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Investigating the Concept of Sustainable Strategy in Digital Service Design

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ABSTRACT

In the new era of rapid economic development, human beings are beginning to think about whether a sustainable development path can be built between humans, nature, and society. Simultaneously, the digital society has increased the number of digital services users encounter in their daily lives and the emergence of more virtual digital products. In this study, we propose a strategy to investigate the concept of sustainability in the design of digital services by working with companies and using a case study of shattered cell phone screen insurance. The large amount of e-waste generated by users' constant use and constant replacement of consumer electronics has yet to receive the attention it deserves. Therefore, we will focus on applying and exploring the sustainability concept in digital services and exploring inspirational design in broken screen insurance services to convey the sustainability concept to users. In the first phase, this study interprets the design case of the sustainable concept through case studies, with desktop research used to analyse the qualitative content of the inherent status of e-waste in policy and implementation. Questionnaire research was conducted to collect data on users' experiences of e-waste generated by cell phones as a carrier of broken screen insurance services, using data secondary analysis to elicit user trust patterns for new products and concepts. We created a mind map centred on sustainable environmental protection, emotional interaction design, and e-waste and defined the user needs for each of the three major areas. The framework of the digital service tandem based on the concept of sustainable screen-shattering insurance was established to demonstrate the different types of environmental design that can be incorporated at different stages of user contact with screen-shattering insurance. In the second phase, based on the design framework of the first phase, the functional architecture of the shattered screen insurance service design is organized. The interaction model of the online digital service is conceived, specifically visualizing the process of each link and designing the interaction form. According to research and practice, the design of digital services must be socially attractive, functional, and easy to understand to increase retention rates. This helps to increase public awareness of sustainability concepts and allows users to build a deeper awareness of environmental protection, thus enhancing the communication strategy of sustainability concepts in digital services.

Keywords: Digitalization, Service design, Sustainable concept

INTRODUCTION

In recent years, "ecology", "new energy" and "sustainable development" have become buzzwords. As time goes by, waste is produced and

non-renewable resources are consumed, the problem of unreasonable use of limited resources and ineffective maintenance of the ecological environment gradually becomes serious, and people begin to advocate environmental protection and material conservation.

Design bridges life and production and plays a role in harmonizing people with nature and people with each other. "Design as a bridge between culture, sustainability, and innovation" (Celaschi, Elena, & Alessandro Deserti. 2014). Design can make living products and services sustainable, making them more environmentally friendly and entering the era of sustainability. Currently, appropriate design can effectively slow down or stop the destruction and consumption of the natural environment. Tukker and Tischner (2006) argue that appropriate design can effectively slow down or stop the destruction and consumption of the natural environment. On the one hand, the concept of sustainability solves the problem of recyclable energy and materials, establishes a lasting design concept that improves the quality of life, and reduces the consumption of non-recoverable resources through technology and production system transformation. "Sustainable design through process innovation: A practical approach to greening the product lifecycle" (Lofthouse & Hockley, 2009). On the other hand, durable technologies meet the needs of human survival and spiritual security, and promote the long-term, stable, and safe development of society.

In addition to physical products, users are most exposed to digital services, and cell phones and mobile networks are an integral part of today's society. Therefore, it is worth exploring how to combine the concept of sustainability with digital services and integrate environmental protection and resource utilization. With the rapid development of the Internet era, the embodiment of the concept of "sustainable" and "environmental protection" is not only a small-scale offline practice, but also the use of digital media in a widespread and universal way of communication is more conducive to future development. The small low-carbon behaviour in life relies on the concept of sustainability and environmental protection propaganda that has gradually entered the hearts and minds of people. For the main design of the shattered screen insurance digital service, it is closely related to the e-waste and recycling chain of resources, which will be used as the entry point of the design, combined with the core concept of sustainability, through the digital service design in the multimedia network platform to promote and popularize.

RESEARCH METHOD

Based on case studies, desktop research and questionnaire research, we analysed existing sustainable design ideas to support subsequent solutions. Then to collect market and user data to understand the direction of existing digital services for broken screen insurance that could be cut into to achieve the requirement definition.

