

Innovation of Smart Jewelry for the Future

Yi Song^{*}

Beijing Institute of Fashion Technology, CO., Beijing, 100029, China

Abstract

Smart jewelry is a subcategory of wearable devices. Compared with conventional jewelry, smart jewelry has advantages such as beautified appearance, wearability, and practicability. As an emerging category, smart jewelry has attracted much attention from developers and consumers, but it is still at an initial stage of development and is faced with arduous difficulties and challenges. This paper analyzes the consumption characteristics and market performance of smart jewelry products and focuses on the innovation strategies of smart jewelry products in the future. How can developers diversify the functions of jewelry with wearable computing technology and actively seek for difference and change under existing conditions? The innovation of smart jewelry products shall center on the users and the new thought of future development shall be explored starting from cross thinking, scene innovation, and blur boundary so as to find out the new relationship between smart jewelry and humans and provide the reference for developers. With the development of science and technology in the future, miniaturization and diversity will make the boundary between smart jewelry and conventional jewelry increasingly indistinct, and wearable computing will enrich the interaction mode between humans and jewelry. The developers shall have more open attitudes and take “innovation” as the core driving force of product development so as to reconstruct the aesthetics and connotation of jewelry and bring more possibilities for jewelry.

Keywords: function; innovation; smart jewelry; wearable computing

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1. Introduction

With the continuous improvement of Internet technology and electronics and communication technology, Google launched Google Glass in 2012, which has drawn publication attention to wearable devices. In 2014, the International Consumer Electronics Show (CES) held in the United States once again pushed wearable computing to a new height. Wearable products in various application fields emerged in an endless stream, bringing a new relationship of human-machine collaboration to the public [1]. Smart jewelry, as a kind of ornament worn on the body, is noticed by developers and given with various diversified functions, and it has become a subdivision of wearable devices. Smart jewelry is a category of wearable technology, and therefore the market definition of wearable technology was applied to the second market definition: smart jewelry involves esthetic electronic devices, which provide value for their user through esthetic and different functions and features [2]. If connecting hardware devices to mobile phones, information exchange will occur between the device and human body, thereby generating a human-computer interaction (HCI) and human-human interaction (HHI). With the intervention of wearable computing, jewelry has functions that go beyond its inherent attributes, such as health monitoring, message notification, motion monitoring, event reminders, photo taking, and GPS positioning. Most smart jewelry products are designed with near-field communication technology, Bluetooth technology, and sensor technology, granting the jewelry with functions of storing and transmitting information. The wearing style, service category, and functional characteristics of existing smart jewelry can be divided into the following (It is shown in Table 1).

Gartner, the world's leading IT research and consulting firm, pointed out in its research report that smart wearable devices have a prosperous future in the next few years. The global sales of smart wearable devices are expected to reach 267 million units by 2020, with a compound annual growth rate (CARC) between 2015 and 2020 up to 18.2% and sales proceeds up to 32.77 billion US dollars [3]. In the face of the booming market for wearable computing, the development of

^{*} Corresponding author.

E-mail address: lovesongyi@126.com

smart jewelry is also facing tough challenges. In January 2018, Ringly, a smart jewelry brand in New York that has received \$5.1 million in the Series A round financing, posted a message on its official website that announced the suspension of production [4]. At the beginning of its establishment, Ringly was once widely concerned because of its strong fashion appearance and focus on notification function, but it eventually failed. At present, the acceptance of smart jewelry products that have been put on the market is not high. In addition to satisfying the attitude of hunting for novelty, consumers are not dependent on smart jewelry products. Therefore, whether from the perspective of the user or the industry chain, the development of smart jewelry has just begun. Firstly, in terms of technology, the integration of electronic elements used in smart jewelry products and the battery life cannot meet the ideal use requirements. There is a conflict between the technical realization and the appearance design, and the limitations of technological development go against the full play of the supply chain, thus restricting the development of smart jewelry. In terms of market, most smart jewelry products on the market are similar and homogeneous, serving the same function as the smartphone. Therefore, the peculiarity and uniqueness of smart jewelry products are easy to be replaced. In terms of users, compared with traditional conventional smart jewelry, users that use smart jewelry products are few, and the acceptability of products is not high. Few smart jewelry products can meet the curiosity of users, and it is difficult to establish the dependency and consumption habits of users on products. For the female consumption group, the availability and usability of smart jewelry shall be improved [5]. As a nascent product, smart jewelry will be faced with some problems and challenges that are unavoidable at this stage. Although technology is the key factor that hinders the development of smart development, the developers need to seek changes and breakthrough through innovation under existing conditions so as to explore the new thought, new relationships, and new methods of development between human and smart jewelry.

