to see in the product, and whether they were likely to purchase culture inspired products. A descriptive analysis of the survey data was undertaken and the results were used to inform the development of the design brief for the cultural product.

***Step 3:*** *Implementation phase*

Pugh (1991) considers conceptual design as the phase in which concepts or solutions are generated to meet the needs of the Product Development Specifications. In the implementation phase the product design specification for the cultural product was identified and included the following elements: materials, customers, environment, competition, weight, standards specifications, performance, product cost, aesthetics, time scale, legal and market constraints. The results of the implementation phases were used to transfer the relevant cultural design elements into the development of the product prototype.

## Findings from the cultural-based product design case study

In the identification phase of the original cultural object the literature review indicated that Botswana's material culture can be summarized into the following areas: arts and crafts, baskets, minerals, owning cattle and water (Moalosi et al, 2005). It was also noted that baskets and

woven mats are the oldest and most diverse plant-based crafts found in the world (Novellino and Ertug, 2006). In addition, the skill required in the production of baskets is often associated with factors such as people's perceptions of the environment, conceptions of the self and models of economic interaction, social hierarchy, and division of labour (Novellino and Ertug, 2006). Given that traditional baskets represent an important branch of Botswana's material culture and are considered one of the oldest craft traditions in the world, Tswana baskets were selected as the original cultural object for the case study.

***Cultural levels and design features of the traditional tswana baskets***

The design features identified from the outer level of the traditional Tswana baskets included material, colour, surface patterns and details. The baskets are made from natural fibres (*mokola* or *moretlwa*) and are usually brown or red in colour (Botswana Government 2013). The range of basket shapes include closed baskets with lids, tray types and bowls which could be an indication of their functions (Botswana Government 2013). The baskets are made mainly by the *Bayei* and *Hambukushu* from the North-Western regions of the Okavango Delta. The baskets consist of 24 original surface patterns using very few colours.

The surface patterns including vegetal patterns (related to nature) and basic geometric and symmetric elements (circle, diamond, triangle, dots, and squares or check-board) were created through the use of differently coloured grasses or dyed leaves during the weaving process (Nettelton, 2010; Geddes, (1998). The surface patterns are also highly symbolic as they are said to signify either the rituals or folktales, and lives of the original weavers (Geddes, 1998). Furthermore, studies suggest that the Tswana basket patterns were not only decorative, but also had a mathematical aspect and ideas to them which has not been recognized by academia (Geddes, (1998).

At a mid-cultural level the closed lid baskets were used as vessels for containing or storing various food stuffs such as grain, vegetables, and even liquids such as beer and smaller plate-like baskets were used for winnowing grain after it was pounded (Nettelton, 2010; Botswana Craft Gallery, 2010). Overtime, however, primarily because of urbanization and the rising middle class, baskets are now used as interior decoration for offices and homes.

At an inner cultural level, the symbolic value of the basket patterns is reflected in the original basket weavers' interaction with nature and their environment (Lupo, 2011). Each of the original basket patterns

has its own unique name making reference to nature or the environment of the original weavers. For example, the Flight of a Swallow patterns represented the pattern of swallows before it rains and was considered good luck (Botswana Craft Gallery, 2010). On the other hand, the Knees of the Tortoise is a simple pattern that represents a human interpretation of the Knees of the Tortoise (Botswana Craft Gallery, 2010). Gerdes (2003) suggests that the fact that people gradually became capable of working out geometric concepts lies in the fact that human observation of nature was not a passive, but an active one in the sense that, to meet their practical needs, human beings made objects more and more regular in shape.

The analysis of the three cultural levels of the traditional Tswana basket provided the designer with the idea of transferring the traditional Tswana basket surface patterns onto a modern product. Based on the outer and inner level findings, the basket patterns were divided into three themes: name, design elements, and symbolic meanings (see Table 1).

