

Designing for wearable and fashionable interactions

Exploring narrative design and cultural semantics for design anthropology

Wei-Chen Chang and Rung-Tai Lin

Chang Gung University | National Taiwan University of Arts Taipei

This research examines wearable, fashionable interaction design to mediate the narrative and semiotic concepts found in technology and fashion. We discuss the principles of design anthropology using Taiwan proverbs to transmit the “people-situation-reason-object” method and analyze five case studies that provide new approaches for designers engaged in future industry. Design anthropology attempts to engage physiological and psychological design through technological function, meaning formation, and fashion aesthetics to achieve cognition between people and the environment. The wearable, fashionable interaction displays characteristics of narrative and semantics transmitted through craft culture as well as collective, cheerful, and creative performance. It is a confident and innovative attempt, which bears a joyful and fundamental interface. This study takes two directions, with cultural thinking serving as the basis to establish a set of traditional craft designs and interactive objects that assist designers in using the senses to inform and initiate new lifestyle values.

Keywords: design anthropology, wearable and fashionable design, proverbs culture application, product design, design practice

1. Introduction

Wearable, fashionable interaction design integrated with sense technology is about to become available through human-centered design that is more focused on “methodologies and techniques for interacting with people in such a manner as to facilitate the detection of meanings, desires and needs, either by verbal or non-verbal means” (Giacomin, 2014). How these wearable, fashionable products align with style conventions imparts both intelligence and fashion trends. Picture

this future scenario: A customer buys his products in the market. He presses a computer touchscreen and his products appear within seconds. This may sound like a sci-fi movie, but such magic products will soon be changing our lifestyles. Basic research in this area has not achieved maturation and question remains what kinds of products “should be released.” The human mind is exceedingly capable of grasping the salient features of complex situations and social relationships, which are captured in words such as “value,” “significance,” “important,” or “bottom line,” in a word, “meaning” (Freeman, 2004). So, if we apply cultural semantics through this model, we should get the meanings of wearable, fashionable interaction products that can be selected directly. What products should we use in the future? Markussen and Krogh (2008) suggested that people use technology and reorganize their cultural background, knowledge, and expectations imaginatively. Thus, product designers will surely continue to play with colors and styles, but hi-tech intelligent experiences are ready for design. In addition to the ordinary purposes of understanding the five senses, people are also equipped with interactive functions like visual acuity, automatic color analysis, and the transmission of data for fashion consumption. Kim DeReuter pointed out that this wearable technology cannot only engage with our other senses but also with the effects of gravity (iQ by Intel and PSFK Labs, 2014). The designers’ own culture and values, their sense of connectedness with the product being designed, their emotions, aesthetic preferences, and other nonphysical aspects all come into play (Razzaghi & Ramirez, 2005). Resistant to the attitude of customers, usage barriers and value barriers highly impact the opposition to wearable devices (Sun & Luarn, 2016). This research aims to determine the answers to questions related to the creation of value such that people are willing to pay more for the next five years of the technology bubble (Bleak, 2016; Chi, 2014; Tsai, 2013) and (2) utilization of cultural value in wearable and fashionable product design. The final goal of future industry is to create a model that can satisfy the human senses.

Cultural semantics and narrative design are discussed in the hope that designs, apart from meeting their functional purpose, can also fulfill “expressive meaning.” Interactive systems hinge on addressing the relationship between embodied interaction and cultural meaning construction (Markussen & Krogh, 2008). A successful product designer does not only seek solutions for problems when working on product design. He or she also tries to convey certain “connotations” outside of the expected functions by applying narrative design and scientific techniques to create reasonable products that yield cultural value for users. Therefore, this study suggests a positive experience all around, especially for personalized commodities. Wearable, fashionable, interactive products – to which narratology and cultural coding are applied – are discussed to explore cultural semantics and narrative design as the foundation to construct the relationship

between wearable fashion and culturally creative design. This paper argues for the establishment of a wearable, fashionable, and interactive design model so that designers might evaluate the demand for sensory experience in the interactions between fashion and technology.

1.1 Wearable and fashionable interactions

Because of the recent personalization of technology, we communicate and share details about ourselves regardless of distance. Wearable devices convey a unique portrait of their wearers, creating a continuous link between people, simulating closeness, changing the way we understand one another, enabling new forms of attention and care, and enabling meaningful experiences (Fawkes & Lachut, 2014). A product is the manifestation of a culture and civilization, as well as the integration of meaningful expression and personal aesthetics. Certain controllable aspects of interactive products showed clear patterns of emotion in the responses of our participants. These wearable, fashionable interactive products also exhibit one's perception toward life, a display that can resonate with its user. McGregor (2013) pointed out that wearable technology connects to what the customer needs, such as getting a new health or fitness device, supporting innovation and innovators, or imagining the unimaginable.

A perfect storm of innovation, sensory technology, big data, cloud services, voice user interfaces, and mobile computing power are coming together to pave the way for connected wearable technologies (Svanberg, 2013). However, the industry trend remains translating professional data to the needs of the public market, a process in which user demand creates personalized commodities (Lin, 2014). Therefore, the design process begins with a definition of goals and objectives and concludes with how it resonates with the consumer (see Figure 1) (Lin & Kreifeldt, 2001). This framework is used to study customer factors related to available intention and the relationship among the five "W"s: what's the problem, what exists, what's wanted, what's real, and what's safe. The designer develops a conceptual framework for wearable and fashionable product design that focuses attention on interactions between intellectual need, creative interface, consumer demand, emotional cognizance, and health care. The main wearable devices abandoning reason is that up to 21% of consumers believe that the function and options are still limited (Ericsson Consumer Lab, 2016). Apparently, there are huge opportunities for wearable manufacturers to improve functionality and, consequently, customer satisfaction. A product may therefore be produced that the consumer values and cherishes (Hsu, Chang, & Lin, 2013).