Table 1. Classification of smart jewelry functions [6]

	Product characteristics	Product functions	Product form
Health oriented	Highlighting fitness tracking, step speed measurement, heart rate monitoring, sedentary reminder, health management and other sports, physiology and medical support functions;	Timing, step counting, heart rate detection, reminder, display, wireless data transmission and reception, and analysis;	Smart ring, smart bangle, smart watch, smart bracelet and headwear;
Navigation oriented	Real time displaying navigation information in data format and performing specific function operations through virtual reality technology such as digital lens or holographic projection;	Navigation positioning, shopping guide inquiry, web browsing, messaging, purchase & payment;	Smart watch, smart bracelet, and smart glasses;
Environment oriented	Monitoring, analyzing and trip reminder of surrounding environments (such as temperature, humidity, UV, air and weather);	Positioning, display, monitoring, wireless data transmission and reception, analysis and reminder;	Smart ring, smart bracelet, smart bangle and smart pendant;
Action oriented	Daily activity monitoring, motion recognition and gesture control, information reminder, emergency alert, entertainment activities and social interactions;	Positioning, music, reminder, display, analysis, wireless data transmission and reception, and social interaction;	Smart ring, smart bracelet, smart watch, and smart bangle;

2. Innovation Perspective of Smart Jewelry

2.1. Definition of Innovation

The word “innovation” originates from a word in Latin that has three meanings: updating, creating new things, and change. In the product design field, innovation is often defined as a behavior that takes making changes and seeking differences as a goal and puts forward a thought different from conventional or common ideas with existing thought patterns and innovates or creates new things, methods, elements, routes, and environment in a specific environment. This is to meet ideal or social demands to obtain certain beneficial effects while utilizing existing knowledge and substances. During innovation, developers are required to have innovative thoughts, solve problems in novel and innovative ways, and break through the limitations of conventional thought. They are also required to think about problems in unconventional and even unusual ways and perspectives and put forward distinctive solutions to generate novel, unique, and valuable thought achievements [7].

Innovation based on product category can be divided into five levels (It is shown in Figure 1). The first level refers to the superficial innovation, in which the appearance is beautified and designed; the second level refers to heritage innovation, meaning that the previous generation of products are optimized and redesigned; the third level refers to the progressive innovation, in which the function of the product is improved so as to make the product easy to be used and valuable; the fourth level refers to opportunistic innovation, in which the existing products are repositioned based on the original design so as to look for new function value; and the fifth level refers to fundamental innovation or disruptive innovation, which stands for an innovative manner not existing on the market. The difficulty gradually increases from the bottom to the top of

the innovation pyramid. Meanwhile, the value created also increases. The degree of innovation and the value content will inevitably differentiate the products. For smart jewelry, superficial innovation and heritage innovation cannot stratify the requirements and relying on appearance beautification, and single optimization cannot trigger a profound change of smart jewelry. The progressive innovation focuses on the usability of products, but developers cannot only be satisfied with the functional optimization brought by technological change; they must make an in-depth reflection on the new relationship between jewelry and humans in the scenes of life from opportunistic innovation, reposition and reconstruct it so as to complete disruptive fundamental innovation, and make wearable computing bring about more possibilities for jewelry.