Sustainability Case Studies

Sustainable design in modern society can be visualized in large areas of architectural design, where green buildings are designed to conserve energy, water,

and building materials to avoid pollution of the interior and exterior of the building, or by installing alternative energy sources such as wind, solar power, and rainwater harvesting systems, and often using recycled building materials (Celaschi & Deserti, 2014).

In other design industries, taking product design as an example, choosing to use sustainable materials, but at the same time the product is designed to be overly functional and consume excessive energy during use, then the final product cannot be considered sustainable design and full sustainability is difficult to achieve. For designers, for different design objects, they can strive to make the design conform to the sustainability concept from single or multiple perspectives. For example, in sustainable design thinking, the efficiency of product output is driven by the change and redesign of technical processes, more effective use of raw materials, reducing waste, streamlining work steps, and improving work efficiency (Lofthouse & Hockley, 2009). For instance, the company Patagonia, known for its outdoor clothing and gear, has implemented sustainable design practices by using recycled materials, reducing water usage in production, and implementing a program to repair and resell used clothing, promoting circularity and reducing waste.

For the recycling design of discarded products, the consumption of non-renewable resources is essential in human life and progress, and if the reuse of old resources can be effectively improved, to a certain extent, the new non-renewable the use of new non-renewable resources (Tukker, Arnold, & Tischner, 2006). For example, the company ECOALF has developed a sustainable fashion line made from recycled ocean plastics, turning waste into a valuable resource and promoting a circular economy.

Desktop Studies

Through desktop research and data analysis, the following three critical data were obtained (see Chart 1).

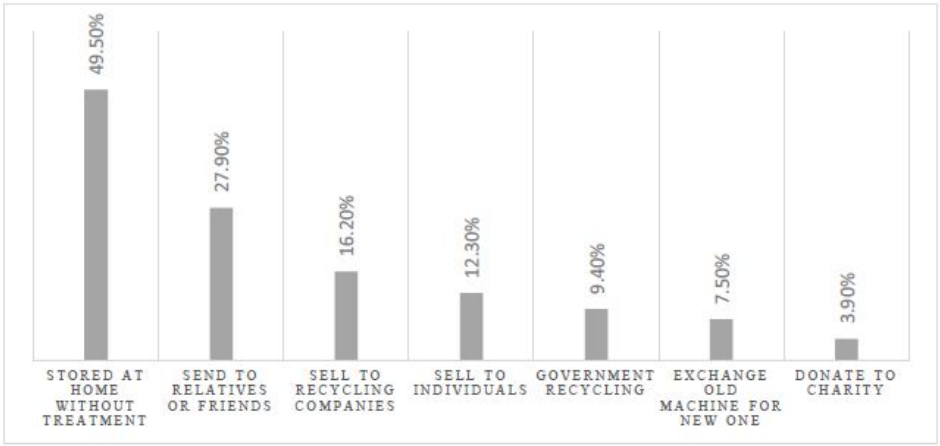

Chart 1: Public survey report on mobile phone use and recycling (see founds. 2021).

1. about 49% of the population has a "do not dispose of" attitude towards old cell phones
2. about 15% of people will carry out recycling transactions
3. about 7% of people will choose to trade in their old phones for new ones

The current cell phone recycling needs to be more professional and institutionalized. The public's knowledge of cell phone recycling needs to be more profound. People need to learn that all parts of a cell phone will have great value after proper recycling, and the life of all electronic parts does not end simultaneously.

