

Cultural Ergonomics Beyond Culture - The Collector as Consumer in Cultural Product Design

John Kreifeldt¹, Yuma Taru², Ming-Xean Sun³, and Rungtai Lin^{2(✉)}

¹ Tufts University, Medford, MA, USA
john.kreifeldt@tufts.edu

² Graduate School of Creative Industry Design, National Taiwan University of Arts,
Ban Ciao City, Taipei 22058, Taiwan
lihan.workshop@gmail.com, rtlin@mail.ntua.edu.tw

³ Institute of Applied Arts, National Chiao Tung University, Hsinchu 300, Taiwan
buddasfox@gmail.com

Abstract. The purpose of this study is 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 by taking advantage of new production technology, they may be transformed into modern products and so fulfill the needs of the contemporary consumer market. The gungu, literally "weaving box", in the Atayal aboriginal language, was chosen as the cultural object for this study. The paper focuses on and analyzes the weaving box's appearance, usability, cultural meaning, operational interface, and the scenario in which it is used. Then, this article intends to create an interface for examining the way designers communicate across cultures as well as the interwoven experience of design and culture in the design process.

Keywords: Cultural ergonomics · Weaving box · Cross cultural design · Taiwan aboriginal culture

1 Introduction

Designing local features into products appears to be more and more important in the global market where products are losing their identity because of similarities in technology, function, and form. Cultural features then are considered to be unique characters to embed into a product both for the enhancement of its identity in the global market and for the fulfilment of the individual consumer's experiences (Hsu et al. 2013). Using local features in design fields as a strategy to create product identity in the global market, the designer has noted the importance of associating products with cultural features in order to enhance product value (Lin 2009). At this point, the field of Industrial Design has played an important role in embedding cultural elements into products and in increasing cultural value in the global competitive product market. Therefore, designing a product with local features in order to emphasize its cultural value has become a critical issue in the design process (Hsu et al. 2011).

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 products will be a design trend in the global market. Obviously, we need a better understanding of cross-cultural communications not only for the global market, but also for local design. While cross-cultural issues become important 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 worthy of further in-depth study (Lin et al. 2009). The importance of studying culture is shown repeatedly in several studies in all areas of technology design.

In the global market - local design era, connections between culture and design have become increasingly close. For design, cultural value-adding creates the core of product value. It’s the same for culture; design is the motivation for pushing cultural development forward. Therefore, based on the “Taiwan Experience”, the purpose of this paper is to study how to transfer “cultural features” to design elements, and design “cross culture” into cultural products to reinforce their design value (Lin and Lin 2010). This paper has established a cross-cultural design model to provide designers with a valuable reference for designing a successful cultural product. Results presented herein create an interface for examining the way designers communicate across cultures as well as the interwoven experience of design and culture in the design process (Lin 2007).

2 The Collector as a Consumer

A successful consumer product is perhaps the most difficult of human use products to design. A successful product means that enough are purchased and at a price to return a sufficient and timely profit to its manufacturer. Unlike the bespoke tailor or shoemaker who designs for a particular person, the consumer product designer is greatly handicapped by knowing little about the users for whom he is designing (and will likely never see) except perhaps in a statistical way. And any consumer statistic varies greatly among potential users especially in the international market.

Furthermore, unlike designing for users of industrial, military, aviation, or medical products, the designer of a consumer product faces perhaps the ultimate challenge: the consumer has the option of choice especially in a competitive market. A consumer need not purchase the designer’s product. And even if purchased, the product need not be used resulting in lack of repurchase sales or bad word-of-mouth publicity. And even if used it may not be used correctly nor safely, nor maintained correctly or at all if such is required, etc., all with similar negative impacts on future sales.

The basic anthropometric and physiological variables determine the goodness of “fit” of the product to the user or the ability to use it “correctly” (i.e., safely and functionally as the designer intended). The human body has definite limitations in sizes, ranges, preferred direction of motions, etc. The magnitude of the difficulty in designing a successful consumer product becomes clearer as consumer variation in those psychological and aesthetic factors which critically affect purchase are added to the “goodness of fit” variables (Lin and Kreifeldt 2001).

The architect Louis Sullivan’s dictum that “form follows function” is largely true if “function” is carefully determined and “form” implemented thoughtfully to “fit” the body.