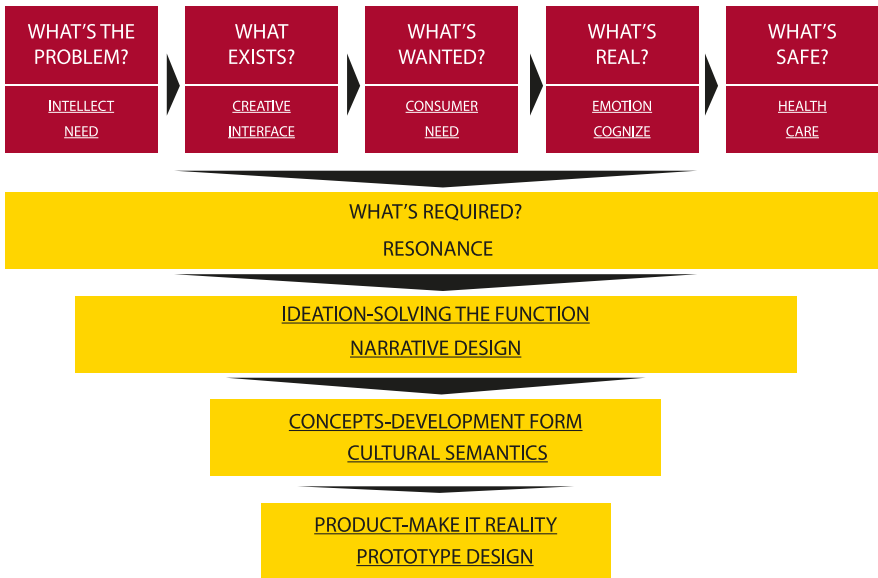


Figure 1. Available intention for wearable, fashionable interactive products

1.2 Wearable computing

Hi-tech materials were first developed in the early-21st century. Eventually, there will be intelligent fibers with memory capable of taking us into a fantastic new world. Fibers that remember their shapes are an important branch of intelligent materials. Textiles made with intelligent materials can sense and respond to external stimuli. Clothes made from such materials are equipped with certain memory and become intelligent. When you put on your clothes, you are wearing a computer. This is the future trend for clothing. Many intelligent products have already been developed. But lifestyle product categories in the market are grabbing consumers' attention. It is, however, possible that they can co-exist successfully in their niche markets (Nguyen, 2016).

The LifeShirt developed by VivoMetrics Inc. of the US has been popular among professionals in risky businesses since it was initially marketed (see Table 1). In Finland, one company has designed an intelligent piece of children's clothing in which a built-in thermometer monitors body temperature (Galbraith, 2016).

A practical wearable computer depends upon a number of factors organized under the user/tool/task framework. This framework is a common design factor in consumer product design (Kreifeldt & Hill, 1976; Kreifeldt, 1982). The key method of wearable computer design is fulfillment of the user's need and satisfaction, including product appearance (form) (see Figure 2) (Lin & Kreifeldt, 2001).

The related framework has inspired the stages of a wearable fashion model, from the manipulation interface (accessible, wearable, body posture, orientation, comfortable, user-friendly) to the engagement interface. This framework was developed to guide designers as they think about how interaction can change given new feedback via human system task, adaptive feedback, exploration, and immersion. The following presents a comprehensive overview of the human system design framework, which involves thinking activities, the role of design in cognition, and how barriers to wearable computing can provide essential feedback

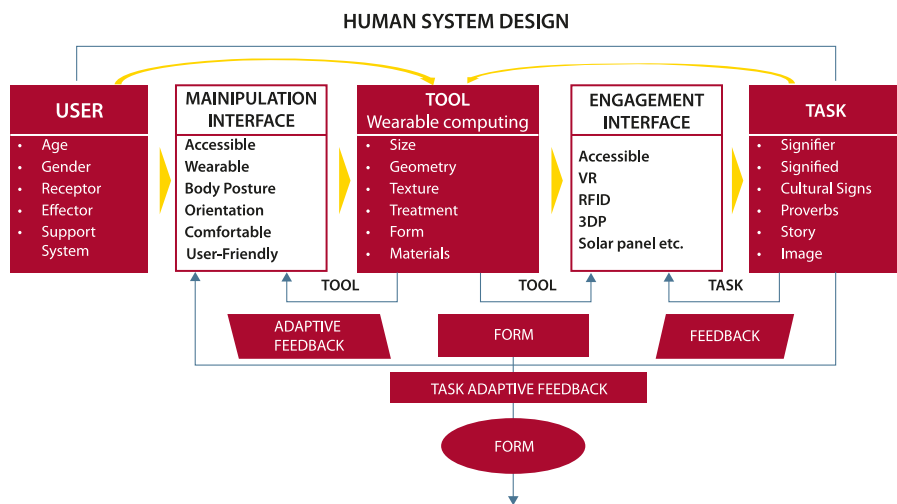


Figure 2. The user-tool-task method as a wearable computer design framework

1.3 Fashionable technology

Interactive design has a strong impact on fashion technology. It not only adequately demonstrates concepts for future products but also carries influence equal to that of a fashion aesthetic. It may even affect social and economic performance while reshaping people's attitude toward clothing. In other words, the interactive design of different garment makers is slated to become a unique way of communication in garment production. Technologies are undergoing rapid evolution, from wristbands and glasses to clothing and embedded devices (Fawkes & Lachut, 2014). IDTechEx's wearable technology research has been turbulent, with a meteoric rise in hype. The conclusions from the report state that wearable technology products are thriving, with a total market value of over \$50bn in 2019. This historic growth is driven by product types, including smart watches, continuous glucose monitoring devices (CGM), hearing aids, headphones, augmented reality (AR), virtual reality (VR), and mixed reality (MR). In addition, many new types