Questionnaire Research

Analysis from this perspective of the masses, people buy broken screen insurance is also a distrust of their own protection of good cell phone screen (see Chart 2). At the same time, based on the analysis of basic user profile characteristics, we aim to understand the basic situation of most users and some levels of trust in screen insurance (see appendix). So buy as a kind of insurance, and for broken screens or electronic waste, people for the new environmental protection propaganda trust value in the absence of general awareness does not improve, so people will question the brand propaganda of environmental protection, the back may not be simple (see Chart 3). The

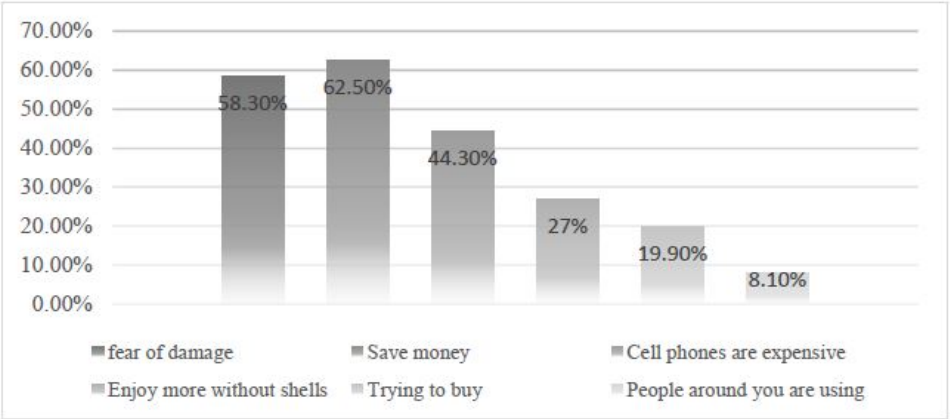

Chart 2: Reasons to buy broken screen insurance.

Cross-tabulation analysis	Purchased	Not purchased
Apple Care	139 (45.3%)	11 (13.1%)
Official warranty service for branded cell phones	203 (66.1%)	34 (40.5%)
Other third-party repair services	149 (48.5%)	24 (28.6%)
Cell phone e-waste recycling	16 (5.2%)	34 (40.5%)

Chart 3: Does broken screen insurance affect users' trust in the cell phone recycling industry.

user's attitude towards a product or a new idea goes from common to trust, and the process is built from three aspects: cognition, emotion and attitude.

The user's attitude towards a product or a new idea goes from ordinary to trust, and the process is built from three aspects: cognition, emotion and attitude.

Cognition: from the beginning, the user knows nothing, to gradually hear of e-waste, resource recycling, or directly see the relevant public service ads and slogans.

Emotion: From indifference to familiarity, and eventually can reach a state of empathy with the new concept, for example, for sustainable e-waste caused by the consequences of the initiative to make a vision.

Attitude: From indifference to acceptance of the concept of sustainable recycling of e-waste, we will take action and become familiar with the concept subtly.

Requirements Definition

Through the data output and analysis of the pre-study, a mind map was organized and framed to determine the definition of user requirements for the three major segments (see Table 1).

The broken screen insurance digital service system under the original brand concept is more inclined to cell phone protection. The broken screen, no risk, belongs to the investment-type risk protection. User interviews and field research found that when users use the broken screen insurance service, the original repair will be based on the degree of damage to the phone screen. Not only the screen has a replacement, but other parts also have a new replacement. So, the electronic waste generated by the broken screen insurance during the repair process is diverse and enters the company's resource recycling line. Therefore, we want this service to expand into an online operation system for shattered screen insurance with an environmental nature, implementing the concept of e-waste environmental protection into the overall design and using emotional design to reflect the temperature of shattered screen insurance.

The concept of emotional design is concentrated in the overall design of the service and process, for the broken screen that is supposed to be garbage gives a unique meaning; each piece of the broken screen has a memory

Table 1. Definition of requirements for the three segments.

E-waste	Emotional design	Environmental Philosophy
·Popularization & understanding	·Services & Processes	·Production & Promotion
1. Phone life (screen life)	1.The End of Mobile Phones	1. The use of green elements
2. The Life of Trash (The E-Waste Cycle)	2. (The screen that would have been garbage) gives value	2. A new type of environmental hazard that needs urgent attention
3. The value of recycling	3. Demonstrate the efficiency of the repair process	3. Youthful communication

value. The shattered screen is specific to each person because of what happened and the mood at the time. Every cell phone has a better ending. As the electronic product with the highest obsolescence rate, cell phones produce a significant amount of garbage every year, which can be more efficiently used for its residual value and improved resource utilization.