The form can then be both physically and to some extent aesthetically pleasing because it conforms to the human body rather than depending upon the body to conform to it (Moore 1992). The well-known adaptability of the human is both a benefit and drawback in design in as much as it may be depended upon too much by the designer. Likewise, the early Industrial Designer Dreyfuss (1984, 2012) rejected the speculative design of external form alone as irrelevant. He believed that fitting machines to the users would be most efficient. Focus groups, interviews, questionnaires and such are techniques for trying to determine consumer likes/dislikes and preferences. Psycho-statistical techniques such as Multidimensional Scaling (MDS) and its relatives are further aides (Lutz and Ramsey 1974). While these have proven to be of help, it is rare that consumers can articulate their aesthetic preferences in a way useful for designers.

Consumers are usually unable to verbalize the correct reasons why they like and dislike a product which can then easily lead the designer astray. For example, the user swinging golf clubs to test them may have a strong preference for the “feel” of one versus the others or may want “more” of that particular “feel”. The designer must deal with its physical attributes but the user is largely unable to verbalize what he means by “feel” or what the preferred one has that the others do not in words helpful to the designer. This is because the “feel” of the club is strongly related to its moment-of-inertia (I) which, although clearly perceptible, is a term and even concept unknown to users and even to some designers (Kreifeldt et al. 2011).

The aesthetic response of potential consumers has become a driving factor in product design. However, designers are even more handicapped because of the consumers’ inability to verbalize their aesthetic preferences clearly and in design useful manner (Norman 2004). In terms of paint, canvas, frame and labour, a painting as a product would cost little. Yet a collector is willing to pay an amount for it that far exceeds its nominal value. So the design question becomes: why? The collector as consumer may provide design useful insights into purposeful aesthetic design (Kreifeldt et al. 2011; Kaplan 2004). Towards this end, aesthetic response is explored here via a particular Western person’s reaction to a seemingly simple user “product” – a gungu - designed

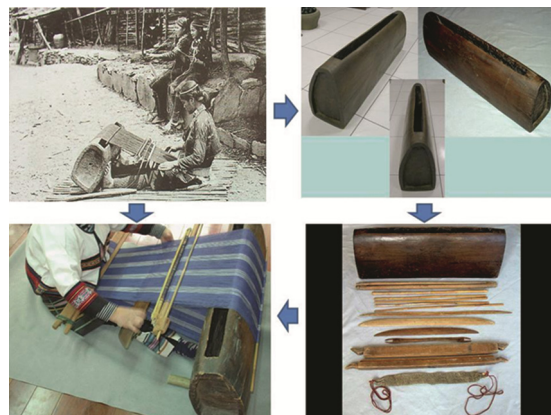


Fig. 1. A gungu designed as a weaving as practice tool (Lin and Kreifeldt 2014)

long ago for the art of weaving as practiced by Taiwan's aboriginal Atayal weavers as shown in Fig. 1.

3 What Do You See in that Old Thing?

The Atayal weaver used a primitive type of loom sometimes called a “backstrap” or “back tension” loom. This apparatus is a type also found in many cultures particularly in South East Asian countries like Malaysia and Indonesia. Although “primitive”, it permitted complex patterns of considerable beauty to be woven (Varutti 2015).

To use the loom, the weaver braced her feet against the gungu around which the continuous warp threads passed completing their circuit around the breast beam held near her body by a strap fastened at each end and passing behind her back: hence the name “backstrap”. The weaver would alternately tighten and loosen the warp threads as part of the weaving process. She did this by pushing with her feet against the box creating a strain against the strap against her back to tighten the thread tension as she “beat” a new weft (cross) thread down and then relaxed to loosen the tension so that she could insert the next weft thread as shown in Fig. 2. She continued this basic process until the weaving was completed (Chang et al. 2008).



Fig. 2. Backstrap used in weaving process (Lin and Kreifeldt 2014)

The first view the collector had of such a box or even knew of its existence or purpose was in a small village town in Taiwan. The box was sitting on the floor of a modern Atayal weaver's shop and the collector described it as “leaping up” and speaking directly to his collector's soul. It appeared to him as a sculptural object with a rich golden, honey-brown patina from generations of bare feet pressing and rubbing against it.

To a collector, “weaving box” hardly gives an adequate picture of that object. In cold technical terms it was of wood and about 1½ shoulder widths wide with a sort of triangular cross section having smoothly rounded corners to facilitate the passage of the warp threads around it. The base was about 12” wide and tapered upward perhaps 14” to a smoothly rounded top which had a slit opening wide enough to admit the various sticks, shuttle, beater, backstrap and other weaving apparatus for storage as well as the weaving in progress (See Fig. 2). The hollow construction with the slit in the top made it also function as a resonant cavity. In the old days of head-taking the gungu was beat like a drum to raise an alarm or when a man brought a head back to the village to bring good fortune after some unwanted occurrence such as crop failure (Chang et al. 2008).

