Investigating the Development Trends of Future Traveling Lifestyle Scenarios in Product Innovation

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Abstract

This study aims to investigate the development trends of future lifestyle and advanced technology, which can be used as a reference for product innovation for future lifestyle scenarios. The method of study first discusses future lifestyle and advanced technology trends, extracts the relevant scenario issues of future lifestyle trends and the scenario issues are used to conduct questionnaires and interviews for future lifestyles. Furthermore, the KJ method and frequency distribution are used for data analysis and discussions, thus, the main factors of the development trends of future lifestyle and advanced technology are acquired. Finally, using the method of scenario description, as based on results, the proposals of innovative product development of future lifestyles for different groups are established. The results of the study determined that advanced technology development is very important and should be the primary consideration of product design and development in the future.

Keywords: Future Lifestyle, Innovative Design, Advanced Technology, Product Design.

1. Introduction

Smart living is the lifestyle pursued by many people in the contemporary era, and is manifested by environmental consciousness and convenience. The impact of globalization demonstrates that the design and development of an advanced innovation should be based on consumers' needs. Today, people communicate and interact through social networking sites (SNSs); this exchange is not limited to transferring of information only, but also the interaction

with our environments and lifestyle. How people think and interact with each other influences the design of products (Cohen, 2012). In order for an advanced innovation to meet consumers' needs, 4 "I" life has been proposed by Cocilova et al. (2012), which includes Interface (human-machine interface), Intelligence (artificial intelligence), Integration (system integration), and Infrastructure (system operation facility). Under a basic operational environment, the system is integrated to combine the user interface and human interaction, thus meeting users'

needs, providing accessible services, and reducing users' resistance to difficult technologies and operational obstacles. Through service experience, users can approach future lifestyle scenarios, which is the direction and goal of enterprises.

In future R&D of many advanced countries, it is a common practice to combine advanced technology with human-centered concepts and develop strategies to develop future lifestyle scenarios and advanced innovation. Environment, biomedical, information, and communication are identified as the four key areas of development (Norton, 2012; Swan & Luchs, 2011). Maslow suggested that the five basic human needs are closely related, indicating that the interaction between people and community, the interaction between human and heaven, and the interaction between human and nature are associated with human needs (Pan & Du, 2010).

The Innovation of using knowledge is the key index of global competitiveness. So the innovative design combines with prospective technology to improve future lifestyle trends becomes the key for industry to go beyond the challenges and grow lastingly in the future. The common part of future R&D among advanced countries is humanism, and the main parts are four major areas of science and technology: environment, biomedical, information, and communication. So this study will start with humanism to investigate the use of prospective technological design to enhance the quality of lifestyle. It will also allow users to feel the convenience brought about by the technology and design of the new lifestyle in the future.

2. Literature reviews

2.1 Prospective technology

The essential part of the development of prospective technology is intelligence lifestyle. It means to combine the user's interface and interaction through by the IT infrastructure and the capability of systematic integration. There are four trends of intelligence lifestyle generalized as follows:

(1) Intelligent interaction to meet the humanities: The intelligent household appliance helps people to live a healthier life. The computer technology will be everywhere in everyday life. The interactive space will break the limit of 2D and achieve the real world of 3D. The user will have a whole new feeling about 3D by combining the 3D digital content and the real 3D displayer.

(2) M2M -- the new revolution of the internet: M2M will be the most important trend of industry in the next decade. Many countries including U.S., China, and Korea are upgrading the national industrial strategies for it. And it is predicted to become the key to a world economy in 2020, and create a trillion U.S. dollars business opportunity.

The chief applications of M2M includes green architecture, intelligent home, and intelligent grid. In pace with the development of societies, economy, technology, and related national policies all around the world, the intelligent living space will become a vehicle of technology mixed with innovation and lift a huge business opportunity (Department of Industrial Technology, 2012).

(3) Interactive service combining electronic device creates an unlimited opportunity of

business: The digital signage and the e-book are both the examples of interactive service combining electronic device. Interaction is the most important part of the human-machine interface (Yang Renda, 2011).

(4)   Cloud applications everywhere: When cloud computing is developing rapidly and environmental awareness is growing dramatically. Green cloud has become the main backing for the development of industry. By the research of the FIND (Foreseeing, Innovative, New, Digi services), a research center of the Institute for Information Industry, 37% of the service industry in Taiwan has gone for a service innovation, and their revenues have grown 33.3%. The revenues of the industries applying ICT to service innovation have even grown 52%. Both the rates mentioned above are higher than 4.4% -- the growth rate of those which have never dedicated in service innovation (Department of Industrial Technology, 2012).

2.2 Future lifestyle

According to analysis of future lifestyle scenarios and the trends of advanced technology, there are six main human needs, as described below:

(1)   Future travel information integration and recording

The portable mobile sensors, developed by advanced technology, will provide convenient functions of customization, information translation and integration, and memory recovery. For example, during a trip, the "automatic journal" function directly transforms the itinerary into a journal. The GPS function allows travelers to preview the complete itinerary and live views

(Tvede, 2010; Fan, 2011; Benckendorff et al., 2009).