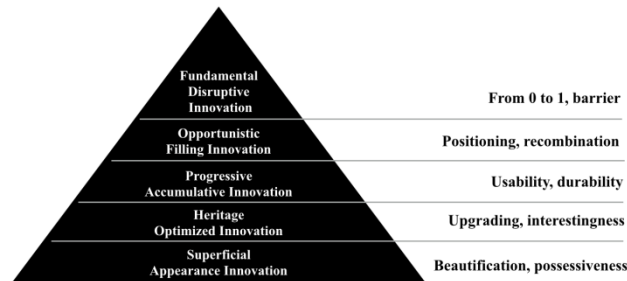


Figure 1. Product innovation pyramid [8]

2.2. Difference Between Innovation and Creativity

People are often inclined to confuse it with “creativity” while discussing innovation. During the development of products, both “creativity” and “innovation” are very important, but they have essential differences. Creativity is just an idea, while innovation refers to a systematic work and creative ideas can promote the optimization and implementation of innovation systems. Creativity aims to put forward the idea of solving problems effectively in the whole innovation system, which usually rests in the concept and the mind and provides the working path. The path and the way in which the idea is generated are called the creative method, namely, the way to obtain creative ideas. However, innovation places particular stress on systematicness and complexity, which belongs to a complex organizational behavior or process. It is difficult to drive the whole innovation system by solely relying on creative ideas for most of the time, but it is an essential factor to push the innovation system forward (It is shown in Figure 2).

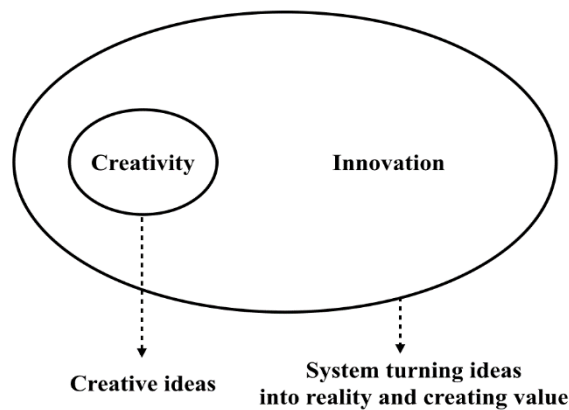


Figure 2. Relations and differences between innovation and creativity

2.3. Innovative Manner and Perspective of Smart Jewelry

The innovation of smart jewelry products is not only embodied in the breakthrough and improvement of technical parameters, namely “quality” and “quantity”, but also in the reshaping of product definition. Product innovation is a system design process, which considers the “event” entirely, rather than the innovation of a single object or a certain link. It is required to run through the whole process from product conception, design, and trial production to marketing, which is an innovation combined with function innovation, form innovation, and service innovation at a multi-dimensional level. In product development, the perspective and starting point of innovation have different ways and exert different effects targeting different categories, but the goal is to seek “differences” in horizontal latitude and breakthroughs in vertical latitude.

2.3.1. Innovation Fundamentals of Smart Jewelry

Innovation is an orderly activity connecting multiple links, such as generation of creativity, research and development, design and development, commercialized production, and marketing [9]. Certain fundamentals and conditions are required to carry out innovation activities. For smart jewelry products, its uniqueness is based on the special attributes of “jewelry”. Therefore, the innovation and development of smart jewelry shall be based on the full understanding of jewelry attributes and the impact on the development process of human society, and the significance of its existence shall be understood and studied. The innovation perspectives on smart jewelry by developers need to be based on the primary attributes of jewelry. Jewelry originates from the “dialogue” between humans and nature through the behavior of body decoration. Later, with the formation of social classes, jewelry became a “tag” that showed social hierarchy and personal wealth. Today, with the transformation from productivity society to consumer society, jewelry has become a kind of fashion consumer goods that helps in the transformation from internal to external expression, presenting their tastes and styles [10]. Different people have different jewelry appeals, wearing habits, and consumption patterns, so they have produced diversified jewelry forms to adapt to the lifestyles and hobbies of different groups of people. On the basis of dressing up and beautifying the external image of the wearer, jewelry has the functions of socialization, collection and preservation, event commemoration, emotional sustenance, fashion label, dressing help, and symbolizing wealth, responding to use appeals from different groups of people (It is shown in Figure 3). Jewelry focuses on appearance and wearing comfort, and it has consumer characteristics of non-rigid demand and low-frequency. Smart jewelry should be based on the attributes of jewelry itself, to build and overlap reasonable functional orientation and solutions (It is shown in Figure 4).