of wearable technology products have emerged during this time, ranging from new types of electronic skin patches to smart apparel made with electronic textiles, and other new technologies fit for footwear, rings, and headbands, like VR, radio frequency identification (RFID), and 3D printing (3DP) (Hayward, 2019). Burr (2015) mentioned that we must give context to data in order for the wearer's experience to be meaningful and valuable in the establishment of baseline sport performance and fitness activity that provides individualized feedback necessary for improvement. This results in a data-driven trend toward individualized, customized exercise plans. In this section, we analyze the accessories worn by people and present insights into an online field survey conducted in April 2013 involving 4,656 US individuals aged 18–88 years (see Figure 3) (Forrester, 2013). In this way, accessory designers develop certain expectations that can interact with their designs. By purposely considering different parts of the design, designers can better understand how the design interacts with their users and perhaps reconsider or improve upon a product's interface.

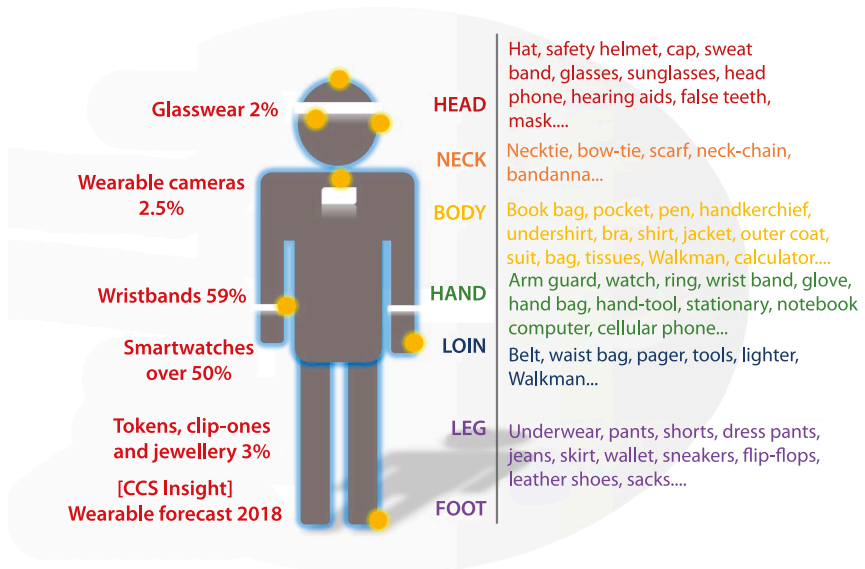


Figure 3. Wearable and fashionable product's interface design for accessories

2. Wearable and fashionable interactions produced by narrative design and cultural semantics

We deconstructed the interactions of accessories developed to support the wearable, fashionable interactive design process. In this paper, we expand the model

with related literature and use it to analyze the design process. The survey targeted users of wearable, fashion interactive products (see Figure 1). The framework describes the interactions with a wearable, fashionable interactive product over time in human system design (see Figure 2). Using narrative design and cultural semantics as strategies to create product identity in the global market, designers assign products with cultural features to enhance product value. This requires a better understanding of cross-cultural communications for participating in the target market and developing local sources. Lin (2007) pointed out that cross-cultural issues have 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. The importance of studying culture has been repeatedly stressed in studies in all areas of technology design (Ho, Lin & Liu, 1996; Lin, 2005).

2.1 Wearable and fashionable interactions product design in narrative design

The user behavior model is one of the design steps adopted in interactive product design. It stresses an awareness of context when considering the intelligence features of wearable applications. We also summarize a narrative for real-life, rule-based applications that intelligently assist users according to their behavioral rules in their daily activities. The designer creates a scene or employs the user's story to depict the likely product appearance in the design. Narratology is the theory and study of narratives, their structures, and how they affect our perception. The field analyzes various narrated texts in terms of theatrical structure, plot device, characterization, scenes, types, and literary skills. When describing a narrative, the most important part is the standpoint from which the story relates. Barthes (1968) mentioned in his book "S/Z" that the narrative code insinuates the cognition of action in a text. When such a code manifests a certain cultural value, it is a cultural code (Hofstede, 1994).

Barthes (1968) also pointed out that this turned into structuralistic narratology, using three hierarchal levels: functions, actions, and narration to analyze a narrative text. "Functions" are the basic elements of a narrative work (the theme and descriptive words in the story). Through the metaphors in a narrative, the lives of people are treated as stories that are regarded as meaningful and practicable, permitting the lives of humans to be experienced as a way to cure human needs. Audiences are encouraged to relate their own stories through externalization, destruction, and rewriting, as well as to find new meaning and direction in the story.

In Narratology: An Introduction to the Theory of Narrative, narratology as a theory is related to the narration, narrative text, image, event, incident, and “story telling” of a cultural product. The structure of the narrative is hinged together through the special features or behaviors of the characters and then complemented with a plan or method to achieve the purpose of making the reader understand the story. The basic narrative structure consists of four elements: background, purpose (or question), method (or solution), and ending (Lin & Kreifeldt, 2001). When a designer creates scenes or adopts users’ stories to depict an interactive design product, he or she is designing and studying likely problems. He or she can use narratological language expression and psychological therapy to understand the “cognition” of users, meaning the path of behavioral cognition, which triggers questions, provides associations, and fuses specific reference points to depict the cultural context of the scenes he or she creates. Symbols could be words, gestures, pictures, or objects that carry a specific meaning within a culture (Hofstede, 1994). Gaver (2003) suggests that we have to map the “ambiguity of context,” which requires an integration of seemingly incompatible meanings. Therefore, designing a product with local features in order to emphasize its cultural value has become a critical issue in the design process (Hsu, Lin, & Lin, 2011). It can be used to stimulate curiosity, generate a suspenseful or surprising effect, produce conflicts, or set up one or more events (De, 1991; Lin, 1994; Bordwell & Thompson, 2001).