(2)   Future health information processing

The geriatric medicine and health information technology is at an advanced level, and today, health information can be recorded digitally. For instance, users can use a customized virtual health management assistant to find out their physical changes. In addition, virtual e-nurses will keep track of the health conditions of an entire family, thus saving labor and time, and recording the data (Canton, 2006; Hsu, 2006; Chuna & Patterson, 2012; Gallaghe, 2011; Bell & Gemmell, 2009).

(3)   Future home network construction

Electric appliances are developed towards the trend of interactive technology and network integration. Digital setting, use records, family health information, driving records and maintenance logs can all be accessible from the home network platform. In addition, bio mimetic robots with sensing capacity can be used in daily lives (Tvede, 2010; Hsu, 2006; Bell & Gemmell, 2009).

(4)   Future work models

The advancement and prevalence of the internet has led to the emergence of virtual teams for handling digital and cross-regional works. Many companies have established virtual work communities. Team members can access the records in digital storage and communication devices. Such work models have the advantage of having no restrictions on work places, minimized loss of data, save energy, and are environmentally friendly (Tvede, 2010; Hsu, 2006; Bell & Gemmell, 2009; Underwood & Harrison, 2009).

(5)   Future lifelong learning

The era of information integration will enter the

stage of "total memory", meaning users can have personalized learning portfolio by open interactive information and integration of learning records. In addition, real-time e-learning allows the learners to learn anytime and anywhere (Tvede, 2010; Bell & Gemmell, 2009; Baynes & Baynes, 2010).

(6) Future personal monitoring and security system

The prevalence of technology has resulted in global security threats due to state violence, terrorist activities, and criminal syndicates. When national security is under threat, monitoring technology will become more advanced and widespread; however, personal rights and privacy are violated at the same time. Thus, surveillance and monitoring can be extended to personal properties at all times (Tvede, 2010; Canton, 2006).

From a human centered perspective, this study conducts an investigation on the trends of future lifestyle scenario, and analyzes its evolution. The findings can serve as important references for development of innovative products in this scenario. With ideas of future lifestyle concept, this study validates the potential human needs and trends of the future.

3. Methods

3.1 Research framework and process

The research framework is shown in Figure 1. This study reviews literature on future lifestyle trends, development and current situation of advanced technology developments, and concept future lifestyle concept and videos. After analyzing the future lifestyle scenarios and advanced technology trends, this study extracts related issues of future lifestyle trends. Based on the above issues, a questionnaire survey and

semi-structural interviews were conducted to identify users' needs in future lifestyle scenarios. The data analysis used KJ and frequency distribution methods. The results are integrated and compared with findings of existing studies to identify key points of development trends of future lifestyle scenarios and advanced technology. Finally, the results are validated through scenario depiction and implementation. Innovative products of future lifestyle scenarios for different people groups are then proposed.
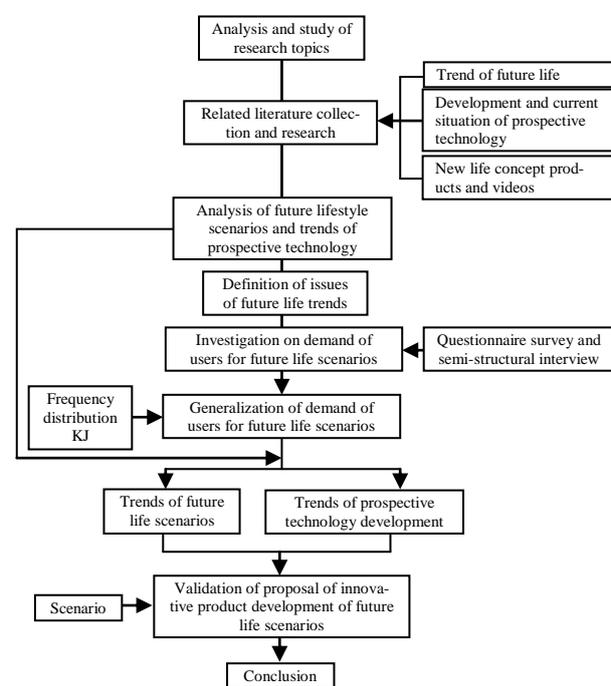
Fig 1. Research framework

3.2 Participants

To determine users' needs in future lifestyle scenarios, this study targeted future target consumers as participants. According to the investigation of future consumption capacity, although population aged 20~30 accounts for 17.44% of the national population of Taiwan (16.75% in 2010), their consumption capacity is twice than that of other age groups. The purchase of boutique products of this group accounts for 40.8% (Yeh & Chang, 2011). It is obvious that the consumption capacity of the

age group 20-30 is representative. In addition, the advancement of the internet has allowed the transmission of information to be faster in a greater amount, and internet users are under the impact of cultural diversity and new modes of online consumption. As a result, the age group of 20-30 will be the future target consumers (in the next decade), and are influential on the market trends (Jing & Ruiming, 2013; Narang et al., 2012; Agnieszka, 2011; Chenne, 2011).

The participants for this research were selected from the population of young consumers aged 20~30. At first, the participants were chosen through the internet questionnaire on a random basis, and repetitiousness investigates to reduce the scope to 50 participants. Of the fifty participants, forty completed all phases of the research. Twenty of the participants were male and twenty were female. A total of forty effective questionnaires were collected, with a return rate of 80%.

3.3 Research tools

To effectively identify users' needs in future lifestyle scenarios, this study applied questionnaire survey and semi-structural interviews as the main research tools. The questionnaire contains six topics, which are generalized from literature reviews. Each topic is investigated in two phases.