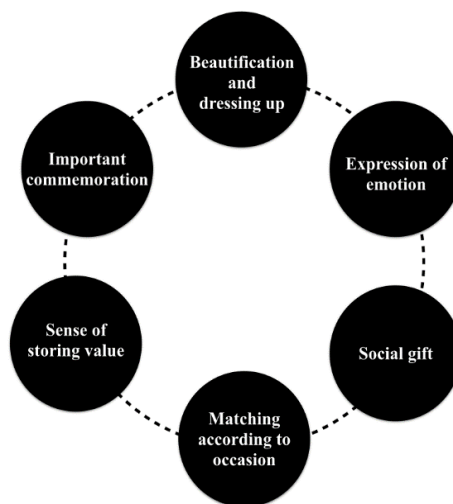


Figure 3. Consumption motive of jewelry

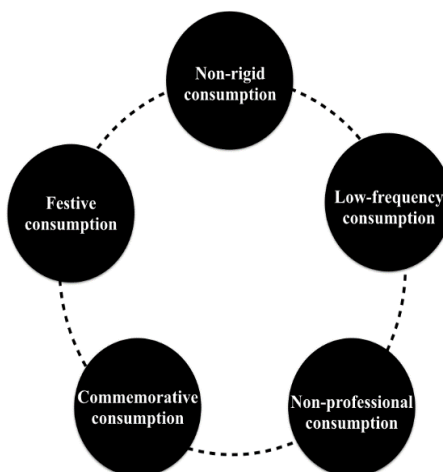


Figure 4. Consumption characteristics of jewelry

2.3.2. User-Centered

Reasonable innovation derives from the understanding of user demands. The communication and interaction between developers and users are important factors that promote the progress of design in each stage of development, which are implemented throughout the whole innovation process. A focus on users may promote the competitiveness of products and services and make the users consider that they obtain the products that are indeed in need and valuable. The users generally include men, women, seniors, children, youth, etc., but each group can be subdivided according to different demand dimensions. The core of any product is the user. The product shall meet the demands of the user, solve the problems encountered by the user, and endow more value to the product in a way accepted by the user. User-centered design is a design model that is centered on the user when making decisions and emphasizes the priority of users in the design process. To put it simply, the design and development of products shall start from the demands and feeling of the users [11]. For the purpose of having a deeper understanding of the users, the common methods used in user research include questionnaires, one-on-one interviews, and focus groups, which take the users as the object of the research and understand the expectations and demands of the user through the point of view expressed by the user. However, the user participatory design that emerges gradually advocates not only centering on users, but also integrating the users into the design process deeply so as to cultivate the master consciousness of users and inspire and mobilize their enthusiasm and initiative.

The user-centered concept emphasizes that the developers shall be immersed in the user environment and continuously collect the feedback information of users with the development of design concept and thought. They are required not only to participate in development directly, but also to demonstrate the prototypes of products or services that have been established on the basis of previous works so as to obtain their evaluation.

Any innovation centering on the user will undergo user screening, user locking, user understanding, and other processes. For smart jewelry, female users are usually the core users. Therefore, more fashion factors will be added to the products so as to respond to the internal needs of female users to the fashion. Female users wear smart jewelry for the purpose of catching up with fashion trends. Therefore, the functionality of the product is not the only factor affecting females' selection of smart products. "In this age, with the rise of female self-consciousness and economic capability, females have become the main force of purchasing power, which is the consensus of market research. The purchasing power of females is determined by the fact that married females are the decision purchaser of family and by the shopping recreation motivation of single women and other female consumption behaviors" [12]. Female demands for wearable smart jewelry include such four dimensions as functionality, aesthetics, usability, and product prices (It is shown in Figure 5). The first one is functionality. Females pay more attention to special functions, which should have a clear theme and orientation. They emphasize the difference of product functions. In terms of aesthetics, they emphasize fashion and beauty and pay less attention to the sense of science and technology. In terms of usability, they pursue simple operations, which can eliminate the rejection of female groups for technological products. In terms of product price, since smart jewelry belongs to an emerging category and does not develop maturely, prices that are too high will affect the purchasing enthusiasm of users.