**Table 1: Names, characteristics of design elements and symbolic meanings**

| Pattern name | Patterns | Characteristics of design elements | Symbolic meaning |
|---|---|---|---|
| Palm leaf | 2 | Simple combination of diamonds and square shapes /Intricate combination of diamonds and squares | Interpretation of nature/ fauna |
| Back of the ython | 1 | Checker board triangle pattern | Interpretation of nature |
| Forehead of the Zebra | 3 | Alternating flower like pattern / Star like pattern / alternating triangle pattern | Interpretation of nature |
| Flight of the Swallow | 3 | large checker board triangle pattern / star like alternating triangle pattern/ flower like alternating triangle pattern | Sign of Pula/ rain and good luck/ interpretation of nature / folklore/ beliefs |
| Tears of the Giraffe | 1 | Parallel lines or dots | Hunting rituals and folklore |
| Urine trail of the Bull | 2 | Simple zigzag pattern / Intricate zigzag pattern | Interpretation of nature/ hunting ritual |
| Shield | 2 | Triple triangle pattern/ Double triangle pattern | Armour / protection |
| Knees of the Tortoise | 2 | Single diamond pattern/ double diamond pattern | Interpretation of nature |

| | | | |
|---|---|---|---|
| Running Ostrich | 2 | Simple circular pattern of stepped circles/ intricate circular pattern of stepped circles | Interpretation of nature |
| Roof of the Rondavel | 2 | Simple spiral pattern/ Intricate spiral pattern | Habitat |
| Forehead of the Kudu | 2 | Narrow check board triangles | Interpretation of nature |
| Ribs of the Giraffe | 2 | Simple and intricate curved concentric patterns | Interpretation of nature |
| **Total** | **24** | Geometric patterns: triangles and diamonds | Interpretation of nature |

***Translation phase***

The focus group was asked to carry out a number of tasks. First, the focus group was asked to provide a ranking of the criteria they would like to see represented in a design from the following: A (Fashion); B (Novel); C (Practical); D (Desirable); E (Weight); F (Comfortable and Ergonomic); and H (Culture). The results are presented in Tables 2 and 3 and explained below.

**Table 2: Paired comparison**

| | B | C | D | E | F | G | H | RAW SCORE | CALCULATION | WEIGHT ( 1-10 ) |
|---|---|---|---|---|---|---|---|---|---|---|
| **A** | A-10 | A-6 | A-6 | E-7 | F-6 | A-7 | H-9 | 30 | 30/37*10 | 8.1 |
| | **B** | C-5 | B-8 | B-5 | F-5 | B-1 | H-10 | 14 | 14/37*10 | 3.7 |
| | | **C** | C-6 | C-5 | F-5 | C-5 | H-6 | 21 | 21/37*10 | 5.6 |
| | | | **D** | D-7 | F-5 | G-4 | D-5 | 12 | 12/37*10 | 3.2 |
| | | | | **E** | E-10 | G-4 | H-6 | 17 | 17/37*10 | 4.6 |
| | | | | | **F** | F-2 | H-6 | 23 | 23/37*10 | 6.2 |
| | | | | | | **G** | G-2 | 10 | 10/37*10 | 2.7 |
| | | | | | | | **H** | 37 | 37/37*10 | 10 |

| CRITERIA | | IMPORTANCE (RATE) |
|---|---|---|
| H | Culture | 10 |
| A | Fashion | 8.1 |
| F | Comfortable and Ergonomics | 6.2 |
| C | Practical | 5.6 |
| E | Weight | 4.6 |
| B | Novel | 3.7 |
| D | Desirability | 3.2 |
| G | Manufacture cost | 2.7 |

**1 = Minor difference**

5 = Moderate difference

10 = Major difference

0 = Equal importance

With reference to Table 2, the focus group was asked to rate the importance of each criterion on a scale of 1 to 10 (explained in table 2 above) relative to one other criteria (A to H). The value of 1 from the scale is used to indicate that there is a minor difference, whereas a value of 10 indicates that there is a major difference. If both are equally important the value is zero. For example: The first matrix entry in Table 2 above (upper left hand) compares A (Fashion) to B (Novel) and a rank of 10 for A was agreed on by the focus group - indicating that criterion A, Fashion, is more important than criterion B Novel, by a factor of 10 on a scale of 1 to 10. The raw score shown on the right is the sum of all A scores (30), B scores (14), C scores (21) etc.

In order to convert raw scores into weight on a scale of 1 to 10, the Criterion with the highest raw score is given a weight of 10. For this study, Criterion H: Culture had the highest raw score of 37. Each raw score was divided by the highest value and multiplied by 10 to get the weight on a scale of 1 to 10 (see upper right hand box in Table 2).