The first phase is a closed questionnaire and each questionnaire is given 4~6 yes or no questions. The purpose is to study users' current questions of use situations, and how they solve these problems. A sample is shown in table 1. The second phase involves semi-structural interviews of 4~7 open-ended questions. The aim is to gain a deeper understanding of the problems users encounter. In the questions, users describe how they solve the problem now, and

how they wish to solve the same problem in the future (as shown in table 2). Finally, the results are analyzed using frequency distribution and KJ in order to generalize the trends and key points of future lifestyle scenarios.

Table 1. The first phase question

No.	Item	Question	Yes or No
B014	Travel experience	Have you ever gotten lost while travelling overseas?	☑Yes ☐ No

Table 2. The first phase question

No.	Item	Question／Answer
B101	Travel experience	Q: when you were lost while travelling, how did you solve the problem? Imagine you are in the future. How would you wish to be able to solve this problem immediately?
		A:

3.4 Data analysis and process

To understand users' views on the current situation and needs concerning the six human needs, this study uses frequency distribution of descriptive statistics to analyze the results collected from the close-ended questions in the first phase. KJ is used to analyze the qualitative data of semi-open-ended interviews in the second phase. Descriptive statistics can translate the original data into meaningful information, and also visualize the concentration and dispersion trends of the entire data. Data processing methods include frequency distribution, diagrams, and scales of data (Lee & Lee, 2012). Hence, in the first stage, this study uses frequency distribution to understand users' views on the current situation of six future lifestyle scenarios.

In the second phase, KJ is used for analysis. KJ can help us uncover insights from the data gathered. The "integrated skills" of data analysis can generalize different data and opinions, and transform them into a set of results relating to the context. KJ is suitable for identifying unknown events, constructing systematic ideas of

events, breaking through current conditions, establishing a new system and delivering beliefs and principles. Hence, the content or structure of problems can be clear and manageable. KJ can divide data into units and integrate them.

The method to carry out this study is applying KJ focus group study and brainstorming, in which the three researchers were expected to collect and reorganize the data. Firstly, the 40 copies of data were transcribed verbatim. The interview contents for each issue was reorganized, categorized into units and labeled accordingly. Each label is then written on one card, and similar cards are sorted together to form a group.

4. Result and discussions

The data collected from the questionnaire and interviews underwent rigorous data analysis. Due to the focus of the paper, this paper will present the results of one topic - "future travel information integration and recording" as an example. The authors can provide completed analytical results upon request.

4.1 Current situation, demands, and trends of future lifestyle scenarios
4.1.1 Analytical results of future travel information integration and recording

The current situations, difficulties, and future demands of travel experience, travel records, and travel sharing are discussed. Frequency distribution is used to sequence the items by ratio. The diagrams derived by KJ are used to infer items of users' future demands.

(1)   Travel experience

From the data collected, we identify that all participants have "travel experience in unfamiliar areas" and 100% of participants have "experience of traveling abroad". Regarding perceived difficulties, 88% "could not adapt to the

environment", 85% "got lost while travelling", and 70% "experienced language gap and difficulty of communication" (Figure 2).

Ask a passerby	Check the map
B103-P05 Ask a passerby. B103-P06 Ask local people or police B103-P01 I ask passerby when I get lost B103-P08 Asking for directions is an opportunity to approach local people	B103-P07 Check the map B103-P03Map checking B103-P03 GPS Guide map
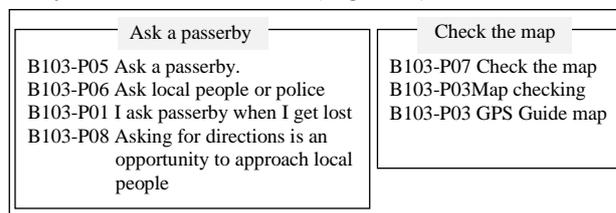
Fig 2. Participants' solution for difficulty in traveling

As shown above, when traveling in an unfamiliar area or in foreign countries, many travelers cannot adapt to the environment, which is often solved by bringing medication. Another common problem is "getting lost", which is because they are unfamiliar with the area, and this can be solved by asking for directions or using a map. Hence, the future demand suggested by users is to provide sufficient travel information, to enhance language proficiency and to improve their adaptive ability (Table 3).

Table 3. Travel experience: current dilemmas and future demands

Current solution for difficulty methods	Future demand
1. Ask a passerby 2. Check the map 3. Prepare medication by myself	1. Provide sufficient travel information 2. Enhance language proficiency 3. Improve the adaptive ability

(2)   Travel records

The results of frequency distribution suggest that 45% of participants encounter difficulties while reorganizing travel records and 75% have difficulties searching for past travel records.

According to Figure 3, most participants usually use camera or mobile phone to record the pictures, texts, and videos.