The weaver did not want to sell the box because it was part of her family heirlooms which was perfectly understandable and correct. Too many cultural items – material manifestations of the culture and examples by which it may be studied - have been lost or left their homes into museums and private collections. The only arguments collectors can offer are that such objects will be cherished, cared for, and preserved against the very real possibility that left in situ they might be forever lost. Moreover, such objects can foster wider interest in cultures which may be losing the fight against the transforming forces and pressures of societal evolution toward a secular rather than a spiritual society (Varutti 2015).

A wise man of the famous Iban weaving people in Borneo said that a society which is moving forward without spiritual fulfilment is paving the way for its own self-destruction and extinction. The artifacts of a culture are its external expression. Modern products need a connection with a spiritual foundation. And a culture must find its spiritual foundation (Lin et al. 2016).

4 Implications for Cultural Product Design

The extrinsic or manifest properties of the weaving box could serve as models for cultural product designs. Superficial function and appearance are important in product design. They can make the consumer/viewer respond: “that really appeals to me” or “that’s interesting”. But more is needed to gain real attraction to the consumer/viewer. Those are the intrinsic properties of culture which speak directly to the interior feelings or soul of the viewer. By incorporating these, the viewer may well say not just that the product is attractive but that he really desires it (Lin et al. 2015). That is, he may respond as a collector does in his desire to possess something because it touches his heart and soul and consequently be willing to spend considerable money to possess it. A common question asked of a collector who prizes a simple looking artifice such as the gungu is: What do you see in that old thing? “See” is a very short word standing for a very complex emotional reaction from seeing as well as an experiencing an actual and virtual haptic sensation of tactile feeling (Lin and Kreifeldt 2014).

The first response is to the box’s extrinsic surface appearances: the sculptural qualities of size, form and shape; the color; the wonderful patina; the surface qualities of smoothness as well as the pleasing irregularities of a lovingly handmade object. The eye can partially detect these for the mind which can be additionally pleased by the virtual haptic sensations the eye sets up. Looking at an object arouses virtual sensations of tactile feel if attention is paid. The art connoisseur Bernard Berenson said that he experienced “ideated sensations” in front of paintings which stimulated his tactile sense and changed the tonus of his muscles. But the hand passed over the surface of the gungu is pleased beyond what the eye can detect and induce. Here the regular and irregular textures, the smooths and the roughs, the curves and the planes, the solidity and much more are directly felt and enjoyed. “Don’t Touch” is a cruel prohibition to the haptic aesthetic sensibilities (Lin and Kreifeldt 2014). It is the equivalent of posting “Don’t Look” beside the Mona Lisa. And even the ear is pleased by the sound from thumping the box and perhaps images come to mind knowing the history of its use as a drum. These are all

satisfactions arising from sensory impressions and to some extent might be judged to be superficial.

But secondly, at a deeper and emotional level, a sensitive observer may “see”, “feel” or even “hear” as though he were actually there the sharp clack-clack of the beaters of generations of women as they press against that box and perhaps sing as they loom cloth to clothe their children and menfolk and their spiritual times when weaving the now nearly lost powerful patterns of spiritual protection, ritual use, and cultural meaning (Kring et al. 2006). Such a collector is in contact with people of long ago and far away and there is both joy and sadness in that old weaving box. That is what one can “see” in that old thing (Lin and Kreifeldt 2014).

To a sensitive observer, the weavings made on such looms of the aboriginal peoples are also appealing as is nearly anything handmade in which the passion and “soul” of the artist as well as the technique can be perceived. Unfortunately, all the old authentic weavings seem to exist only in museums, collections and/or as fragments. In so many native cultures around the world the knowledge and necessity for their arts and crafts and spirituality have either vanished or are vanishing. Sadly, this is also true for Taiwan’s aboriginals (Lin and Kreifeldt 2014). But for those who lament this fact, let them simply pay the aboriginal artists the price for their art and it will flourish as never before.