Table 3 shows the calculated weightings. The most important criterion is H: Culture followed by A: Fashion, then F: Comfortable and Ergonomics and lastly G: Manufacture cost.

**Table 3: The importance of criteria ranking order**

| Importance of the Criteria in ranking order | |
|---|---|
| **Criteria** | **Weight (1 to 10)** |
| H. Culture | 10 |
| A. Fashion | 8.1 |
| F. Comfortable and Ergonomics | 6.2 |
| C. Practical | 5.6 |
| E. Weight | 4.6 |
| B. Novel | 3.7 |
| D. Desirable | 3.2 |
| G. Manufacture cost | 2.7 |

The focus group participants were also presented with a random list of common domestic and personal products and requested to select their preferred product. The list consisted of a handbag, a bedside lamp, a table placemat, a head scarf, a wall art, and a neckpiece. The next stage was

to determine the rating (through a sensitivity curve) that the focus group would allocate to each concept (e.g. handbag, placement, etc), which the researchers had sketched according to the groups' specifications) and which they compared to similar brand products from John Lewis and Homebase (these are established brands in the UK chosen by the group). For example, for concept 2 which is a wall art, the researchers produced a sketch of a *mowana* tree with swallows flying above and around it to signify rain and the group was asked to compare this with selected similar pieces of wall art from the two brand stores in relation to the criteria of Novel (see figure 2).

**Figure 2: Sensitivity curve for novel (Wall Art)**

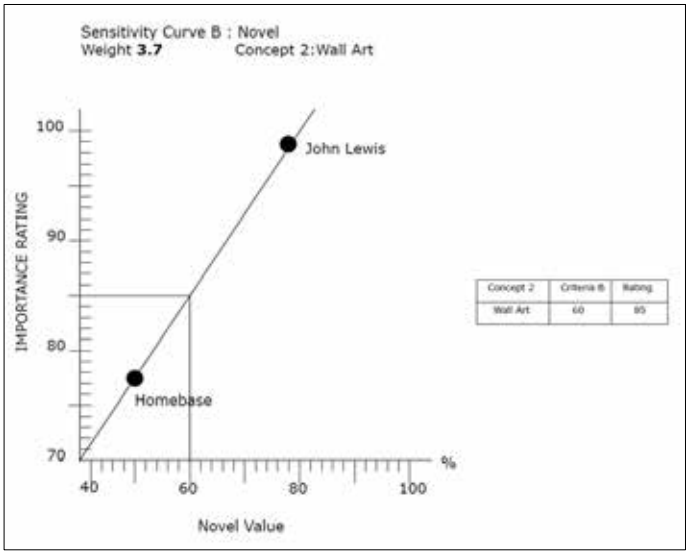



Figure 2 shows a sensitivity curve for concept 2 (wall art) in relation to the criteria novel. The group were asked to select similar pieces of wall art from the two brand stores (which they Googled and agreed on). The group chose John Lewis as a higher value brand and Homebase as a lower value brand. They plotted the wall art on the criteria of novel value of Homebase at 50% and that from John Lewis at 80%. They then agreed that the novel value of the sketch was at 60% - translating to an importance rating of 85% on the Y axis. The importance rating was then multiplied by the importance weighting of the criteria B (Novel) of 3.7 (see figure 2) to determine their final rating. The steps were repeated for each criterion against each concept. The end result, which is the Design Weighted Matrix, was produced and is shown in Table 4.