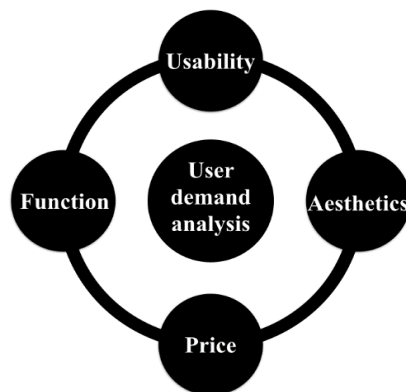


Figure 5. User demand analysis elements of smart wearable products [13]

2.3.3. Cross Thinking

Centering on the user is the premise of innovation. After screening and locking the corresponding user groups, the direction and way of innovation can be further defined through several paths and ways of thinking. Cross-innovation can break through the thinking barrier of developers and existing situation and look upon the problem from a new angle of view.

Cross-innovation refers to the innovation activity by using cross thinking, which emphasizes how to produce ideas and new working directions in the stage of thinking. It is a way of thinking that combines two or more ways of thinking at the same time. Cross thinking often utilizes knowledge from different fields, different disciplines, and different cultures or combines different concepts in the same field. In our thinking consciousness, it is easy for people to generate new ideas on the focus where different categories fit with each other, namely the “intersection”. “Generally, the great creation we understand is often the invention in a single field, the creation obtained at the intersection of different fields and the brand new field that opened up. The inspiration erupts at the intersection of ideas, concept and cultures. When ideas are established on the intersection of different fields, different disciplines and different cultures, you can connect existing concepts to form a great deal of outstanding and new ideas” [14].

If it is required to obtain cross thinking, developers are required to contact different cultures and fields and combine superior resources. The diversified integration of thoughts and cognitive experiences will bring about unexpected innovative achievements. In 2011, Neurowear, a Japanese company, developed a cat ear headdress called Nekomimi (It is shown in Figure 6). By capturing the brainwave data, the product can detect tiny changes in the human brain and perceive the wearer’s concentration, and then the cat ear will take corresponding actions. The ear will pick up when the wearer concentrates and droop when the wearer is relaxed. In normal cases, the cat ear will spin positively. The developer of Nekomimi describes this product as: “Nekomimi is the new communication tool that augments the human bodies and abilities. We created new human organs that use a brainwave sensor. People think that our bodies have limitations, but just imagine if we had organs that don’t exist, and could control that new body? Right now, Nekomimi can become a part of your body” [15]. The creative idea of this product originates from capturing the intersection between brainwave technology and articles worn, thus creating innovative products that visualize the wearer’s emotional state. Originally, brainwave technology and body decoration were two fields in which there was no relation, but developers have used their rich experience in the field of brainwaves and caught up with new ideas at the intersection with body decoration. The product ingeniously takes advantage of the cat ear shape to produce a sense of affinity, thus bringing an interesting interaction for the consumer and enriching the communication between people. The product subtly makes use of the shape of the cat ear to bring out cordial feelings. This bionic cat ear headdress has been reported around the world by a number of well-known websites. More than 70000 orders have been obtained at only about \$50. In addition, Neurowear has other accessories in the shape of animal tails that are also very popular (It is shown in Figure 7). Developers utilize the interactive mode of brainwave induction to create new relations between inanimate bodies and users.



Figure 6. Brainwave induction product of Nekomimi



Figure 7. SHIPPO-Brain controlled tail

2.3.4. Scene Innovation

“Originally, scene is a term in film and television field, which refers to the action in a specific time and space, or the specific picture constituted by character relations. It is a specific process expressing the plot through character’s action. From the perspective of film, it is the different scenes that constitute a complete story. Different scenes have different meanings. When the word is used in the business field, the scene is often expressed as an application form related to human behavior, which requires five elements: time, place, character, event, and connection mode” [16]. While measuring a product, it is necessary to place the product in a specific use environment and to measure the timeliness, efficiency, and customer satisfaction of a specific user for a particular purpose. For smart wearable products, the evaluation shall be extended to the degree of easy use, the degree of easy learning, the degree of attraction to users, and overall mental feelings of users before and after the product experience.