However, one must be discerning in what is purchased. If only the best is accepted, only the best will be produced. The old axiom: “bad money drives out good money” is equally true in that accepting inferior work drives out better work. It is amazing that the aboriginal women carried information for weaving complicated patterns in their memories and were able to execute it on their backstrap looms. Such knowledge needed to be carefully passed down from mother to daughter by example and instruction. Once that chain is broken, and without the means of recording the weaving instructions, a pattern could be lost to posterity.

Taiwan however is very fortunate that through the painstaking and loving work over many years by Professor Yu-Shan Tsai at Fu Jen Catholic University and of Mrs. Yuma Taru in Miaoli County, many of the aboriginal patterns which would otherwise be lost have now been preserved in modern weavers’ notation so that they can be woven again. The world owes a great deal to such women.

The old authentic pieces were woven on a backstrap loom and made of hand spun material such as ramie. Before commercial dyes with their bright and wide range of colors became available, the threads were colored with native dyes. Although old patterns may be copied, modern pieces are now often woven of commercial cotton threads using commercial dyes and on a modern floor loom. Moreover, the “authentic” pieces were woven within a definite spiritual and cultural ethic (Lee 2000; Lin and Kreifeldt 2014).

Does a modern weaving suffer for these reasons against the authentic? To a collector; yes - to some extent. Clothiers appraising a fabric speak of its “hand” meaning its “feel” (Kreifeldt et al. 2011). The “feel” of a product can be as important as its “look” in terms of satisfaction. (In some cases, such as a razor or toothbrush, “feel” is more important than “look”.) The beauty of a pattern, identical in a modern and in an old weaving, may be the same. However the “feel” to the fingers of a modern weaving with its uniform, smooth, commercial cotton threads differs greatly from that of an old weaving with its

rougher threads of irregularly hand spun ramie. This difference is also apparent on close visual inspection. And of course, the history of the two pieces is importantly different.

Collectors of tribal art generally prefer the “authentic”. They even attribute to it that important aspect of “honesty” of a work made for use within a particular ethnic culture. In fact, some collectors will accept only objects showing signs of tribal wear as an indication of its being “authentic” as long as the wear itself is “authentic”. Wear tells its own stories about a tribal piece.

5 Framework for Hand Held Products

Because of their conservative natures “primitive” cultures have much to teach about modern product design. Such cultures have generally slowly and cleverly improved their tools. An example is the paddy cutting knife carved from a deer antler by an Iban man of Borneo as shown in Fig. 3. Although serving only as knife to cut the ripe rice stalks several features may be noted. Firstly, although a humble utilitarian tool it is beautifully carved with figures. In fact its beauty attracted its collector. The carved figures are not necessary for performing its physical function but have great spiritual symbolism to these people. They are also suggestive of the human need for beauty as shown in Fig. 3 (Kreifeldt and Hill 1974; Liu 2007; Lin et al. 2016).

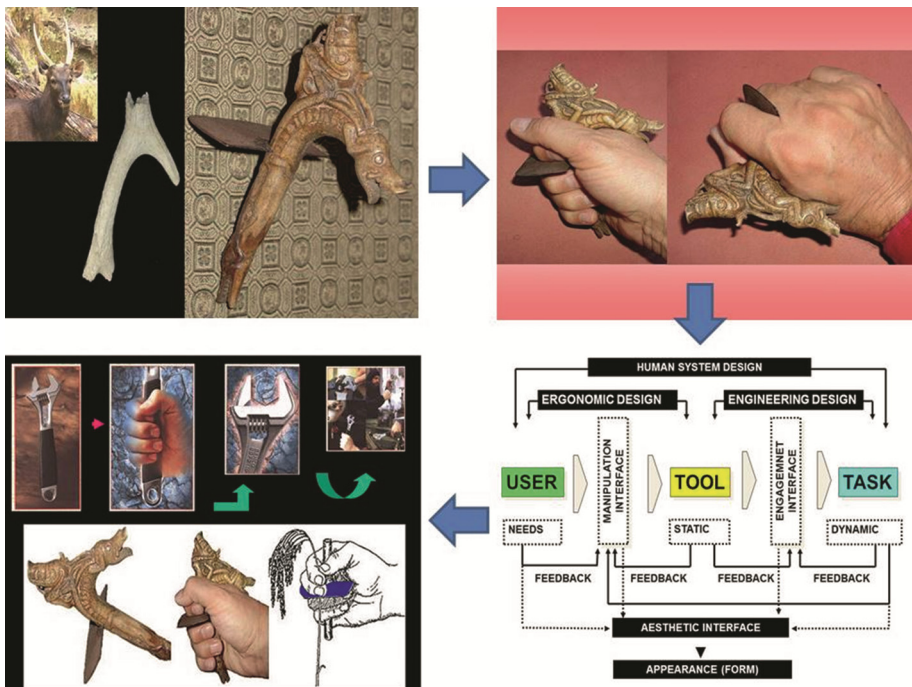


Fig. 3. Framework for Hand held products (Lin and Kreifeldt 2014)