Present the travel records by pictures, texts, and videos

B201-P01 Recording by photos
B201-P13 Recording by photos
B201-P09 Image recording
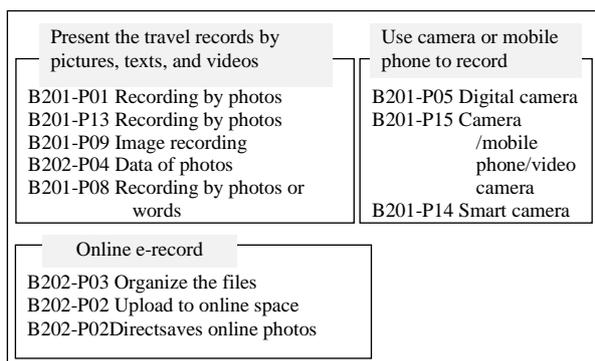B202-P04 Data of photos
B201-P08 Recording by photos or words

Use camera or mobile phone to record

B201-P05 Digital camera
B201-P15 Camera /mobile phone/video camera
B201-P14 Smart camera

Online e-record

B202-P03 Organize the files
B202-P02 Upload to online space
B202-P02 Directsaves online photos

Fig 3. Current conditions of travel records

Regarding the content of travel records, the users suggested that they record meaningful, interesting, special and trivial things, daily lives, sceneries, customs, traveling evidence, and friends and relatives (Figure 4).
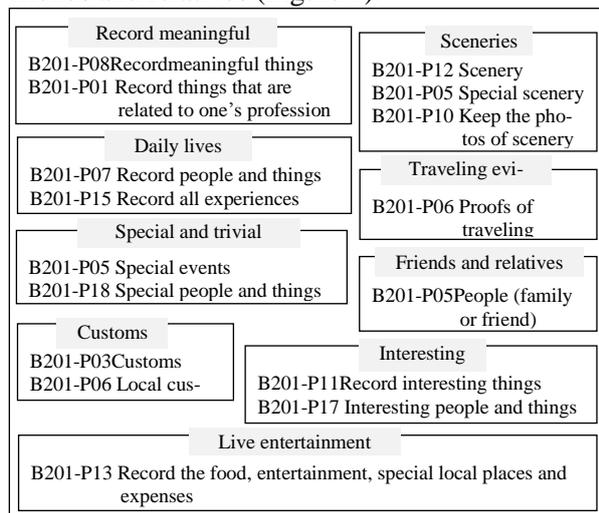
Record meaningful

B201-P08 Recordmeaningful things
B201-P01 Record things that are related to one's profession

Sceneries

B201-P12 Scenery
B201-P05 Special scenery
B201-P10 Keep the photos of scenery

Daily lives

B201-P07 Record people and things
B201-P15 Record all experiences

Traveling evi-

B201-P06 Proofs of traveling

Special and trivial

B201-P05 Special events
B201-P18 Special people and things

Friends and relatives

B201-P05 People (family or friend)

Customs

B201-P03 Customs
B201-P06 Local cus-

Interesting

B201-P11 Record interesting things
B201-P17 Interesting people and things

Live entertainment

B201-P13 Record the food, entertainment, special local places and expenses

Fig 4. Content of travel records

Participants' recording methods and contents regarding traveling record are shown in table 4.

Table4. Traveling record: current recording methods and contents

Current recording methods	Current recording contents
1. Present the travel records by pictures, texts, and videos 2. Online e-record 3. Use camera or mobile phone to record	1. Record meaningful 2. Daily lives 3. Live entertainment 4. Sceneries 5. Traveling evidence 6. Special and trivial things 7. Friends and relatives 8. Customs 9. Interesting

As seen above, the participants mentioned 8 difficulties (Figure 5): large size of recording

device, an insufficient power of recording device, insufficient recording memory, difficult to record due to bad weather, insufficient memory space, text recording is not in real-time, loss of recording, and time-consuming to organize the recordings. Hence, the existing recording devices have problems of large physical size, insufficient power and storage capacity, as well as the real-time use of the data, loss of data, and organization of data.
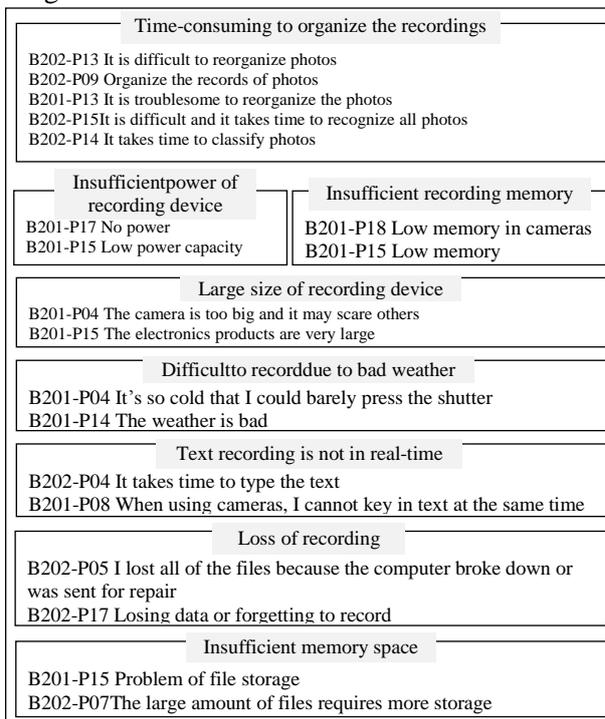
Time-consuming to organize the recordings

B202-P13 It is difficult to reorganize photos
B202-P09 Organize the records of photos
B201-P13 It is troublesome to reorganize the photos
B202-P15 It is difficult and it takes time to recognize all photos
B202-P14 It takes time to classify photos