2.2 Function application of narrative design in design of wearable and fashionable interactions

Narrative is the vessel that carries the message expressed through “story.” Therefore, it includes people’s needs and the expressive function of “story.” In the following examples, the story expresses emotion on three “levels,” whereas “narrative design” identifies the needs of the users, extrapolating functional analysis through understanding their life stories. Therapeutic conversation is an approach to help people deal with their plights and problems and solve the problems (Lin, 1988).

Barthes (1975) splits this work into three hierarchical levels: “functions,” “actions,” and “narration.” “Functions” are the elementary pieces of work, such as a single descriptive word that can be used to identify a character. Further design decisions had to be made about how to represent different narrative states for the user at the interface levels.



The interaction is derived from our location in a physical and social world as embodied actors (Harrison, Sengers, & Tatar, 2007). Therefore, the intelligent clothes listed above show that humans no longer use only conventional fibers as clothing materials. Informational technology and advanced data transmission

Table 1. Three hierarchal levels of narrative design: Example 1

| Level | Story | Narrative | Healthy coat |
|---|---|---|---|
| Function level <Background> <Purpose> | 1. Story theme 2. Plot 3. Subject 4. Elements | Lili has had the habit of smoking for many years and she “could not control her smoking addiction”. |  |
| Action level <Method> | 1. Pragmatics 2. Grammar; 3. Semantics | It would be convenient if there were a device to “tell the level of smoking addiction immediately”! | |
| Narrative level <Result> | 1. Symbolic beauty 2. Formal beauty 3. Medium perception beauty | Wearing the “clothes with the design of lungs”, the lungs on the clothes turn black as soon as she lights up a cigarette. | |

Note: Arranged for this study; photo source: www.oobject.com.

Table 2. Three hierarchal levels of narrative design: Example 1

| Level | Story | Narrative | Hug shirt |
|---|--|--|---|
| Function level <Background> <Purpose> | 1. Main theme of story 2. Background character 3. Venue atmosphere | Linda is “alone” studying “abroad” and gets “homesick”. |  |
| Action level <Method> | 1. Character structure 2. Execution structure | By making a phone call, the “clothes” transmit Linda’s strong hug, body warmth and heartbeat. |  |
| Narrative level <Result> | 1. Character structure 2. Execution structure | Embracing the clothes immediately sends the other’s passion to Linda and Janet, who she has not seen for years and misses so much, giving each other a hug right away. | |

Note: Arranged for this study; photo source: www.oobject.com.

technology have innovative approaches that can lead to new lifestyles, changing the way humanity lives. The inter-infiltration between cultures, technologies, and thoughts will be expedited across the globe. Hence, narrative design allows design-

ers to interpret past human events, introduce experience and cognition of past action into their designs, and combine story-mapping strategies as a function of “design anthropology.” Design will turn from tangible to intangible, and practical product design will change to wearable and fashionable product design through phenomenologically situated interactive thinking. The role of interactive design will be to help realize and meet practical needs in people’s lives as well as to continue improving upon efficiency of use (feasibility) and experience (function).

3. Design case studies




Using local features in design fields as a strategy to create product identity in the global market, the designer notes the importance of associating products with cultural features to enhance product value (Lin, 2009). Observably, this reflection on reconstructing model interactions has given us some initial insights into relevant steps and constructs. In consideration of how “wearable and fashionable product design” can support culture interaction over time, we now present five design cases in which an interactive, future environment was developed and qualitatively evaluated with humans in a cultural context. These two narrative design cases were chosen because wearable, fashionable interactive models were key features of their design process. User evaluations showed that they were deconstructing user needs. We describe the developed design, interaction scenario, and the user study set-up for each case below. After this, we how we analyzed each design case.

3.1 Form application of cultural semantics in design of wearable and fashionable interactions

Cultural semantics is the vessel that carries the message expressed through “language.” It includes people’s images and the expressive function of “language.” In the following examples, a diversified sense of value and the meaning of local cultures should be integrated into a designer’s aesthetic to display different possible lifestyles and resonate with consumers.




Liang (2012) suggests that successful designs depend on how their unexpectedness supports spontaneous and improvisational meaning-making in a given context. The above examples take a shared sense of perception, providing the designer insight into the cultural pulse through the process of meaning-making, which is also an important element in distinguishing between different materials. Only through cultural semantics will the emotional elements in careful design be expressed. Only through the proverbial is it possible to realize the meaning of the designers in the particular handmade design. Ross and Wensveen (2010)

Table 3. Three hierarchal levels of proverbs: Example 1 – A good tree cannot bear bad fruit, nor can a bad tree bear good fruit

| Signifier | Signified | Technology |
|---|--|---|
| <p>(台)歹竹出好筍。 phai²¹tek' chhut' ho' sun⁴ 歹竹 出好 筍 歹竹 出好 筍 歹竹 出好 筍</p>  | Education Early Life In Taiwan – Environmental protection | Solar panel Handmade craft |
| Object sign | Cultural signs | |
|  | Grow up Better Level |  |
| Signifier | Signified | |
| Bamboo | Three Straight | |





Note: Arranged for this study; photos sources: google.com and Techno-Craft Lab.