The connection mode between humans and products shall be paid attention to in the scene. The innovation of scene requires connecting the ways of different individuals in different groups, and different individuals in different groups are connected by the scenes. The unique value created by this connection forms an experience, which may promote consumption and acquisition of a good use feeling. It can be shown that when people use a certain product, what they like is not the product itself, but the scene where the product is located and the feeling they have in the scene. Therefore, for the innovation of future smart jewelry, it is necessary to consider the scene in which smart jewelry works and how the product can be connected to the user. Through a new connection, the product no longer exists as the traditional object but as the medium that triggers the scene. Its commodity attribute is reduced greatly, and it has become the opportunity to enhance the experience.

User’s product experience comes from who is satisfied in what way and in what circumstances. The new experience is often accompanied by the creation of the new scene; the new demands are accompanied by the insight into the new scene. Momento Pearl, a smart pearl jewelry, is one of such products. It focuses on creating new ways to connect people to jewelry and meet different user demands in specific scenes so as to bring an impressive user experience. In March 2015, Galatea, a US jewelry company, released Momento Pearl (It is shown in Figure 8). The wearable computing technology was used to help users express their feelings through jewelry from an emotional perspective. It was created as a “gift” for people to express their affection and convey emotion and is used for collection and remembrance. The developer embeds the NFC chip in the pearl core and puts it in the mother shell. The nacre excreted wraps the surface of the pearl core to form the pearl. Users can store voice, picture, or video content in the mobile phone into natural pearls by using NFC near-field communication technology and can use jewelry to make sounds or browse the pictures and videos in the scene giving gifts. When a man wants to propose, the man can record the sound “marry me?” on the chip inside the pearl through the mobile phone. The woman can touch the phone to open the APP when she receives the gift. Then, she can hear her lover’s sound and wear it on her body as a memento. The daughter can give the recorded words “thank you” as a birthday gift to her mother. The mother can regard the pearl jewelry as her daughter’s emotional sustenance and treasure it. Users can also store photos of their families and children’s wonderful laughter in the jewelry (It is shown in Figure 9). In this case, wearable computing technology enhances emotional expression and plays a vital role in promoting emotional interaction. The NFC chips used in this product never need to be recharged and are waterproof, allowing jewelry to be worn for a long time.



Figure 8. Momento Pearl and APP interface

Liber 8 Technology, a Hungarian company, launched a smart electronic bracelet called Tago Arc in 2015 (It is shown in Figure 10). It was designed to bend a soft e-paper display into a bracelet by fixing the metal structure. It is connected with near-field communication technology (NFC) in mobile phones to control the black and white electronic ink display. The user can arbitrarily update the display image on the surface of the bracelet and upload patterns designed by themselves through APP. In the wearing scenario, Tago Arc is jewelry that can adapt to different matching demands and can also respond to the wearer’s demands for fashion and change. Except for a single scene, Tago Arc has also created another new usage scenario for users, in which the APP users can upload their own designs and wear their designs on their bodies. In the new usage

scenarios, the role of users has changed from a passive user to an active creator. Moreover, this smart jewelry does not require recharging. The bracelet is recharged by RF energy harvesting while using the phone's NFC reader to transmit images.