**Table 4: Design weighted matrix**

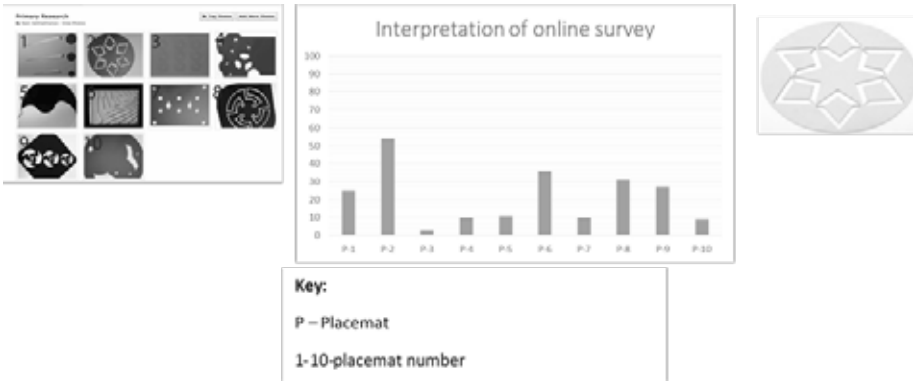
| Design | Criteria | A | B | C | D | E | F | G | H | Weighted | ranking | Rating |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Concepts | Weighting | [8.1] | [3.7] | [5.6] | [3.2] | [4.6] | [6.2] | [2.7] | [10] | Rating total | (10 to 100) | |
| Concept 1 | Rating | *80* | *90* | *85* | *80* | *78* | *83* | *79* | *84* | 3639.7 | 9.3 | 3 |
| | R x W | 648 | 333 | 476 | 256 | 358.8 | 514.6 | 213.3 | 840 | | | |
| Concept 2 | Rating | *88* | *85* | *90* | *79* | *73* | *85* | *82* | *85* | 3727.3 | 9.5 | 2 |
| | R x W | 721.8 | 314.5 | 504 | 252.8 | 335.8 | 527 | 221.4 | 850 | | | |
| Concept 3 | Rating | *90* | *89* | *95* | *88* | *89* | *85* | *94* | *85* | 3912.1 | 10 | 1 |
| | R x W | 729 | 329.3 | 532 | 281.6 | 409.4 | 527 | 253.8 | 850 | | | |
| Concept 4 | Rating | *83* | *85* | *75* | *80* | *88* | *83* | *85* | *79* | 3601.7 | 9.2 | 4 |
| | R x W | 672.3 | 314.5 | 420 | 256 | 404.8 | 514.6 | 229.5 | 790 | | | |
| Concept 5 | Rating | *78* | *80* | *81* | *75* | *95* | *79* | *85* | *76* | 3537.7 | 9.0 | 6 |
| | R x W | 631.8 | 296 | 453.6 | 240 | 437 | 489.8 | 229.5 | 760 | | | |
| Concept 6 | Rating | *83*<br>672.3 | *85*<br>314.5 | *80*<br>448 | *85*<br>272 | *93*<br>427.8 | *75*<br>465 | *88*<br>237.6 | *75*<br>750 | 3587.2 | 9.1 | 5 |

Table 4 shows the concepts and their associated importance of criteria ratings. The concepts were as follows: a handbag, a bedside lamp, a table placemat, a head scarf, a piece of wall art, and a neckpiece; they were coded as concept 1, 2, 3, 4, 5, and 6 respectively, with concept 3 being

the table placemat. The results were used to inform the development of the design brief. The Letters A-H on Table 4 represent the criteria e. g fashion etc.; and the numbers in square brackets [ ] represent the importance of criteria. The numbers in *italics* represent the % rating of design concepts in a sensitivity curve when plotted in a graph (see figure 2). From the figures, the optimum choice is Concept 3 with a score of 10, followed by concept 2 with a score of 9.2 which was very close. This meant that the focus group had selected Concept 3 – a table mat. According to the United States Patent Office (1962), placemats are mats used customarily as place settings on a dining table. The United States Patent Office notes that such mats are useful for other purposes such as pads beneath lamps and the vast majority of the placemats today are used as protective elements primarily, the decorative features being secondary.

The Facebook online survey participants were given a selection of 10 placemat prototypes (see figure 3) and requested to rank them on a scale of 1-10, according to their preference. The participants were also requested to justify their choice/ranking. Out of the one hundred respondents in the online survey, 54% selected the *Knees of the Tortoise* pattern (P-2 in Figure 3) consisting of a series of semi-structured triangular designs in a muted brown colour for the placemat.

**Figure 3: Design samples and the selection of the knees of the Tortoise pattern**




From the comments given by the participants when justifying their choice, the majority of respondents selected the Knees of the Tortoise design on the following grounds: (1) 10% of the respondents felt an emotional attachment to the pattern; (2) 20% felt the pattern reflected the principle of Botho (social contract of mutual respect, responsibility and accountability that members of society have toward each other);

(3) 10% felt the pattern reinforced the respondents' Tswana cultural identity in its use of colour; (4) 20% of the respondents selected it for its pattern design; and (5) 30% selected it because they felt it represented Tswana cultural identity in its combination of colour and pattern shape.