Table 4. Three hierarchal levels of proverbs: Example 2 – to remember where one's happiness comes from

| Signifier | Signified | Technology |
|--|--|---|
|  | Education Early Life In Taiwan April showers bring May- flowers. | RFID 3D printing |
| Object sign | Cultural signs | |
|  | Source Favors Level |  |
| Signifier | Signified | |
| Bamboo | Three Seeds | |

Note: Arranged for this study; photos sources: google.com and Techno-Craft Lab.

Table 5. Three hierarchical levels of proverbs: Example 3 – the flower is inserted on the cow pie

| Signifier | Signified | Technology |
|---|--|---|
|  | Loving Personal Value Communication Compensation. | LED RFID (Radio Frequency Identification) GPS |
| Object sign | Cultural signs | |
|  | Beautiful Pretty Ugly |  |
| Signifier | Signified | |
| Flower | Dung Flower |  |

Note: Arranged for this study; photos sources: google.com and Techno-Craft Lab

pointed out that the aesthetics of interactive behavior imply a social and ethical dimension. This study tries to construct the principal factor of cultural elements in wearable, fashionable interaction design as the reasonable certification and use of culture through materiality as a means to help designers find the right emotional expression for the product (content). Simultaneously, narrative approaches and cultural semantics are employed to help designers learn to listen closely to customers and communicate with them through RFID or LED tech.

3.2 Implications from design anthropology for model thinking

The wearable and fashionable interactions product design model allows designers to apply cultural semantics to logically connect and integrate the user's thoughts into their designs in order to satisfy users' product experience. This study, therefore, attempts to apply the "wearable, fashionable interactive model" to analyze the future of product design, and explore how to base interactive design on narrative and cultural semantics. The designer must empathize with users and establish an observable experience in line with both user demand and the interactive design concept. This process necessitates meaning-making, understanding, and intentionality.

Design anthropology enables designers to use emotional perspectives of various groups to “observe” people instead of the market. In the spirit of “while in Rome, do as the Romans do,” designers utilize feeling, ritual, story, and poetry as inspiration. Through storytelling and exploration, they select elements and details of a design from the surrounding environment (Alison, 2010). Design anthropology, which emphasizes concepts of form and function, understands people’s experience in product design in addition to related value and meaning. Through observation and inquiry about people’s experience, relations among human affairs, time, and environment is considered, which boosts designer confidence in understanding the culture. The American Institute of Graphic Arts (AIGA, 2008) detailed the following objectives of “Anthropology & Design”: (1) Define the problem: help understanding of question and message confirmation; (2) Find the people: types of people studied and confirmation of people’s question; (3) Plan an approach: data collection to carry out field survey and understand data, emphasis of “five senses” experience; (4) Collect data: observation of details and participative observation; (5) Analyze data and interpret opportunities: analysis of field survey and transformation of observation into “story”; (6) Share insights: storytelling, opinion sharing and creation of narrative. We can see from the above that story plays an important role in “design anthropology.” The field of study has a strong impact on future products. It adequately demonstrates concepts for future products and carries influence equal to that of fashion aesthetics, affecting social and economic performance and reshaping people’s sense of value toward the product aesthetic. In other words, the design anthropology of different product makers has become a unique way of communication in cross-cultural exchange.

The expression of cultural contexts in different design examples explains that the character and image of design anthropology are established through language manifestation. Cultural contexts are brought to every corner of life in order to guide consumer lifestyles and reflect user experience through design anthropology. Design anthropology – measured by cultural understanding – considers cultural elements as part of a product’s design, which purports to convey culture. Therefore, the wearable and fashionable interactions product design model can be said to be a major domain of design anthropology.

4. Model of wearable and fashionable interactions product design

The stages of wearable and fashionable interactions product design model guide designers in thinking about how users show form and function within a local culture (i.e. proverbs) using stories to influence design values. In addition to

both explicit and symbolic communication values, “narrative design” and “cultural semantics” are also capable of cultural communication, which is relevant to people’s desire for expression. Through innovative product design, narrative design and cultural semantics – both crucial aspects of design anthropology – can be conceptualized to accomplish element application and establish unique styles. This paper offers a model for wearable, fashionable interactive product design, as summarized in Figure 4, which includes the following narrative design tools: (1) Function level-physical (material), (2) Action level-social (behavior), and (3) Narrative level-spiritual (ideal). These three levels of narrative design inform the design process from concept to product. Where cultural semantics can be incorporated into product, three levels can be identified: (1) Signifier-visceral design, (2) Cultural signs-behavioral design, and (3) Signified-reflective design.

There are three phases of the wearable and fashionable product design model: (1) the raw function of a manufacturing material from a physical supply aspect, (2) how this material is processed in consideration of human behavior, and (3) the means in which finished goods are distributed to end consumers.

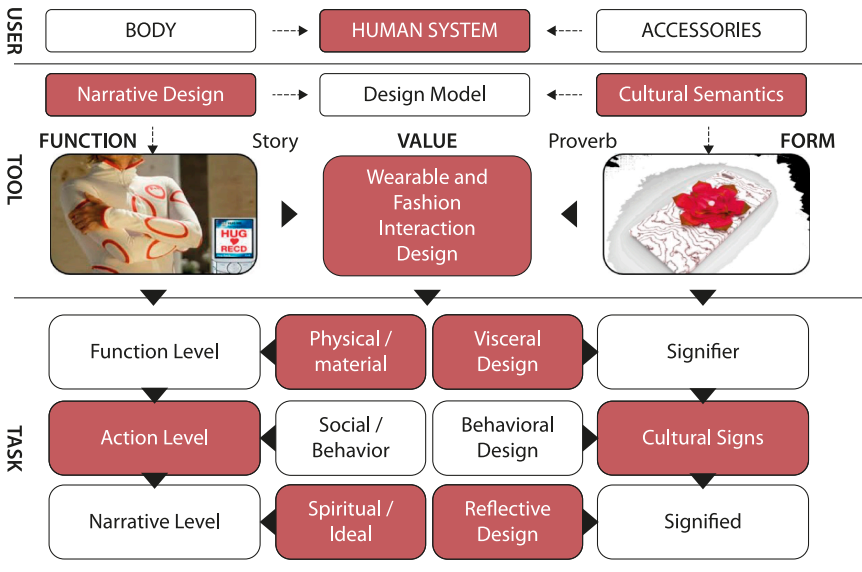


Figure 4. Wearable and fashionable interactions product design model by design anthropology