Insufficientpower of recording device

B201-P17 No power
B201-P15 Low power capacity

Insufficient recording memory

B201-P18 Low memory in cameras
B201-P15 Low memory

Large size of recording device

B201-P04 The camera is too big and it may scare others
B201-P15 The electronics products are very large

Difficultto recorddue to bad weather

B201-P04 It's so cold that I could barely press the shutter
B201-P14 The weather is bad

Text recording is not in real-time

B202-P04 It takes time to type the text
B201-P08 When using cameras, I cannot key in text at the same time

Loss of recording

B202-P05 I lost all of the files because the computer broke down or was sent for repair
B202-P17 Losing data or forgetting to record

Insufficient memory space

B201-P15 Problem of file storage
B202-P07 The large amount of files requires more storage

Fig 5. Problems faced by the participants whilst recording the travel experience

Based on the current situations and difficulties, the subjects' demands for travel records are shown in Figure 6. The demands include automatic sorting and labeling functions of the device, virtual memory, real-time text editing function, real-time charging, full recording, lightweight recording device, and automatic sorting of records. Other demands include high-quality records, compatibility of recording devices with other accessories and physiological sensors. Hence, expandability, automation, and portability of recording devices are most

needed. The most prospective demand is to combine the recording device with a physiological sensor for recording.
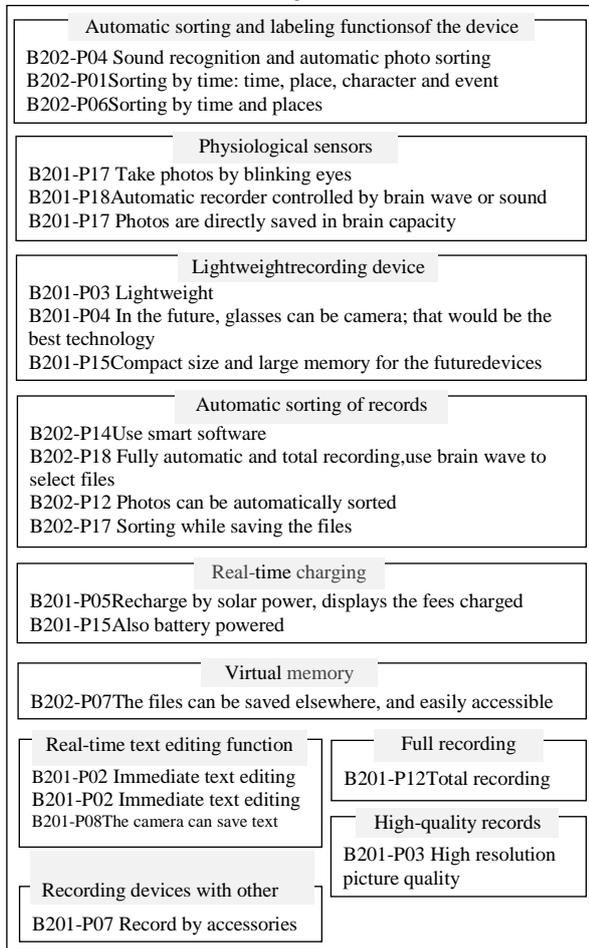
Automatic sorting and labeling functions of the device
B202-P04 Sound recognition and automatic photo sorting
B202-P01 Sorting by time: time, place, character and event
B202-P06 Sorting by time and places

Physiological sensors
B201-P17 Take photos by blinking eyes
B201-P18 Automatic recorder controlled by brain wave or sound
B201-P17 Photos are directly saved in brain capacity

Lightweight recording device
B201-P03 Lightweight
B201-P04 In the future, glasses can be camera; that would be the best technology
B201-P15 Compact size and large memory for the future devices

Automatic sorting of records
B202-P14 Use smart software
B202-P18 Fully automatic and total recording, use brain wave to select files
B202-P12 Photos can be automatically sorted
B202-P17 Sorting while saving the files

Real-time charging
B201-P05 Recharge by solar power, displays the fees charged
B201-P15 Also battery powered

Virtual memory
B202-P07 The files can be saved elsewhere, and easily accessible

Real-time text editing function	Full recording
B201-P02 Immediate text editing	B201-P12 Total recording
B201-P02 Immediate text editing	High-quality records
B201-P08 The camera can save text	B201-P03 High resolution picture quality

Recording devices with other	
B201-P07 Record by accessories	

Fig 6. Future demand of travel record

The participants proposed 8 difficulties that they have encountered, and 10 future demands regarding those difficulties (Table 5).

Table 5. Travel records: current difficulties and future demands

Current difficulties	Future demands
1.Time-consuming to organize the recordings	1. Automatic sorting and labeling functions of the device
2. Text recording is not in real-time	2. Physiological sensors
3.Insufficient recording memory	3. Lightweight recording device
4.Insufficient power of recording device	4. Automatic sorting of records
5. Large size of recording device	5. Real-time text editing function
6.Difficult to record due to bad weather	6. Real-time charging
7. Loss of recording	7. Full recording
8.Insufficient memory	8. Recording devices with other accessories

	9. Virtual memory
space	10. High-quality records
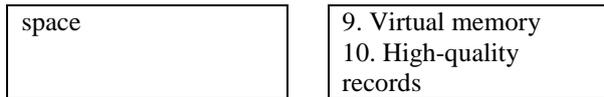
Most participants reported that they record their travel experiences with cameras or mobile phones in formats of photos, texts, and videos. The files are saved and sorted in online spaces. The contents of the travel records are mostly meaningful and interesting people and objects, daily entertainment, and travel evidences. The participants also express the needs for real-time recording, file recovery, and sorting functions. Therefore, the future demands concerning travel records include hardware expandability, automated and portable devices, and physiological sensor operations.