The term e-waste has been mentioned frequently in recent years, and we hope that this term can be more popularized and understood by the public under our subject design, with the protection of the environment as the general background and the importance of propaganda outside of domestic waste, construction waste and industrial waste. By professional factory recycling, using professional equipment, and recycling the value of electronic products, users in the shattered screen insurance online operation system have a more transparent understanding of their actions can bring a positive role in society.

In both the inspirational design and e-waste segments, environmental protection is used throughout, in which green elements are used to make users start to pay attention to the new environmental hazards that can be generated by e-waste. With the medium of broken screen insurance, it is spread through the Internet and rejuvenated.

DESIGN FRAMEWORK

According to the design framework, an essential part of the online broken screen insurance interactive service design lies in the user experience at the insurance purchase stage, expressing precise functionality when reading and browsing. We organized the functional architecture in the broken screen insurance service design (see Table 2).

In the specific business, the main embodiment is the "My Repair Shop" function, providing users with the introduction of broken screen insurance purchase and experience services, after the purchase of follow-up protection and process improvement, after the use of broken screen insurance e-waste recycling services.

In the theme of achievement, by advocating the environmental behaviour of recycling electronic waste, users can participate in the environmental journey while experiencing the broken screen insurance. The subsequent recycling of the repaired broken screen can increase resource recycling. Let users have a greater sense of achievement, using broken screen insurance to increase the game's feeling.

Under the social theme, we want to attract traffic and spread wider through popular things that young people like. Shattered Stories with an emotional memento - Shattered Screen Short Story, which gives social attributes to interesting short stories.

DESIGN PROCESS DETAILS

We conceptualize the interaction model for online digital services, concretize the process of each link, and conceive innovative forms of interaction (see Table 3).

Table 2. Functional architecture of the three main sections.

The Repair Shop (Service Centre)	Business	1. cell phone divination state 2. broken screen insurance business introduction 3. Broken screen insurance process transparency	4. broken screen insurance purchase experience 5. e-waste recycling
Shattered Screen Museum (Record/Interactive/Science)	Achievements	1. Where did my broken screen go? 2. What is the use of my broken screen? 3. my broken screen environmental journey	4. environmental behaviour advocacy 5. e-waste world 6. broken screen insurance is also environmental protection
Shattered Screen (CD-ROM / Drift Bottle)	Social	1. share broken screen story/post 2. view/evaluate others 3. look at the story of 15g	4. Do stories fade with the trash? 5. Broken screen insurance extends these stories

Table 3. Interaction process visualization.

	Reach (keyword)	**Interaction (behaviour)**	**Transformation (communication)**
01 Before you buy insurance	"Broken phone screen" "Mobile phone case"	Animation guide	Try the experience
02 Initial Contact	Promotional banner	Animation/ Dialogue	Learn about broken screen insurance
03 Understanding Broken Screen Insurance	Full-scene experience	Switching scenes	In-depth information about "My Repair Shop", "Shattered Thoughts", and "Shattered Screen Museum."
04 Purchase Insurance	Owning a private repair store	Enter a scene	Dedicated customer service, claims guidance, etc.
05 Claims Completion	Broken screen stories arise	Browse Shredding	Share to "Museum"
06 Recycling	E-waste debris	Go to animation	Connect to recycling platforms

1. Before purchasing insurance, when users browse the shopping platform and search for products related to cell phone peripherals such as tempered film, phone cases, etc., the interface has a small pop-up window, "measure your cell phone MBTI" small h5 for the beginning.