In this study, we adopted an in-depth method of interviewing six experts. We asked open-ended questions informed by the wearable and fashionable interaction product design model and further discussed the model. Narrative design and cultural semantics conveyed by our deconstruction of the model were discussed

deeply to understand the production’s design orientation, value, and proverb application concerning wearable and fashionable product designs such as bag design. The survey focused on three prototypes and model formulations, comparing the design of three products along with prototype application. Collecting data by in-depth interviewing. For example, one interviewee was a 42-year-old design manger, with a masters degree, who earned 70000 NT a month, and is currently a technological company employee.

Bag No. 1 (see Table 3) with a proverbial spirit and comfortable leather, describing the origin of the story of the ethical family proverb. Understanding the connection between Taiwan proverbs and product design. Having feelings for the product which seems to tell a story. It impresses and touches me, and makes me willing to buy the story-based product. Simile proverb design is also the material used by the designer through “reasonable” design development and decoding (Mr. Chen).

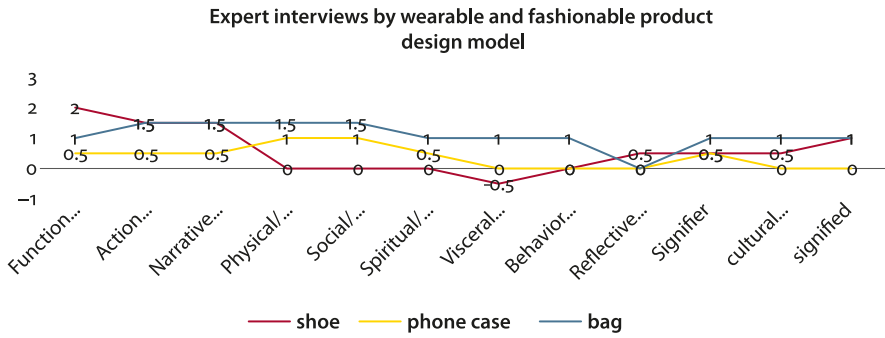


Figure 5. Application of SD method in verifying model calculation in three prototypes

4.1 Design derived from the inner and outer design anthropology values

Design anthropology, which emphasizes human centralism and human nature, seeks to understand people’s experience in product design in addition to its related value and meaning in their lives. Human life becomes more meaningful because of stories, something we especially see in regards to the first bag (see Table 3). Cultural narrative is infused into people, as they grow up tethered to the process of communication. This study has discovered that narratives and cultural semantics are pervasive in all aspects of culture. Narratives and cultural semantics are used to communicate cultural elements in interactive designs, as well as bring about future products that may objectively inform our lifestyle. If we can cherish the culture of our forbearers, acknowledge the connection and influence of proverbs and designers’ use of emotion and language in “wearable and fash-

ionable product designs,” the cultural and personal significance of a product will increase. Fully utilizing cultural contexts (inner) and narrative design (outer) will help us design products that increase their cultural connotations, allowing them to better meet the sensory demands of users. Life can be viewed as a narrative influenced by social context and the cultural conventions of telling. One can imagine a life that is lived, experienced, and told about in a way that depicts a complete relationship between varied cultural contexts.

The user, cultural context, and the environment will interact with one another to achieve the “story” effect in design anthropology. Since the nature of design anthropology is to use the meaning of contexts as the foundation for the creation of product value, it means different contexts will imply different connotations, expressing different meanings of the design value. The designer should add cultural and emotional elements to express non-rational emotional dispositions through this context. The expression of design anthropology exists within cultural contexts. Therefore, design anthropology enables designers to use emotional perspectives of various groups to “observe” people and promote cultural value.

5. Conclusion

The increasing emphasis on localized cultural development in Taiwan demonstrates the ambition to promote the Taiwanese style in the global economic market. Current design philosophy and practice in Taiwan is directed toward producing products with cultural significance to compete in the global market. Therefore, Taiwan proverbs offer recognizable connotations for enhancing design value. The “wearable and fashionable interactions product design” model also has a strong influence that prompts people’s aesthetic and cultural values in contemporary society.

This paper deconstructs the available intention and user-tool-task method found in human systems design to consider how the design anthropology process is being used to create new value within a future market. The wearable, fashionable interactive design concept includes cultural semantics and narrative design to experience the full expression of ideas. Further, cultural values and narration – in combination with consumer demand – engage with personal experience to explain the business value created. Design value that regards local people as important symbols should be developed together with local culture. We have to think about ways to polish various resources in our lives and relationships at both individual and collective levels. The wearable, fashionable interactive product provides an example of applying cultural semantics and narrative design to design while retaining meaningful cultural value. Strong wearable computing and

fashionable technology efforts should be a key component of any company's overall business strategy.