(3) Travel sharing

According to the frequency distribution, 90% of the participants want to share the most interesting parts of their travel experience with their friends, often in forms of photos and videos, which are uploaded and shared online.

As shown in Figure 7, the participants share their travel photos and videos online. In recent years, online communities became popular. Users not only share their travel experiences with their friends and families, but also with online users around the world.
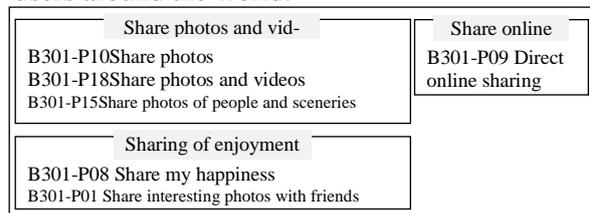
Share photos and vid-	Share online
B301-P10 Share photos	B301-P09 Direct online sharing
B301-P18 Share photos and videos	
B301-P15 Share photos of people and sceneries	

Sharing of enjoyment	
B301-P08 Share my happiness	
B301-P01 Share interesting photos with friends	

Fig 7. Current modes of travel sharing

The difficulties of travel sharing, as indicated by the users, include: exposure of personal privacy, inability to share in real-time and time-consuming in sorting (Figure 8). This suggests that though it is convenient to share online, some private information may be disclosed unintentionally. Although the files can

be shared easily online, there is no device or function for efficient sorting of the files. In addition, photos and videos can only convey visual sensation, and cannot deliver other types of senses such as the touch or smell of souvenirs.

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┌─────────────────────────────────────────────┐
│          Exposure of personal priva-         │
│ B301-P05 It involvespersonal privacy          │
│ B301-P18 Some things cannot be shared          │
│ B301-P08Very private photos need to be shared  │
├─────────────────────────────────────────────┤
│               Time-consuming in                │
│ B301-P02 Identify the dates and places the photos were taken │
│ B301-P14 It takes time to sort photos          │
├─────────────────────────────────────────────┤
│               Unable to share in               │
│ B301-P07 Unable to share real objects, such as souvenirs; besides │
│ 2D sharing, real objects can also be seen and touched │
└─────────────────────────────────────────────┘
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Fig 8. Problems faced during travel sharing

For future demands of travel sharing (Figure 9), users suggested using smart devices for sorting files, setting of share permissions, real-time sharing, sharing by physical senses, unlimited share quality, and full-function camera. As seen, the users expect integration, access control, immediateness, physical sensing, high-quality, and powerful devices for travel sharing.

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┌──────────────────────────────┬─────────────────────┐
│ Using smart devices for sorting │  Unlimited share    │
│ B301-P04 Robot assistants        │ B301-P11 Unlimitedfiles size │
│ B301-P14 Use smart software      │                     │
├──────────────────────────────┴─────────────────────┤
│                    Full-function                     │
│ B301-P01 Look forward to development of 360 degree cameras │
├──────────────────────────────────────────────────┤
│                Setting of share permis-             │
│ B301-P15 Only share some photos to keep personal privacy │
├──────────────────────────────────────────────────┤
│                  Sharing by physical                │
│ B301-P17 Telepathy                                  │
│ B301-P18 Files can be sorted by brain waves          │
├──────────────────────────────────────────────────┤
│                   Real-time sharing                 │
│ B301-P12 Immediate sharing with friends              │
└──────────────────────────────────────────────────┘
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Fig 9. Participants' needs for travel sharing

The users mentioned their problems of travel sharing as: exposure of personal privacy, unable to share in real-time, and difficult and time-consuming to sort files. In addition, photo and video sharing is only for visual experience and cannot demonstrate other senses, such as the touch and smell of souvenirs. Therefore, the users proposed 6 future demands (Table 6).

Table 6. Travel sharing: current difficulties and future de-mands

Current difficulties	Future demands
1. Exposure of personal privacy 2. Unable to share in real-time 3. difficult and time-consuming to sort files	1. Using smart devices for sorting files 2. Real-time sharing 3. Sharing by physical senses 4. Full-function camera 5. Setting of share permissions 6. Unlimited share quality

The above analysis suggests that the users worry about exposure of personal privacy when sharing information online, and experience difficulty in file sorting. Photos and videos cannot convey multiple sensory experiences. Therefore, they expect devices with immediate integration, access control, virtual and physical sensory experiences.

Finally, based on the three analyses of the issues, the users' "future travel information integration and recording" can be concluded as follows: (1) according to travel experience, adaption to environment, sufficient travel information and language capacity are important during travel; (2) the users expect expandability, automation and portability of future travel recording devices, along with physiological sensors; (3) travel record sharing is expected to be based on immediate integration, access control and virtual and physical sensory experiences.

It is noted that the users mentioned the use of physiological sensors for recording, as well as hardware expandability. Hence, in the future trend of travel information integration and recording, in addition to information transfer and virtual experiences, sensory operations can be developed.