### *Implementation phase*

Once the design brief, informed by the literature review, the focus group, and the online survey, was articulated, the final product design specification that would guide the development of the final design concepts during the implementation phase was developed. Stainless steel was considered to be the best material for the placemat due to its aesthetic properties, finishing, and joining, while acrylic was selected for its bright and modern colour range, as well as for its durability. Modern technology in the form of a Computer Numerical Control (CNC) Water Jet Cutter was used to manufacture the table place-mat and coasters. The manufacture of the prototype resulted in a near zero wastage as un-used materials were used for by-products such as a table centrepiece (used to display a flower), and an abstract wall art. In addition, all the artwork generated during the market identification, conceptual design and product development phase were catalogued and archived for copyright protection.

## Discussion and conclusions

The case study set out to test the viability of the culture-based design framework and process developed by Lin (2005, 2006). The case study was successful in generating insights into the process of infusing cultural knowledge into the design of modern products. The case study also offered a learning moment for local designers especially in the analysis of the Tswana Baskets using the three cultural levels.

Buchanan (1998) observed that the ultimate purpose or function of design in society is to conceive products which express and necessarily, reconcile human values concerning what is good, useful, just and pleasurable. The online survey resulted in a rich source of data on the cultural value ascribed to the Knees of the Tortoise pattern by the survey respondents. The respondents of the online survey seemed to respond to the Knees of the Tortoise pattern at two cultural levels: the overall appearance of the pattern, including the form and colour of the pattern, product function, cultural values, and individual feelings, emotions and perceptions.

In addition, the culture-based design framework and process developed by Lin (2005, 2006) provides an important framework to

enhance the design process through the use of cultural-based design research and specifications; as well as an important resource for localized design innovation and inspiration.

**References**


Archer, B. (1995). The nature of research. *Codesign: Interdisciplinary Journal of Design,* 2, 6-13.

Best, K. (2006). *Design Management.* Singapore: AVA Book Production

Boeijen A.V., Daalhuizen,J., Zijlstra, J., & Schoor, R.V.D. (2013). *Delft Design Guide: Design Methods*. Amsterdam: BIS Publishers.

Botswana craft Gallery. (2010). *Botswana Basketry*. Retrieved on date 10 September, 2013 from http://www.botswanacraft.bw/gallery/index.html.

Botswana Vision 2016 Council, 2010.Vision 2016 Booklet.

Botswana Government. Ministry of Labour and Home Affairs. (2002). *National Policy on Culture.* Gaborone: Government Printer.

Botswana Government. Ministry of Finance and Development Planning. (2010). *National Development Plan 10.* Gaborone: Government Printer.

Botswana Government. Ministry of Local Government and Rural Development. (2013). *Botswana Handicraft Catalogue*. Government Printer.

Buchanan, R. (1998). Branzi's dilemma: Design in contemporary culture. *Design Issues* 14 (1), 3-20.

Bryman, A & Burgess, R.G. (1994). *Analyzing Qualitative Data.* London: Routledge.

Desmit, P & Hekkart, P. (2007). Framework of product experience. *International Journal of Design,* 1(1) 57-66.

Fallon, T. C. (2005). *Combinex®-A Method for Sound Decisions.* Retrieved on January 01, 2011, from http://www.google.co.uk/#sclient=psy&hl=en&q=carlos+fallon+combinexpdf.

Gerdes, P. (2003). *Awakening of Geometrical Thought in Early Culture.* Retrieved 10 December, 2014 from http://www.integreon.com/.

Geddes, P. (1998). *Women, Art and Geometry in Southern Africa*. Lawrenceville NJ: Africa World Press.

Hall, E. T. (1990). *The Silent Language.* New York: Anchor Books.

Hammersley, M. & Atkinson, P. (1995). *Ethnography: Principles in Practice*. London: Routledge.

Hofstede, G. (1991). *Culture and Organisations: Software of the Mind.*

London: McGraw-Hill.