Consumer behavior in this global market is reflected in "wearable and fashionable product design." Especially since the Internet and modern computer technologies have broadened designers' potential in the global perspective, society as a whole has rapidly changed as new technologies have been integrated into everyday business practices and community affairs. Designers must also rise to the challenges of the new millennium. To contemporary designers, not only is creative ability the combination of aesthetics and culture, but it also now includes applying culture and technology. Traditional culture as a designing medium is an essential tool. In order to accomplish this, designers must be equipped with contemporary aesthetics and creative abilities, deal with fashionable technologies, and understand the accordant connotations. Further, because of the rapid development of modern technology, technology aesthetics and cultural value have become inseparable. Due to the close relationship between culture and aesthetics, the technology aesthetic experience needs to be the focus of cultural value in the human system design. Thus, this research suggests beginning from the perspective of "design anthropology" to explore materials and characteristics available through local resources in order to further develop "wearable, fashionable interactive" design products. An emotional design value needs to be developed if designers are to develop re-specified procedures for future designs.

Funding

The authors gratefully acknowledges the support for this research provided by the Ministry of Science and Technology, Taiwan (TW) No. 103-2410-H-182-018.

Acknowledgements

The authors wish to thank the various students who designed the products presented in this paper, especially, Kang-Hsiu Chang Chien, Yi-Ting Chen.

References

- American Institute of Graphic Arts (AIGA) (2008). An ethnography primer. Retrieved from <http://www.aiga.org/content.cfm/ethnography-primer>
- Alison, J.C. (2010). *Design anthropology-Object culture in the 21st century*. New York, NY: Springer Wien.

- Barthes, R. (1968). *Elements of semiology*. (A. Lavers & C. Smith, Trans.). New York, NY: Hill & Wang.
- Barthes, R. (1966). *An introduction to the structural analysis of narrative*. Birmingham, UK: University of Birmingham.
- Bleak, S. (2016). The next five years the technology bubble. Retrieved from <http://www.bnext.com.tw/column/view/id/40987>
- Bordwell, D., & Thompson, K. (2001). *Film art: An introduction*. New York, NY: McGraw-Hill Education, Inc.
- Burr, S. (2015). Adidas wearables boss: The trend is for more sensors on the wrist. Retrieved from <http://www.wearable.com/meet-the-boss/adidas-wearables-boss-the-trend-is-for-more-sensors-on-the-wrist>
- Chi, H. (2014). Wearable devices business of opportunities innovative applications become the key to the market. Retrieved from http://www.mem.com.tw/article_content.asp?sn=1410020011&page=2
- De, S. (1991). *Putting difference to work*. New York, NY: Norton.
- iQ by Intel and PSFK Labs (2014). Future of wearable tech report. Retrieved from <http://www.slideshare.net/InteliQ/future-ofwearabletech>
- Ericsson Consumer Lab (2016). Retrieved from <https://www.ericsson.com/thinkingahead/consumerlab/consumer-insights/wearable-technology-and-the-internet-of-things>
- Fawkes, P., & Lachut, S. (2014). The future of wearable tech key trends driving the form and function of personal devices. Retrieved from http://hacedores.com/wp-content/uploads/2014/04/future-of-wearable-tech_v1.0.2.1.pdf
- Forrester (2013). North American Technographics® consumer technology survey. Retrieved from <https://www.forrester.com/North+American+Technographics+Consumer+Technology+Survey+2013/-/E-SUS2092>
- Freeman, W. J. (2004). How and why brains create meaning from sensory information. *International Journal of Bifurcation and Chaos*, 14(2), 515–530. <https://doi.org/10.1142/S0218127404009405>
- Galbraith, D. (2016). Best interactive clothes. Retrieved from <http://www.oobject.com/category/best-interactive-clothes/>
- Gaver, W. W., Beaver, J., & Benford, S. (2003). Ambiguity as a resource for design. In V. Bellotti & T. Erickson (Eds.). *Proceedings of the SIGCHI conference on Human Factors in Computing Systems* (pp. 233–240). New York, NY: ACM.
- Giacomin, J. (2014). What is human centered design? *The Design Journal*, 17(4), 606–623. <https://doi.org/10.2752/175630614X14056185480186>
- Harrison, S., Sengers, P., & Tatar, D. (2007). The three paradigms of HCI. Retrieved from <https://people.cs.vt.edu/~srh/Downloads/TheThreeParadigmsofHCI.pdf>
- Ho, M. C., Lin, C. H., & Liu, Y. C. (1996). Some speculations on developing cultural commodities. *Journal of Design*, 1(1), 1–15. (in Chinese)
- Hofstede, G. (1994). Cultures and organizations: Software of the mind: Intercultural cooperation and its importance for survival. Retrieved from <https://bi.snu.ac.kr/Courses/4ai14s/140522.pdf>
- Hsu, C. H., Chang, S. H., & Lin, R. (2013). A design strategy for turning local culture into global market products. *International Journal of Affective Engineering*, 12(2), 275–283. <https://doi.org/10.5057/ijae.12.275>