5. Implemetation

According to data analysis and findings, the implementation is based on the issue that is most concerned by the users - "future travel information integration and recording". The scenario of "travel record" is presented here to serve as an example. The method of scenario depiction was first applied to human-machine interaction (Suri & Marsh, 2000). The best example is the case of ID TWO, a design company in the UK, and Richardson Smith, a design firm in the U.S., which used the scenario method to develop a panel printer for Xerox. The application in the early stage was to observe scenarios of product use, and then introduce the human-machine interface design. Later, the method has been used to develop various types of products (Liu, 2010). The internationally renowned design company, IDEO, applied the scenario method to innovative product development. The process includes five steps: (1) understanding; (2) observation; (3) visualization; (4) evaluation and refining; (5) implementation (Smedt, P. D. et al., 2013). Scenario planning should be based on the users' background and motive. Through scenario imagination and physical concepts, future life-style scenarios are depicted, allowing designers to systematically create products that match future life-styles.

5.1 Understanding

This section probes into the current situation of advanced technology, and conducts case analysis, in order to understand the scenario of travel records (integration and recording of travel information).

As previously mentioned, the users' demands for "future travel information integration and recording: travel records" include hardware expandability, automation, portability and physi-

ological sensor design. The users particularly indicate their expectation on devices with physiological sensing functions and hardware expandability. The future trends of this issue focuses on information transfer and virtual experience, as well as the development of physiological sensing operations and enhanced functions (Table 7).

Table 7. Descriptions of current usage, future demands, and development trends

Item	Travel records
Current usage	1. Time-consuming to organize the recordings 2. Text recording is not in real-time 3. Insufficient recording memory 4. Insufficient power of recording device 5. Large size of recording device 6. Difficult to record due to bad weather 7. Loss of recording 8. Insufficient memory space
Future demands	1. Automatic sorting and labeling functions of the device 2. Physiological sensors 3. Lightweight recording device 4. Automatic sorting of records 5. Real-time text editing function 6. Real-time charging 7. Full recording 8. Recording devices with other accessories 9. Virtual memory 10. High-quality records
Development trends	The future demands concerning travel records include hardware expandability, automated and portable devices, and physiological sensor operations.

5.2 Observation

This study conducted field observations in the scenario of travel records, and the key findings are described below. The observation found that, while using cameras for photo taking, users may not be able to capture the best shot at once. As such, they often use the function of continuous or multiple shots. However, when they have a large quantity of photos, they cannot delete the blurred or unimportant shots quickly. As a re-

sult, the memory becomes full very quickly. After taking photos with cameras or smart phones, the users can upload the photos to different platforms for sharing but the photos can only be displayed in low resolution, which are unable to convey the splendor of the scenes. Hence, this study treats this observation as a reference for the following visualization.

5.3 Visualization

According to the observation in the previous section, this study focuses on "future travel information integration and recording", and refers to the development in the scenario of living concepts and key points of prospective technology. The visualized scenario description is presented by 5W1H, as shown in Table 8 and Figures 10 to 15.

Table 8. Scenario: real-time recording and sharing

Item	Scenario
What	When traveling in a foreign country or unfamiliar regions, people tend to record interested people and things, and share them with friends who can enjoy the exotic images.
Where	Foreign cities
When	Approximately in 2024
Who	Alice (tourist)
How	Alice enjoys traveling abroad. As soon as she arrives at a new place, she explores her surrounding excitedly, and is curious about all people and things. She cannot wait to share with her family and friends. She takes out the fully automated image recorder from her backpack and places on her eyes. It automatically projects a virtual window and records what she sees. She slides her hand on the top of virtual window horizontally for zooming and takes beautiful photos. After taking many pictures, Alice selects and sends photos to family and friends. Friends in different places receive the messages and photos sent by Alice. Her friends can browse the photos and virtual 3D images by the receiver. They are totally involved.

Item	Scenario
Application	Image recording: 1. Fully automated image recorder in a form of lens, and is attached to glasses. It traces the movements of the eyes, and records all people and things seen. 2. It is attached to glasses and is lightweight, minimizing damages. 3. It has the function of sunglasses, and can protect eyes, absorb solar energy, and recharge with solar power. 4. Smart image recording automatically deletes the unimportant images to save memory space.

Fig 10. Alice enjoys traveling abroad. As soon as she arrives at a new place, she explores her surrounding excitedly, and is curious about all people and things. She cannot wait to share with her family and friends.
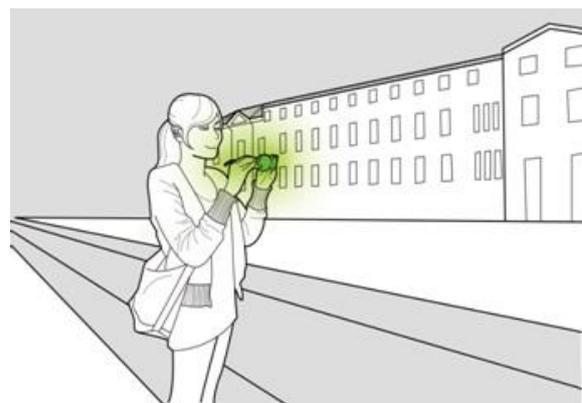

Fig 11. Alice takes out the fully automated image recorder from her backpack and places on her eyes. It automatically projects a virtual window and records what she sees.