2. In the initial contact phase, users use the broken screen insurance carrying platform software with banners, friend-sharing link cards and advertising pop-ups in the interface to turn to within the broken screen insurance program.
3. Users who want to know about broken screen insurance will experience scenario-based services, not only in the interface style. What users want to know will be followed up in real-time, presenting the scene's periphery when not purchased, specifying the repair store so that broken screen insurance is no longer a flat display.
4. After the insurance purchase, the interface scene from outside the room into the house. The house is the user's repair store. Click on the interface scene will have a different animation display. The attendant and repair boy can interact, and other features in the interface below one can view.
5. From the purchase of insurance to the claims phase, we have developed other rooms to view, the Shattered Screen Museum and the Shattered Story Wall, where you can learn about the current state of e-waste and see interesting and oddly touching little stories of shattered screens in the Story Wall.
6. After completing the purchase, the interface prompts the content of the recycling end, the old phone can be recycled by the original phone company, etc.

CONCLUSION

Through the research users have about sustainable e-waste, with the development of society, the existence of e-waste cannot be ignored, and users this aspect of the concept of sustainability, there is still a particular knowledge gap, the masses do not understand what e-waste is, do not understand its recycling value. Furthermore, there needs to be more publicity for digital Internet services.

Our goal is to reach users with new sustainable ideas in services related to e-waste, to communicate the ideas more user-friendly way, and to present our design strategies in digital services.

Therefore, the user's exposure to the new circular economy of sustainable e-waste is slightly narrower and needs to be more widely publicized. In the Internet age, it is vital to express the idea of sustainability in the digital service they most often encounter. This digital service needs to have a combination of social appeal, easy-to-understand functionality, and achievement to increase retention rates.

APPENDIX

This data table presents the results of our survey on the basic information of users of screen insurance. We conducted statistics and analysis from different aspects such as age, income, and number of mobile phone holdings, to better understand the audience of screen insurance. The following is an overview of the random sample and basic statistical information about our survey (see Table 4). And to conduct a user trust test on the horizontally related products

Table 4. Participant characterization (total number of 391, 20 samples taken).

Random Participant Coding	Age	Monthly disposable income (RMB)	Number of electronic devices	Current phone ownership hours	Cell phone price range	Whether to purchase insurance
P1	25	2000–5000	2	Within one year	2000–3999	Yes
P4	30	2000–5000	3	More than two years	2000–3999	Yes
P11	19	More than8000	3	More than two years	4000–5999	Yes
P20	21	5000–8000	1	Within one year	4000–5999	No
P24	27	2000–5000	2	Within one year	2000–3999	Yes
P38	22	2000–5000	2	More than two years	2000–3999	Yes
P43	26	2000–5000	1	Within one year	2000–3999	No
P67	21	2000–5000	2	More than two years	2000–3999	Yes
P98	30	5000–8000	2	Within one year	4000–5999	Yes
P111	20	2000–5000	1	Within one year	4000–5999	No
P128	29	5000–8000	2	More than two years	4000–5999	No
P160	21	5000–8000	3	More than two years	2000–3999	Yes
P179	22	5000–8000	3	More than two years	4000–5999	Yes
P201	19	2000–5000	2	More than two years	2000–3999	No
P231	21	2000–5000	1	Within one year	2000–3999	No
P259	25	2000–5000	3	More than two years	2000–3999	Yes
P287	25	2000–5000	2	Within one year	2000–3999	Yes
P309	26	2000–5000	1	Within one year	2000–3999	No
P341	27	5000–8000	3	More than two years	4000–5999	Yes

Table 5. The degree of user trust in different broken screen repair brands.

Options	Overall ranking	Sort First	Sort Second	Sort Third	Sort Fourth
Apple care	1	191(48.8%)	125(32%)	61(15.6%)	14(3.6%)
Official warranty service for branded cell phones	2	131(33.5%)	176(45%)	69(17.6%)	15(3.8%)
Other third-party repair services	3	51(13%)	75(19.2%)	225(57.5%)	40(10.2%)
Cell phone e-waste recycling	4	18(4.6%)	15(3.8%)	36(9.2%)	322(82.4%)

associated with screen insurance, to understand and analyze the content and user psychology (see Table 5).

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