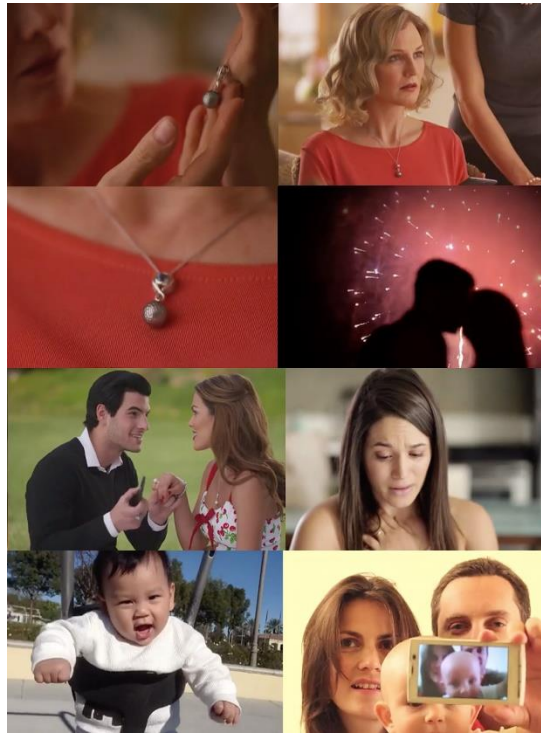


Figure 9. Usage scenarios of Memento Pearl products



Figure 10. Tago Arc electronic bracelet

2.3.5. Blurred and Open Boundary

“Nowadays, the post-theoretical era is faced with an ‘implosion’ world where all kinds of boundaries become blur completely. The original distinct systems are full of crowding and overlap. There are polarization, obvious opposites and disappearing boundaries in each system with different meanings. In fact, what we are encountering is the increasing blurring, vacillating, fusion and overlapping of various boundaries, not only in theoretical fields. Blurred boundary has been a common phenomenon: it has swept the social, economic, industrial, enterprise and other fields. The boundary of regional development is being broken, and the frontier of each industry can be continuously expanded and interacted” [17]. In product development, the blurred boundary can understand that product positioning is not clear. It can also be understood as innovation to break the boundary barrier. It is because of fuzziness that new possibilities can be gained. In cognition, if people establish the differences between different categories too strictly, they will often miss the innovation in the boundary

area. Boundary blur refers to not only the blurring of physical boundaries but also the flexibility and variability of boundary. The blurring of boundaries does not mean that boundaries are not needed, but those rigid boundaries are not required. What is needed is that developers can deem the boundaries more flexible.

Wearable computing may bring about many new possibilities between humans and jewelry, which can become a “too” blurring the boundary between jewelry and other fields and thus create a new opportunity for innovation. For example, the miniature video jewelry Neclumi, developed by Fast Co Labs, projects light images by using a miniature projector fixed on the collar of the garment (It is shown in Figure 11). The product is still in the prototype development stage. A glowing image shines around the wearer’s neck, like a shining necklace. The wearer controls the necklace through special application software, such as adjusting the width and position of the beam, triggering the shape change of an image to obtain a decoration effect according to the different body actions, walking direction, and volume of sound. In this case, Neclumi is defined as the interactive device worn on the body, in which the boundary between jewelry and interactive device is blurred. The intensified interaction is expressed by various body behaviors of the wearer, enriching the aesthetic connotation of jewelry. It not only maintains the jewelry in the traditional “single” and “stable” state, but also adds more changeable elements into it, thus generating the possibility of innovation.



Figure 11. Neclumi miniature image lighting jewelry

3. Future Development Direction of Smart Jewelry

3.1. Miniaturization

Louis Sullivan, a famous American architect, once suggested: “form follows function”. For today’s smart jewelry, most are based on function realization, and the appearance makes a compromise on hardware volume and performance. In the future, the progress of smart jewelry will be affected by the development of science and technology, which means that some of the problems existing in today’s smart jewelry, such as large size, poor performance, and insufficient diversity of design, will be improved with the development of processors, mobile Internet, sensors, battery technology, and emerging materials. “Smart wearable equipment development has included the innovation and development of kinds of system software, sensor, chip, power supply, storage and display. Upon the improvement of above-mentioned territories, it could result in micro-sensor, technology for flimsy but high capacity battery, new display technology and human-computer interaction techniques, building up standard exchange communication protocol etc. We have to implement and facilitate the smart multi-field development of wearable equipment in the above field of technology” [18]. For smart jewelry, the volume is a key index in addition to product performance. Because jewelry is called a “miniature sculpture” compared to other objects, it is small in size and emphasizes fineness of appearance and workmanship, which is determined by the limitation of decoration parts. The miniaturization development of hardware in the future will have a strong influence on smart jewelry and will make smart jewelry have no differences from normal jewelry. The developer has more freedom to design the appearance of the product, and form no longer follows function. However, the function can adapt to any form, and the comfort of wearing will be greatly enhanced. This provides a good foundation for the true fashion of smart jewelry, thus releasing more space for developers to explore the trend and change of smart jewelry.