Fig 12. Alice slides her hand on the top of virtual window horizontally for zooming, and takes beautiful photos.

Fig 13. After taking many pictures, Alice selects and sends photos to family and friends.

Fig 14. Friends in different places receive the messages and photos sent by Alice.

Fig 15. Alice's friends can browse the photos, and virtual 3D images by the receiver. They are totally involved.

5.4 Evaluation and refining

This study evaluates and refines the scenario of the issue by SWOT analysis. SWOT is a market analytical method proposed by Albert Humphrey. Through evaluation of Strengths, Weaknesses, Opportunities and Threats of a company, it provides a thorough analysis and positioning of competitive advantages prior to setting corporate strategies. In recent years, SWOT is commonly applied to the evaluation and analysis of product design, design strategy, design planning, and acts as reference for designers and developers. Thus, this study evaluates scenarios of the issue by SWOT analysis (Table 9).

Table 9. Scenario: real-time recording and sharing

Strengths	Weaknesses
• **Support of current technology:** development ofvarious prospectivetechnologies is vigorous (see Table 7). There are companies that support the development. • **Total recording:** it breaks through the limitation of angle of view and records what the user sees. It can minimize the discomfort after long-term viewing. • **Recording is simple and user-friendly:** it combines physiological sensors. The operation is simply based on familiar physical movement. Users can thus freely record the trip. • **Convenience to share 3D images:** theadvantage of **a** 3D naked-eye viewer is that users do not have to wear glasses. They can use it any place and it is suitable for all ages.	• **Time of market development is short:** development of physiological sensor technology and 3D development is shorter than other display devices. Hence, it requires market promotion and longer market introduction. • **Higher cost:** the cost is higher than other display devices, which may be an obstacle for mass consumers.

Opportunities	Threats
● **Expansion of social networking business opportunities and broad application:** it can be used in social networking platforms, entertainment, education, guide, business, etc. The business opportunities are unlimited. ● **Integration of communication platform and visual communication:** by image communication and touch or video communication, it shows interaction between humans and platforms. In the future, it will be visualized and is the key of development.	● **Data theft and exposure of privacy:** although the Internet is prevalent, and protection of personal information is stipulated by laws, hackers and theft of data are still unavoidable. ● **Technical prevalence:** Google Class and 3D image development still have space for improvement; the technologies are growing and can be expanded in the future.

As seen above, the scenario has competitive advantages and opportunities. The propose design combines simple and user-friendly physiological sensing operations, total recording, and social networking platforms for interaction. With prospective technology, such as real and virtual 3D images, new opportunities can be created in broad fields. Currently, the cost of new technology is high, and products in the market are in the testing stage. Hence, the market share and product popularity are incomparable to conventional display devices. However, it is expected that prospective technology will become mature. When suppliers invest more capital and effort, the prices will be lower, thus driving the market share and purchase intention higher. In turn, more funds and talents will be invested in this industry to develop the technology.

5.5 Implementation

Since the scenario design of this study is the prior work of product design, the implementation of the practical design is not discussed.

6. Conclusions

This study analyzed future lifestyle scenario development trends and key points of advanced technology development trends. The findings can serve as references to develop future inno-vative products. Facing a changing R&D environment, social structure, and life demands, products are expected to continuously evolve and improve. Innovative technology and new product development can enhance future lifestyle scenario. Apparently, trends will be the key to future industrial operations and continuous growth.

From literature review and empirical study findings, this study proposed future lifestyle scenario development trends, as well as the key points of advanced technology development trends. The process effectively analyzed future users' demands concerning six issues, thus providing a reference for innovative product development of future lifestyle scenario. According to the frequency distribution of each issue, the needs were ranked. With the analytical results, the industry can identify the key development items and develop the functions and services that meet future lifestyle scenarios. Companies can thus seize opportunities in future product development, and control the key success factors of the next market competition.

According to future lifestyle scenario development trends, based on the three factors of the issues, the users' "future travel information integration and recording" can be concluded as follows: (1) according to travel experience, adaption to environment, sufficient travel information and language capacity are important during travel; (2) the users expect expandability, automation, and portability of future travel recording devices, along with physiological sensors; (3) travel record sharing is expected to be based on immediate integration, access control and virtual and physical sensory experiences. These factors should be concerned in future product design and development, in order to satisfy users' needs, create products that are

innovative and revolutionary, and meet the new trends of future lifestyle scenario.

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未來生活情境中產品創新之發展趨勢調查

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摘要

　　本研究旨在探討未來生活型態和前瞻技術的發展與趨勢，可作為未來生活型態開發產品創新的參考。其研究方法首先討論未來生活型態和前瞻技術之趨勢，萃取未來生活型態情境的相關趨勢問題，以及針對消費者未來生活型態進行問卷調查和訪談。此外，運用 KJ 方法和次數分配之數據分析作交互討論，因此，建構出未來生活型態和前瞻技術的發展趨勢的主要因素。最後，使用情境描述法根據研究結果分析，建立了不同族群未來生活型態對於創新產品開發之建議。研究結果確定了前瞻的技術開發影響了消費者的生活型態，亦是未來生活中是創新產品設計和開發的主要考慮因素。

關鍵詞：未來生活型態、創新設計、前瞻技術、產品設計