Secondly, its design form permits gathering and cutting the rice stalk easily and naturally with one hand (one hand operation). Thirdly, and importantly for product designers, the “product designer” had taken advantage of the pronged shape of the antler so that the tool naturally conforms to the hand which has the effect of the tool holding the hand rather than the hand holding the tool. That frees up the fingers of the hand to perform the tool’s function rather than being devoted to holding the tool. An examination of such simple tools or products of other cultures can readily suggest design principles (Kreifeldt and Hill 1974; Lin et al. 2016).

The “preference for the primitive” exists in every culture and every age. The “old ways” seem better than the “new ways”. There is the feeling that older and less “sophisticated” works are morally and aesthetically superior to modern ones. Even the ancient Greeks looked to their past as being better. An Iban grandmother in Borneo complained that her granddaughters having been to school are now quite useless because now they “can’t cook, can’t mind babies, and can’t even make a mat” (Lin and Kreifeldt 2014). This simple statement emphasizes that “education” is a double edged sword or perhaps a sword without a grasping handle: dangerous to both user and foe. Where and how did this particular attractiveness of earlier products arise? They were generally made for a particular person, or for one’s God or king. The desire was to please by all the perfection and ingenuity of which the maker was capable believing that the recipient would take no less (Kreifeldt and Hill 1974; Lin et al. 2016).

What may be gained in product design by the use of globally available technology can also produce a profound loss as that characterless technology replaces the local cultural underpinnings that create a unique character. This leads to products with an “international” design lacking any particular, pleasingly, and identifiable cultural identity. As a result they may be valued for the money paid for them but they are not treasured or cherished because they do not “speak” to the owner. They are quickly discarded when an “improved” version comes to market (Lin and Kreifeldt 2014).

6 Summary

Taiwan is a multi-culture blend of traditional Chinese with significant East Asian influences including Japanese and such Western influences as American, Spanish and Dutch. With their beautiful and primitive visual arts and crafts, Taiwan’s aboriginal cultures should have great potential for enhancing design value and being recognized in the global market (Lee 1982). Evidence shows that the prospect of Taiwan’s local cultures will undoubtedly become crucial cultural elements in future design applications. Over time, Taiwan gradually developed its own distinct culture, mostly from a variation of Hoklo culture from Southern China (Lee 1997). Of course, the Taiwanese aboriginals also have distinct cultures. For example, aboriginal music from the Bunun tribe played at the 1996 Olympic Games brought that form of music to the global arena. Additionally, martial art movies from Bruce Lee to Jacky Chan to the Oscar-winning movie director Ang Lee have promoted recognition of Taiwanese culture at the international level (Wu et al. 2004, 2005).

The increasing emphasis on localized cultural development in Taiwan demonstrates an ambition to promote the Taiwanese style in the global economic market. Current design philosophy and practice in Taiwan is directed to producing products with cultural significance to compete in the global market. Then a product may be produced which the consumer not only values for the money paid for it but is also treasured and cherished (Hsu et al. 2013).

Acknowledgements. The authors gratefully acknowledge the support for this research provided by the Ministry of Science and Technology, Taiwan under Grants 103-2221-E-144-001-MY2 and 103-2410-H-144-003-MY2. The authors also wish to thank those who contributed to the research.