- Hsu, C.-H., Lin, C.-L., & Lin, R. (2011). A study of framework and process development for cultural product design. In P.L.P. Rau (Ed.), *Internationalization, design and global development* (pp. 55–64). Berlin, Heidelberg: Springer.
https://doi.org/10.1007/978-3-642-21660-2_7
- Hu, Y.M. (1994). *Narratology*. Hubei, China: Huazhong Normal University.
- Hayward, J. (2019). A comprehensive overview of markets across all wearable electronic devices, from smartwatches to skin patches, AR, VR and MR to hearables, smart clothing to smart eyewear, and more. Retrieved from <https://www.idtechex.com/zh/research-report/wearable-technology-forecasts-2019-2029/680?setlang=zh>
- Kreifeldt, J., Taru, Y., Sun, M.X., & Lin, R. (2016). Cultural ergonomics beyond culture – The collector as consumer in cultural product design. In P.L. Rau (Ed.). *Cross-Cultural Design. CCD 2016. Lecture Notes in Computer Science*, vol 9741. (pp. 355–364). Cham, Switzerland: Springer International. https://doi.org/10.1007/978-3-319-40093-8_36
- Kreifeldt, J.G., & Hill, P.H. (1976). The integration of human factors and industrial design for consumer products. *Proceedings of the Human Factors Society Annual Meeting*, 20(5), 108–112. <https://doi.org/10.1177/154193127602000502>
- Kreifeldt, J.G. (1982). Consumer product design projects for human factors classes. *Proceedings of the Human Factors Society Annual Meeting*, 26(8), 735–739.
<https://doi.org/10.1177/154193128202600816>
- Liang, R.H. (2012). Designing for unexpected encounters with digital products: Case studies of serendipity as felt experience. *International Journal of Design*, 6(1), 41–58. Retrieved from <http://www.ijdesign.org/index.php/IJDesign/article/view/1059/402>
- Lin, J.Y. (2014). Wearing technology is weak, the consumer market is shrinking. *Global Views Monthly*, 332.
- Lin, R. (2009). Designing friendship into modern products. In J.C. Toller (Ed.), *Friendships: Types, cultural, psychological and social* (pp. 1–24). New York, NY: Nova Science Publishers.
- Lin, R.T. (2005). Creative learning model for cross-cultural products. *Art appreciation*, 1(12), 52–59.
- Lin, R., & Kreifeldt, J.G. (2001). Ergonomics in wearable computer design. *International Journal of Industrial Ergonomics*, 27(4), 259–269.
[https://doi.org/10.1016/S0169-8141\(00\)00055-X](https://doi.org/10.1016/S0169-8141(00)00055-X)
- Lin, S.W. (1988). *Children's literature*. Taipei, Taiwan: Wu-nan Books.
- Lin, W.B. (1994). *Story writing in children's literature*. Taipei, Taiwan: Caterpillar Foundation of Philosophy.
- Markussen, T., & Krogh, P.G. (2008). Mapping cultural frame shifting in interaction design with blending theory. *International Journal of Design*, 2(2), 5–17. Retrieved from <http://www.ijdesign.org/index.php/IJDesign/article/view/323/162>
- McGregor, S. (2013). Wearable technologies enabling the next wave of internet of things innovation. Retrieved from <https://bi.snu.ac.kr/Courses/4ai14s/140522.pdf>
- Nguyen, M. (2016). The most successful wearable for consumers. Retrieved from <https://www.wearable-technologies.com/2016/01/the-most-successful-wearables-for-consumers/>
- Razzaghi, M., & Ramirez, M., Jr. (2005). *The influence of the designers' own culture on the design aspects of products* [Framework]. Retrieved from <https://pdfs.semanticscholar.org/f714/68fae8f4a32a60b3c367bdf03c9a2c890fi8.pdf>
- Ross, P.R., & Wensveen, S.A.G. (2010). Designing behavior in interaction: Using aesthetic experience as a mechanism for design. *International Journal of Design*, 4(2), 3–13. Retrieved from <https://pure.tue.nl/ws/portalfiles/portal/3033502/Metis244210.pdf>

- Sun, C. H., & Luarn, P. (2016). A factorial study of innovation resistance for wearable device customers (Unpublished master dissertation). National Taiwan University of Science and Technology, Taipei, Taiwan.
- Svanberg, J. (2013). Wearable computing shipments to pass 64 million by 2107. *Berg Insight*. Retrieved from <http://http://www.chewontech.com/2013/11/wearable-computing-shipments-to-pass-64.html>
- Tsai, C. H. (2013). Wearable devices business of opportunities innovative applications become the key to the market. Retrieved from http://www.mem.com.tw/article_content.asp?sn=1410020011&page=2

Address for correspondence

Wei-Chen Chang
Department of Industrial Design
Chang Gung University
259 Wen-Hwa 1st Road
Kwei-Shan, Tao-Yuan
Taiwan, R.O.C.
weichen@mail.cgu.edu.tw

Biographical notes

Wei-Chen Chang is an Assistant Professor and bag designer in the Department of Industrial Design, Chang Gung University, R.O.C., and holds a PhD in Design Research from National Yunlin University of Science and Technology. She excels in the craft aesthetics theme, which arranges design projects for bachelor and masters students in that department and promotes accessory design course of the Hwa-Kang Xing-Ye Foundation. Her research interests include the development of modern craftsmanship applied to design anthropology, including product design, techno-craft design, design aesthetics, cultural commodity design, and lifestyle study.

Rung-Tai Lin is a Professor in the Department of Crafts and Design, National Taiwan University of Arts, Taipei, Taiwan. Professor Lin was previously President of Mingchi Institute of Technology (1996–2002) and Chang Gung Institute of Technology (2002–2003). He earned his diploma in Industrial Design from Mingchi Institute of Technology in 1973 and his BS degree in Industrial Management from National Taiwan University of Science and Technology in 1982. He received his MS and PhD degrees in Engineering Design from Tufts University, MA, USA, in 1988 and 1992, respectively. His graduate work in Industrial Design focused on the integration of computer aided industrial design and expert systems in the design process. Lin has authored/co-authored over 200 papers and presented over 50 papers at professional conferences throughout the world. His research interests are ergonomics in product design, human-computer interaction, and cognitive approach in design. His recent research focused on cultural and creative product design
rtlin@mail.ntua.edu.tw

Copyright of Interaction Studies is the property of John Benjamins Publishing Co. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.