3.2. Functional Focus

Smart jewelry products usually develop from accurate product positioning. It is only possible to build up the function barrier based on the emphasis of its own characteristic and enhance users’ dependency on certain functions. The current situation of smart jewelry is those function categories are too numerous and highly overlapped with smartphones, with very few independent values in use. Smart accessories should reduce the reliability on smartphone drive in the future and enhance the

precise, effective, and practical functions. “What we need is wearable smart equipment instead of the wearable phone. Thus, sending emails, pushing information, taking photos shouldn’t be the core problem solved by wearable equipment. Otherwise, the development of wearable smart equipment would most likely end up as a kind of dispensable product, and they may even be replaced by smart phones” [19]. Therefore, scenario subdivision, functional focus, exclusive system development, etc. would all provide a positive effect on future smart jewelry products for independence and peculiarity creation.

3.3. Universality

At present, the market share of smart jewelry products is still small. Many different kinds of products have come out, but none of them performed well in the market. However, it was very effective and successful in early market education. “The target consumer of smart jewelry is a crossover group. From the aspect of probability, the target consumer group is more minor with small quantity. Hence, we’re still in the early development stage, smart jewelry is hardly occupy the mass market quickly” [20]. However, with the extensive attention of the consumer market, smart jewelry is still highly active. With the technique development, consumption habit cultivation, and boundary dimming with common jewelry, the restriction factors of smart jewelry’s popularization will vanish, and smart jewelry can penetrate into the public’s lives. The development of smart jewelry not only enriches the category of smart wearable equipment, but also becomes the upgrading opportunity and space for the traditional jewelry industry.

3.4. Service Derivation

Future smart jewelry needs to work on the derivation on service. When the difference between smart and traditional jewelry becomes more and more dim, the relationship between smart jewelry and body would not only be limited in data collection. “The two core values in the smart wearable product are closer to people with longer wearing time. Some people regard smart jewelry as dispensable, but the wearable product may be able to make up the related disadvantage under the background of widespread use of cloud computing, big data, artificial intelligence technologies” [21]. Therefore, we cannot take the hardware of smart jewelry as a “data islet”; instead, it should be a service derivation thanks to sufficient technology and data excavation and an imaginative closed value loop formed by breaking the connections among product, data, and service. “Hardware product and application service promote mutually and develop in a spiral escalation way. Application service and hardware product will combine more closely. Along with the hardware products’ perfection supported by application service, the wearable market will grow fast and attract more splendid software service developers and companies to this area. The application ecosystem will also be improved and promoted” [22].

4. Conclusions

The miniaturization of future wearable device releases more space for design, allowing developers to overlay fashionable logic, seek more profound changes, and review the way in which smart jewelry interacts with the body. Thus, the innovative manner of jewelry in the future can be fully released. The function of innovation is often embodied in promoting the improvement and innovation of things created by human and stimulating people to find new demands and solve new problems [23]. Therefore, for a certain period of time, we do not need to define what the smart jewelry is, but to keep it open and embrace richer added value of function. At present, smart jewelry in the orientation stage is just starting out and still has plenty of space for growth, but the change of smart jewelry is becoming more and more urgent. The innovation standard of developers should be changed from “rational” to “transformative”, that is, it should be based on the property of jewelry itself and go beyond the limitations of jewelry to carry out more profound imagination and practice.

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Yi Song is a teacher specializing in jewelry design at the Beijing Institute of Fashion Technology who set up smart jewelry design for two consecutive years in the course "Jewelry Digital Design" and led students to jointly complete the innovative design of smart jewelry. The awards and exhibitions that the teacher has won and participated in include: the Silver Prize of Gold Design Competition of China's Gold Capital Cup in 2004, second award of National Jewelry Design Competition of CCTV Fashion China in 2005, Excellent Design Award of HRD International Diamond Jewelry Design Competition in 2005, and Excellent Design Award of HRD International Diamond Jewelry Design Competition in 2007. In 2008, the book "To Be Beautiful with Jewelry" was published by China Light Industry Press, and the design works were exhibited in the 2013 International Jewelry Art Biennial, 2016 Shanghai International Jewelry Fair, 2016 T&D Lifestyle Design and International Science, and Technology Forum "Technology and Arts" Exhibition. A personal work exhibition "Daily Beauty" was displayed at the China Fashion Week DHUB Exhibition in China and 2017 Shanghai Fashion Week MODE Exhibition.