References

- Chang, J., Wall, G., Chang, C.L.: Perception of the authenticity of Atayal woven handicrafts in Wulai, Taiwan. *J. Hosp. Leisure Mark.* **16**(4), 385–409 (2008)
- Dreyfuss, H.: *Symbol Sourcebook: An Authoritative Guide to International Graphic Symbols*. Wiley, Hoboken (1984, 2012)
- Hsu, C.-H., Lin, C.-L., Lin, R.: A study of framework and process development for cultural product design. In: Rau, P. (ed.) *IDGD 2011. LNCS*, vol. 6775, pp. 55–64. Springer, Heidelberg (2011)
- Hsu, C.-H., Chang, S.-H., Lin, R.: A design strategy for turning local culture into global market products. *Int. J. Aff. Eng.* **12**, 275–283 (2013)
- Kaplan, M.: Introduction: adding a cultural dimension to human factors. In: *Advances in Human Performance and Cognitive Engineering Research*, vol. 4, pp. XI–XVII (2004)
- Kreifeldt, J.G., Hill, P.H.: Toward a theory of man-tool system design applications to the consumer product area. In: *Proceedings of Human Factors and Ergonomics Society Annual Meeting* (1974)
- Kreifeldt, J., Lin, R., Chuang, M.-C.: The importance of “feel” in product design feel: the neglected aesthetic “Do Not Touch”. In: Rau, P. (ed.) *IDGD 2011. LNCS*, vol. 6775, pp. 312–321. Springer, Heidelberg (2011)
- Kring, J.B.B., Morgan, J., Kaplan, M.: Cultural ergonomics. In: Karwowski, W. (ed.) *International Encyclopedia of Ergonomics and Human Factors*, vol. 3, 2nd edn. CRC Press, Boca Raton (2006)
- Lin, C.L., Chen, S.J., Hsiao, W.H., Lin, R.: Cultural ergonomics in interactional and experiential design: conceptual framework and case study of the Taiwanese twin cup. *Appl. Ergon.* **52**, 242–252 (2016)
- Lin, R., Kreifeldt, J.: *Do Not Touch – A Conversation Between Dechnology to Humart*. NTUA, New Taipei City (2014)
- Lin, R., Kreifeldt, J., Hung, P.-H., Chen, J.-L.: From dechnology to humart – a case study of Taiwan design development. In: Rau, P. (ed.) *CCD 2015. LNCS*, vol. 9181, pp. 263–273. Springer, Heidelberg (2015)
- Lin, R., Kreifeldt, J.G.: Ergonomics in wearable computer design. *Int. J. Ind. Ergon.* **27**, 259–269 (2001)
- Lee, R.K.: *The Immigration of Taiwan Southern Island Tribes*. Charng-Ming Culture, Taipei (1997)
- Lee, S.L.: Garments culture of Taiwan aborigines. *Hist. Objects* **87**, 14–28 (2000)
- Lee, Y.Y.: *Taiwan Aboriginal Society and Culture*. Linking Book, Taipei (1982)
- Lin, R.: Transforming Taiwan aboriginal cultural features into modern product design: a case study of a cross-cultural product design model. *Int. J. Des.* **1**, 45–53 (2007)

- Lin, R.: Designing friendship into modern products. In: Toller, J.C. (ed.) *Friendships: Types, Cultural, Psychological and Social*, pp. 1–24. Nova Science Publishers, New York (2009)
- Lin, R., Lin, P.-H., Shiao, W.-S., Lin, S.-H.: Cultural aspect of interaction design beyond human-computer interaction. In: Aykin, N. (ed.) *IDGD 2009. LNCS*, vol. 5623, pp. 49–58. Springer, Heidelberg (2009)
- Lin, R., Lin, C.-L.: From digital archive to e-business: a case study of turning “art” to “e-business”. In: *Proceedings of 2010 International Conference on E-Business* (2010)
- Liu, C.W.: *Culture and Art of the Formosan Aboriginal*. Hsiung-Shih Art Book, Taipei (2007)
- Lutz, F.W., Ramsey, M.A.: The use of anthropological field methods in education. *Educ. Res.* **3**(10), 5–9 (1974)
- Moore, J.D.: Pattern and meaning in prehistoric Peruvian architecture: the architecture of social control in the Chimu state. *Latin Am. Antiq.* **3**, 95–113 (1992)
- Norman, D.A.: *Emotional Design: Why We Love (or Hate) Everyday Things*. Basic Books, New York (2004)
- Varutti, M.: Crafting heritage: artisans and the making of Indigenous heritage in contemporary Taiwan. *Int. J. Herit. Stud.* **21**(10), 1036–1049 (2015)
- Wu, T.Y., Hsu, C.H., Lin, R.: A study of Taiwan aboriginal culture on product design. In: *Proceedings of Design Research Society International Conference – Futureground* (2004)
- Wu, T.Y., Cheng, H., Lin, R.: A study of cultural interface in the Taiwan aboriginal twin-cup. In: Salvendy, G. (ed.) *Proceedings of the 11th International Conference on Human-Computer Interaction*, Lawrence Erlbaum Associates, Las Vegas, Nevada, Mahwah, New Jersey, USA (2005)