Hsieh, M. H. & Guan, S. S. (2011). Differences in design innovation forms in creating artistic cultural commodities. デザイン学研究 58 (4), 97-104.

ISO 9001:2000. Quality management systems – Requirements. Geneva.

Lee, K.P. (2004). Design methods for cross-cultural collaborative design project. In J. Redmond, D. Durling & A. De Bono (eds.), *Proceedings of Design Research Society International Conference*. Paper #135, DRS Futureground, Monash University, Australia.

Leong, D. & Clark, H. (2003). Culture-based knowledge: Towards new design thinking and practice - A dialogue. *Design Issues, 19* (3), 48-58.

Lin, R. (2005). Creative learning model for cross cultural product. *Art Appreciation*, *1*, 52-59.

Lin, R. (2006). Scenario and story-telling approach in cross cultural design. *Art Appreciation,* 2(5), 4-10.

Lin, R.T. (2007). Transforming Taiwan aboriginal cultural features into modern product design: A case study of cross cultural product design model. *International Journal of Design*, 1(2), 45–53.

Lupo, E. (2011). Design, arts and aesthetic innovation. *Strategic Design Research Journal, 4*(2), 40-53.

McHarch, I. (1992). *Design with Culture*. London: John Wiley and Sons.

McLoughlin, C. (1999). Culturally responsive technology use: Developing an on-line community of learners. *British Journal of Education Technology*, 30(3), 231-243.

Matsuhashi, N., Kuijer, L. & De Jong, A.M. (2009). A Culture-inspired approach to gaining insights for designing sustainable practices. *Sixth International Symposium on Environmentally Conscious Design and Inverse Manufacturing* Sapporo, Japan: *The Japan Society of Mechanical Engineers.*

Moalosi, R., Popovic, V., & Hudson A. (2004). Socio-cultural factors that impact upon human-centered design in Botswana. In J. Redmond, D. Durling, & A. de Bono (eds.), *Proceedings of Design Research Society International Conference – Futureground* (Paper No.716), Melbourne: Monash University.

Moalosi, R., Popovic, V., Hudson A. & Kumar, K. L. (2005). Product analysis in relation to the social-cultural perspective of Botswana.

*International Design Congress Proceedings*. Taiwan: National Yunlin University of Science and Technology.

Nettleton, A. (2010). *Life in a Zulu Village: Modernity in South Africa*. Retrieved 19 January, 2015 from http//www.journalofmoderncraft.com/docs/nettleton.pdf.

Novellino, D & Ertug, Z.F. (2006). Baskets of the world: The social significance of plaited crafts. *Proceedings of the IV International Congress of Ethnobotany* (ICEB 2005), 2006, 619-620. Retrieved 19 January, 2015 from http//www.worldcat.org/title/baskets of the/643968136.

Oliver, P. (1997). *Research for Business Marketing and Education*. London: Hodder and Stroughton Educational.

Oliver, P. (2006). Purposive sampling. In V. Jupp (ed.), *The SAGE Dictionary of Social Research Methods*, Retrieved 10 October 2015 from: http://srmo.sagepub.com/view/the-sage-dictionary-of-social-research-methods/n162.xml.

Pugh. S, (1991). *Total Design-integrated Methods for Successful Product Engineering.* Harlow: Addison-Wesley.

Schwartz, S. (1997). Values and cultures. In C. D. Munro & J. Schumaker. (eds.). *Motivation and Culture* (69-84). New York: Routledge.

Selfridge, R & Sokolik, S. (1975). A comprehensive view of organizational management. *MSU Business Topic*s, 23 (1), 46-61.

Strauss, A.L & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. London: Sage.

United States Patent Office (1962). US Patent 3,050,185 Disposable Place Mats. Retrieved from 17 December 2014, from https://www.google.com/patents/US3050185.

Yang, X.Y. (2010). *Culture Trends for Contemporary Design in the 21st Century.* University of Technology Institute of Art and Design. Retrieved from http://www.idemployee.id.tue.nl/g.w.m.rauterberg/conferences/CD_doNotOpen/ADC/final_paper/265.pdf.

Young, P. A. (2008). The culture-based-model: Constructing a model of culture. *Educational Technology and Society*, 11 (2).